If either of these amplifiers is RIGHT... the other must be WRONG

EQUIPMENT REVIEWS:
KRELL, CARY, HEADROOM FORSELL, MFA, NHT, YBA

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MUSICIANS vs THE MUSIC INDUSTRY
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Two recent listening experiences of mine echoed the overblown praise Jon Landau lavished upon Bruce Springsteen after he heard The Wild, the Innocent & the E-Street Shuffle. But all hype aside, Landau was right: Springsteen was the future of rock 'n' roll—or at least what passed for the future of traditional rock in those pre-MTV, pre-techno, pre-house, pre-gangsta, pre-rap, pre-hip-hop, pre-grunge, pre-Mariah Carey, pre-Garth Brooks, pre-sampling, pre-digital days. And I believe that, Landau-like, I too will be right. I have heard the future of audio, and it is digital—digital technology has finally surpassed the sound quality of analog.

"What?!" you splutter into your breakfast java as you peruse this first issue of the new, big, 20-bit Stereophile. "Has JA finally gone deaf? What about this issue's 'Letters' section, in which Athena Productions pleads for high-end magazines to recognize the LP as still scoring over CD as the medium of choice for quality music? What about high-end political correctness?"

But I didn't say "CD"—I said "digital." And by digital I mean the new recorders capable of storing up to 24-bit data. Stereophile recently borrowed such a machine, the $26,500, four-channel, open-reel Nagra D, fitted with 20-bit ADCs, to record pianist Robert Silverman performing Liszt. Before the sessions, Peter McGrath, recording engineer and the proprietor of Florida's Sound Components, flew out to New Mexico to share some of his arcane knowledge with us. Peter brought a selection of his open-reel masters of some of his orchestral recordings, made with the Nagra. He also brought some CD-R dubs of the same recordings.

The 16-bit CD-Rs sounded like very good CD. But the 18-bit Nagra tapes decoded by the same Mark Levinson No.35 processor didn't sound like CD at all. They had a fragile tangibility—that presence that sounds like nothing so much as a live mike feed—that you never hear from CD, but that does get captured by good analog.

Robert Harley reports in this month's "Industry Update" on a visit he and I paid to Sony Classical in New York. Sony's David Smith had arranged for us to audition 20-bit open-reel masters. Again, they didn't sound like CD. To hear that combination of transparency and ease was to lust for it in my own home.

Coupled with Pioneer's and Mitsubishi's introduction of DAT and open-reel digital machines with a 96kHz sampling rate, Pacific Microsonics' HD CD process, and Mobile Fidelity's use of a Mike Moffat--designed 16-bit ADC with a 352kHz sampling rate, it looks as if digital master tapes can finally be made with the resolution and sound quality we were promised more than 15 years ago.

The only remaining debate will be how to preserve as much as that master--tape quality as possible on the commercial 16 bit CD release.

But what if I'm wrong? What if the future of audio doesn't lie in improved quality? As Robert Harley also reports in "Industry Update," the audio-engineering community seems to be much more excited about the reduction of the CD's prolific rate. Data is something that can be stored on a teeny MiniDisc, that can be squeezed alongside a film's frames between the sprocket holes, that can be jammed into an HDTV video signal, and that ultimately can be squirted through a cable into your home.

For these engineers, existing CD quality is an unachievable goal, not a minimum standard. This is why I detest the whole subject of perceptual or low-bit-rate encoding.

But one thing about it does excite me: the idea that you can look at measured defects of components, not in absolute terms ("0.01% of second-harmonic distortion," for example), but in terms of the calculated audibility of the error—"6dB above the average threshold of hearing at 2kHz at 90dB SPL." Both Robert Harley and Peter Mitchell talk about this Noise/Mask Ratio technique in "Industry Update." For me, it holds the promise of finally locating the source of high-end components' sonic qualities. Currently, as Jack English writes this month, "The importance of very small differences that may well be inaudible to some [is a] point of contention." Perceptual measurement techniques will make it a point of contention no longer.

Welcome

With this issue, we welcome Copy Editor Kristen Weitz to our full-time family. An aspiring musician and singer, an undying fan of, in her words, "the greatest rock-'n'-roller who ever lived"—Iggy Pop—and an Honors graduate in journalism and politics from the University of California, Santa Cruz, Kristen's most recent job was as Editor of a New Mexico weekly. Nevertheless, she willingly exchanged her Lou Grant--issue green eyeshade for the opportunity to wrestle with Corey Greenberg's raw copy. But who wouldn't?
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149 DIY high-pass filter
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KEEP ANALOG RECORDINGS ALIVE!

Editor:
I just received very troubling news a few days ago. Kavi Alexander of Water Lily Acoustics informed me that his future recordings will not be released in the LP format because the public is not supporting the sales of the LP. It is troubling because fewer LP releases will mean LP pressing-plant closures sooner than we think. The current state-of-the-art storage medium, the LP, is at the brink of extinction.

After some thought on the subject, I have formulated a simple hypothesis that may explain the cause of the problem of weak sales shared by most, if not all, audiophile labels that are releasing LPs.

The population of audiophiles is composed of LP buyers, CD buyers, and audiophiles who buy both LPs and CDs. Going on the assumption that the individuals who make up each of the two former groups of music consumers will not cross over to the other medium in the future (although I do get reports of some who are selling their CD collections and obtaining as much vinyl as they can afford), I've concluded that the number of LP-buying audiophiles who stop buying LPs (for various reasons, such as budgetary constraints, other hobbies replacing their interest in music, death, etc.) are not being replaced by those who are just beginning to show a serious interest in recorded music and audio nirvana.

If these "new kids on the block" were to read an issue or two of Stereophile in order to obtain information on CDs or LPs as the preferred medium, I believe they would not get a clear picture as to which medium is considered the state of the art by the publication, because the hardware reviews and most software reviews do not compare the LP with the CD. Furthermore, because he or she is constantly being bombarded by the "Perfect Sound Forever" propaganda as spewed on radio, television, and every kind of establishment print media extant, that "kid" will certainly select the CD format. It happens every day! Incoming audiophiles pledge their allegiance to the CD while we lose the LP lover to attrition.

Therefore, in the interest of keeping the LP alive, we must ensure that the outgoing LP consumers are replenished in kind. I therefore propose that Stereophile (as well as the other audiophile publications such as The Absolute Sound, Positive Feedback, Sensible Sound, Bound for Sound, etc.) make it perfectly clear in each issue that the LP is the state-of-the-art storage medium at this time. Period. Personally, I'd like to see it in big bold letters on every page.

Audio dealers can help too. Sure, they cry that the big CD chains like Tower are taking away most, if not all, of their CD business. And they are correct. However, the chain stores do not sell LPs. If the

ONE ADVERTISER'S RESPONSE TO Stereophile's NEW SIZE AND CORRESPONDING INCREASE IN ADVERTISING RATES

Dear Ken,

I am sitting here trying to catch up with the mail I received during the time I have been away in North Carolina. Joanne and I spent 10 days there catching up on our reading, our sleep and certain other unmentionables.

So, I came across this shiny, slick color and weight STEREOPHILE affair announcing that the pages, the cover and the rates are all increasing in size. I can just see you and Archibald conspiring about all this. Archibald: "We'll increase the page size one inch in each direction and we'll increase the page rate by $500." Nelson: "No, we'll increase the page size by an inch and a half in each direction and we'll raise the rates by $1000 a page."

My grandfather, who had an accent, said he knew four guys who owned a movie theater back in the '20s. They were discussing rebuffering the theatre. The first partner said, "Vee should cover da ets mil wheet and raise da tickets from 25 cents to 50. After all wheet is so soft and comfortable. It's won it." The second partner said, "We should cover the seats mit ladder and raise the price to 75 cents. Ettah! Ladder is warm in the winter and cool in der summer. It's won it." The third partner said, "we should cover the seats mit temp and raise the price to $1. Ettah all, temp is so pretty and it will appel to all da women. It's won it, No?"

The fourth partner said, "how about da? We should out da price to 15 cents and cover the seats mit esces."

And you two wise guys should reduce the page size by 10% and the rates by the same amount.

With love and wishes,

Simeon Ishak Bar lian, dea Sandy Berlin

September 21, 1993

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Stereophile, January 1994
Nearly always, designers operate within limits, especially of time and money. Deadlines and budgets constrain their whole approach and the problem they must solve is how to create good products within these constraints. However skilful they are, the result has to be a compromise.

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A momentous announcement

Editor:

Such a momentous announcement as that [about the Adcom GFP-565 preamplifier] which appears on p.123 of Vol.16 No.10 should not be so hidden away. You should put it on the cover, in fluorescent yellow, followed by an exclamation point. I cannot imagine a more unlikely statement from the hallowed halls of Santa Fe. This is the definitive answer to those critics who charge you with financial snobbery. Please publish, at least on the back page, in the biggest and boldest type in your font collection: Stereophile drops a component from THE LIST, claims it is too expensive.

Gary Todd
Columbus, OH

A closed mind?

Editor:

I decided not to renew a few years ago. I originally subscribed because of J. Gordon Holt’s crisp, succinct prose. Today’s Stereophile has moved far from that style. It’s too technical and no longer enjoyable for me.

Recently I read parts of two articles that reflect my disappointment. One dealt with various tweaking which the author, Martin Colloms, claimed improved the sound 3%, 5%, and so on. To me, this is just voodoo electronics better left to The National Enquirer.

The other article appeared last August (p.113). Corey Greenberg wrote, “When are manufacturers who exhibit at CES going to realize that Real People listen to Real Music?”

When are minor authors going to realize that their tastes are momentary fads, and classical music will be appreciated for hundreds of years beyond Sly and the Family Stone?

Stereophile is too much like contemporary thought: “What I feel is true, is true for everyone.” We are far too imperfect for that type of pronouncement.

R. DAVID WALTERS
Monterey Park, CA

An open mind?

Editor:

I’m a recent subscriber and I really enjoy Stereophile. However, I think that exotic wire, interconnects, and related fauna are a joke. Anyone who has ever taken apart an amplifier or speaker would have to agree, unless their mind is completely lacking in logic and the power of reason.

This aside, Corey Greenberg’s articles alone are worth the subscription price.

Darren Leite
Scottsdale, AZ

About time?

Editor:

Regarding Paul McGowan’s letter to Corey Greenberg (October ’93, Vol.16 No.10, p.18): It’s about time...

Van (RAISED ON ROCK ‘N ROLL) Tuma
Midland, MI

Angry ravings?

Editor:

I found JA’s article on the responsibilities of an editor of a high-end journal (“As We See It,” September 1993) as refreshing and comforting as sighting a Coast Guard vessel in a storm of audiophilia.

To read of your cognizance of such matters was consoling, reassuring, and restored my wavering confidence in Stereophile to a great extent. The editor, like the conductor of an orchestra, is “The last line of defense against irresponsible reviews”—or performances, if that be the case. As with any ensemble, someone seeking truth or quality must keep the errata born of giant egos and emotions at bay...

This fan letter is, however, not without criticism—albeit constructive, I hope. Corey Greenberg’s report from the SCES (August 1993, p.113) was quite simply a disgrace. The angry ravings of an obviously overinflated child are, in my opinion, a discredit to your magazine.

I am not in the position to judge the dollar value of such tawdry sensationalism (I don’t work for The National Enquirer), but I’m certain that cheap, clumsily written shots (such as CG made about Nudell) can only be to your detriment in the long term.

Calvin Damon
Milford, PA

Stereophile, January 1994
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IN DEFENSE OF CG

Editor:
Like the other budding audiophiles whose letters appear now and then, I too have enjoyed the writing of Corey Greenberg. Like Corey, I have also experienced the snobbish attitude of the High End toward popular music and youth. This is why I am compelled to write in response to Paul McGowan's letter. In his October letter, Mr. McGowan spends most of his time using nonstandard English in his attempt to belittle Mr. Greenberg. Yet he does make two serious points. First, he accuses CG of not spending enough time listening to the Genesis I. Second, Mr. McGowan suggests that CG does not "have a clue" as to what he is talking about.

Well, I must say that CG does know what he is talking about. If one reads his Conrad-Johnson MV10A preamplifier review, one will see CG's insight, careful comparison, and technical knowledge.

In response to the first accusation, I relate my own experience. With only a few days before my senior year in college, I decided that I needed to buy a listenable pair of speakers to replace my old Yamaha NS-4s. Having had a good experience with my friend's B&W 801s, I drove an hour to a dealer in Brown Deer from my home in Fond du Lac, Wisconsin. There, I was treated quite poorly. Perhaps because I am young, the salesman rushed me. He hurried me through my music and said almost nothing throughout the entire audition. With the prospect of spending another year with the Yamahas on my mind, I bought a pair of B&W DM 600 minimonitors without the careful audition that I had intended to have. When asked how long I could audition the speakers at home, the salesman said that home auditions were not store policy. Maybe it was just me.

In my system, the little B&Ws sounded harsh to the point of driving me out of my room. Perhaps the effect was due to my Philips FR-70 receiver connected to my Pioneer CLD-501 CD/CDV/LD player via AudioQuest Ruby Interconnects.

Well, this system will change soon. After a couple more years and a Ph.D., I will be able to afford something better than my Philips (its treble knob is turned to -2dB). Needless to say, I will neither be buying anything from the store in Brown Deer, Wisconsin, nor will my new speakers be of the Genesis make. I am sure the Genesis I sounds fine, but the gentleman from Genesis (Paul McGowan) does not impress me with the professionalism and respect that potential customers deserve.

Like Corey, I too will carry a "chip on my shoulder" for those of the intolerant faction of the High End. Like Corey, I do not appreciate being rushed through anything. Like me, my young audiophile friends will spend our money elsewhere.

ANDY CHANG
Age 21, Class of 1994
Cornell University
Ithaca, NY

BUTTING HEADS WITH GOATS

Editor:
Young stags should choose their battles more wisely before butting heads with "old goats."

"Corey Greenberg Recommends Rock 'n' Roll to Lizards & Goats" (Stereophile, August 1993, p.113) really got my goat. It's not CG's cockiness, or his rau-cous editorial style, or even his irreverence that has my hooves dug in: It's his funky attitude.

For the record, it has to be said that Arnie Nudell (Genesis Technologies) deserved better treatment from this

---

1 Stereophile, Vol.16 No.6, p.167.
Everything about the Renaissance Seventy/Seventy promises the finest sound attainable anywhere, such as separate power/self-bias systems for each 300B triode, massive 21 section transformers, and 35 pound hand machined chassis. Careful craftsmanship produces minimal distortion, yet uses no feedback. Of course, the palpable realism cannot be described in words. ...you must experience it for yourself.

Also available: Renaissance Thirty/Thirty & Renaissance One-Forty.

Come see these superb amplifiers at the 1994 WCES, Sahara 7201/7202.
Readers may recall that Sly Stone had the rather cynical habit of "blowing-off" his own gigs (many say it was a publicity stunt designed to gain him notoriety). When it became obvious that the Grant Park concert was not going to be any exception, the place went up for grabs. The situation really turned ugly when the police arrived, and in the course of trying to make it back to my car, I narrowly dodged a stray bullet (no joke)—but hey, that's rock 'n' roll... and we like it... right?

All of which leads to my final point: There's an uncanny parallel between Mr. Greenberg's roughshod antics and those of his beloved funk master. And in the off-jaded world of journalism, there will always be something reprehensible about a reporter in search of a story who, unable to find a controversy, sets out to foment one—regardless of the casualties.

**J**ohn **L. De**Co**sta**

**R**osemont, **IL**

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**DISAPPOINTING DIGITAL**

**Editor:**

The standards and practices used in digital audio are inadequate and only getting worse, what with DCC and MD. I will be further disappointed if Stereophile abets the mass marketers' efforts to replace the analog compact cassette with either of these formats. I cringe when I read about 128kb/s DAB. I don't think audio can be a serious hobby with these standards. As alternative formats, why not a CD which has audio frequency modulation onto it instead of being PCM-encoded, or a secondary CD standard which allows enough audio bandwidth to eliminate Gibb's Phenomenon while being flat up to 25kHz or better and having less than 3% quantization distortion (without dither) over a 120dB range? At least then, sound quality would not be seriously format-limited.

**T**homas **M. Dawson**

**L**isle, **IL**

---

**DISAPPOINTING TERMINOLOGY**

**Editor:**

Stereophile has recently contained some careless usages of language which don't help clear audio thinking.

1) "The XYZ is connected across, not in series with, the signal path so that it has no (ill) effect on signal purity." What is being forgotten here is that electronics is a business of loops. Shunt devices and circuits can be just as much in the signal path as series ones, are never wholly out of the signal path, and can add as much, if not more non-linearity, noise, and signal errors as a series component.

2) "The XYZ uses time delay to equalize the LF and HF arrival times." Tautological nonsense! First, if you really could delay time, you would be warping the Universe in which we live in a big way. Second, both "delay" and "arrival" are words about time. What is really going on is more truly represented when the above sentence is rewritten: "The XYZ uses signal delay to equalize the high- and low-frequency signal arrivals."

**B**en **DUNCAN**

Tattershall, Lincoln, England

---

Mr. Dawson should note that an FM CD will still require bandwidth limiting. A secondary CD standard has already been proposed, of course, in the form of Pacific Microsonics' HDCD, which encodes within the 16-bit, 44.1kHz data stream wider-bandwidth and higher-dynamic-range information about the signal.

Ben is, of course, correct about shunt devices being just as much in the signal path as series ones. But despite his correct criticism of our usage of the concept of time, I am unabashed. Once a signal is in the digital domain, it will, by definition, suffer a time delay before being converted back to analog. (In the case of a CD, this time delay is what you pay your money for.) If you delay parts of the signal less than others before their reappearance in the analog domain, you are in essence moving them forward in time—without disobeying the laws of physics or changing the nature of our Universe. In fact, the recent availability of very large hard disks and large amounts of RAM storage means that you can treat the time aspect of a digitized musical signal as just another variable to be manipulated at will.

---

**ASSESSING DATA-REDUCTION SCHEMES**

**Editor:**

I enjoyed Robert Harley's description of his experiences with DCC and PASC encoding (July '93). I would like to make one comment that relates to the optimum way of conducting listening tests for data-reduction schemes that rely on multi-band masking.

At least one of the reviewers in the July issue on DCC remarked that headphone listening should be more revealing than listening over loudspeakers. There is, however, a problem that occurs with data-reduction systems that only shows up under less-than-optimum listening conditions. Since the great majority of potential DCC users will be in an environment that compares poorly with the listening rooms of your reviewers, I believe it is important to understand this mechanism. Sub-band coders rely on the fact that a sinewave at a particular frequency effectively masks noise and dis-

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**Stereophile, January 1994**

WorldRadioHistory
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tortion components that are nearby in frequency. This works well as long as the frequency response during playback (including the loudspeakers and the acoustic transfer function of the room) is relatively flat.

But what happens if the playback response is not flat? For example, if we pass a signal consisting of 10 piano notes through an encoder box, then apply a narrow-band notch filter at the output of the encoder box with a frequency equal to one of the piano notes’ fundamental frequencies, then the fundamental tone will be removed, but the narrow-band noise and distortion components produced by the PASC encoder will not be removed, and will be very audible.

While this may seem like an unfair test, consider what happens when you take the frequency response of a fairly “live” room by very slowly sweeping a sine-wave from 20Hz to 20kHz through your speakers. You will find a very ragged response with notches of 15 or 20dB occurring very often. Normally, frequency-response measurements like this are smoothed to remove these features, but in all but the driest environments they will be present to some degree.

Now suppose that a solo piano is slowly playing a scale, and that the fundamental of a particular note happens to land on a notch in the frequency response. Again, the signal that was supposed to mask the narrow-band noise produced by the encoder is gone, and you will hear narrow-band noise modulation. Another related problem is that of off-axis listening. Assume that a center-panned signal of 5kHz is played through both speakers, and that the listener is off-axis by a quarter-wavelength of 5kHz (less than 0.1°). The two signals arriving from the loudspeaker will now be shifted relative to each other by a half-wavelength, and will therefore cancel. Again, this causes a notch in the frequency response that may unmask the narrow-band noise modulation. Headphone listening will never reveal this problem.

While it would seem from the previous discussion that a solo instrument playing a scale in a live playback environment might represent the worst case for DCC, this is not exactly the case. Since PASC allocates bits in the frequency domain based on the energies in each frequency band, it produces a much greater degree of narrow-band noise modulation if the signal is spectrally complex, with many different frequency bands having high energy. Since there are only a fixed number of bits to be allocated, a spectrally complex signal causes a lower number of bits to be assigned to each band.

A worst-case signal might involve a piano playing a scale in the mid-frequencies, with both low- and high-frequency signals added to the mix, but not so close to the frequency of the piano that it would mask the narrow-band modulation noise caused by the piano. If a signal of this nature were played back in a live environment with a large degree of comb filtering in the frequency response, you might hear some interesting degradations. Traditional audibility tests have usually used solo instruments played back in a very dry environment. In the past, this made perfect sense, as a solo instrument would be unlikely to mask any unwanted distortion products, and a dry listening environment would make it easier to hear any artifacts. But from the previous discussion we can infer that our intuition is wrong, and that worst-case signals are spectrally complex signals played back in a relatively poor acoustic environment with many narrow notches in the frequency response.

These types of problems are well-known by those who are doing the actual algorithm work. I would be interested to see if Stereophile’s reviewers could
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Now, to the information bettering domain — trained these agreements will make a better analog artifacts for frequency-domain expressions. It makes out transient information by dividing the data into a series of discrete blocks. As it is unlikely that repeating the encoding will split the data into exactly the same blocks, doing so will worsen the time-smearing, resulting in an audible phenomenon not unlike traditional modulation noise. Our experience has been that Sony’s ATRAC algorithm is much worse in this respect than DCC’s PASC, perhaps due to PASC’s more conservative approach to the discarding of information.

—JA

ULTRALUCKY?

Editor:
Reading Ken Kessler’s view of the British hi-fi retailer situation and LA’s “Final Word” in the October issue made us realize how lucky we all are in Central NJ. Being midway between Philadelphia and NYC, with an abundance of audio retailers, it’s quite easy for us to weed out the bad ones and simply avoid them. But, even with all the fine stores available to us, we’re not always provided with the exceptional service that is often necessary with such a critical purchase.

Recently, we decided to raise our musical enjoyment by replacing a few pieces of gear. We found a buyer for our PS Audio preamp, McIntosh 2120 amp, and Daliqquist DQ-20 speakers, and set off to discover a affordable and significant sonic upgrade. After reading Stereophile and listening to many good systems, we got an idea of what’s currently available that would satisfy our needs.

Seeing a rather cryptic ad in Stereophile for UltraSystems that seemed somehow connected to the Cable Company, we called them up. After discussing our needs with Robert Stein, we set up an appointment to listen. Although he tried to persuade us to visit their finely appointed (“sexy” is how it was described!) NYC listening environment, we opted for the local convenience and rural atmosphere of Point Pleasant, PA.

The folks at UltraSystems and The Cable Company had all the equipment we wanted to audition, and then some. We were sufficiently impressed that, on our next visit, we purchased. Components were selected for their compatibility, but this is just one part of it. We were sent home with a diverse selection of interconnects and speaker cables that represented the best match for our current and recently purchased components.

Clearly, anyone who doesn’t take advantage of in-home auditioning of cables from The Cable Company is truly gambling. The selection represented some of the best cabling the industry has to offer and ought to have sounded great with anything — yet there were clear winners and losers! We found the cabling that made the system really sing, and bought it. We’re not jaded audiophiles; just folks who want their music to sound really good.

With our choice of speaker cables, we had exact length and termination requirements that needed manufacture. While this was being done, UltraSystems set us up with some “get-me-by” cables — about $800 worth that were included in the original cable evaluation and appropriately matched for the amp and speakers!

The amplifier we purchased was expertly modified by UltraSystems’ Bob Cohen to elevate its already exceptional performance. After we experimented at home with various input tubes for even better performance, it was found necessary to have the amp’s circuitry altered to accept a wider range of tubes. Not only did UltraSystems take care of this for us, they provided us with a loaner amp of the same make and model! Although not as quiet, as focused, or possessing the soundstage of an amp with Bob’s modifications, it was wonderful to have nothing less than what we happily purchased.

What we’re getting at here is that, after 15 years of buying quality audio gear in the eastern US, we’ve had good service and few complaints. But never the “ultra”-friendly, personal, and knowledgeable service from all the folks at UltraSystems and The Cable Company. We’re all very lucky to have helpful folks like this around.

Tim & Kath Martin
Ringers, NJ

IN SEARCH OF EXCELLENCE

Editor:
I would like to report that though JA may conjecture that “the standard of customer service is far higher on this side of the Atlantic” (October ’93, p.45), I can take that statement only as a reflection of how bad the service is in England, and not that service is any good in the US. My experience, some years ago, with attempting to purchase a high-end system left me with shame and anger. I was made to feel shame for my lack of funding, my lack of aural acuity, my inex-
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experience, my lack of a satisfactory audio library, and my inability to understand what a pathetic and unprofitable customer I was.

When one of my co-workers recently decided to spend part of his brand-new $55k/year paycheck on an audio system, I urged him to spend it on high-end equipment, assuring him that wonderful sound was his for the same price as the Sony rack system he was contemplating. He returned from the high-end dealer with his tail between his legs and purchased the Sony system the next day. I think he has forgiven me.

In my wanderings through the Southern California high-end audio retailers, I have never been made to feel welcome, nor has any effort been made to “help” me beyond the standard, desultory offer of “may I help you.” In many of the stores I have been the only customer among several (euphemistically speaking) “salesmen,” and they have chosen to chat among themselves, wash and sort records, or read magazines rather than suffer the indignity of an admittedly inexperienced customer.

I do not believe that the high-end business has any interest in expanding its market. The high-end business is simply a very large clique, with all of the attendant entry fees and rules of behavior. There are many potential customers, such as myself, whose only desire is to get the best-sounding system we can for the little we can spare. I have no interest in joining the clique. I have no interest in making audiophilia my life’s passion. I suggest that there are many like me, and that any retailer (or manufacturer) interested in long-term survival would do well to pay less attention to honoring the brethren, and more to selling product to any who are willing to pay. If you are confused as to how to go about this, I recommend re-reading Tom Peters’ *In Search of Excellence*. It’s really very simple. Guy Buchanan

Ramona, CA

**RETAILING IN THE UK #1**

**Editor:**

We read with interest and amazement Ken Kessler’s “Industry Update” article (October '93, p.44) in which he attacks British specialist hi-fi retailers. Unfortunately for Ken, much of his ammunition (in the form of Mana Acoustics’ John Watson’s opinions) was dud; let us explain why...

For the record, let’s explain where we’re coming from: Grahams Hi-Fi is acknowledged as one of the leading specialist hi-fi retailers in the UK (even listed as one of the “five best hi-fi shops in the world”). We have been trading for over 60 years, and our level of customer service is envied by many. The quality of service we provide is directly linked to the support we receive from our suppliers.

Bearing this in mind, we were sad that at the end of 1992 we had to stop dealing with Mana Acoustics, because they were unable to give the grade of service which we require. This was the first time in the history of our company that we have had to stop selling a product which we think works really well, because of inadequate and unprofessional supply.

We feel it is imperative that your readers hear the other side of the John Watson story.

Grahams approached Mana about selling their products; a number of our staff already used their stands and wanted to be able to recommend them to our customers. Despite the fact that the trade margin offered by Mana was about half that of any other distributor, we felt that the products were worth selling.

During our trading with Mana we did not make a single sale which was referred directly by the manufacturer. (Pretty obvious when the manufacturer sells direct!) All our business came from our recommendation and demonstration. (John must be kicking himself now.)

---

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"Overall, however, the Sanus was the best looking of the units under evaluation. In the more important functional area, the Sanus Rack comfortably accommodated anything we wished to place on it."

"The CF45 is, however, the most suitable as the support for a full-up audio-video system (with two of the rack and the optional Video Bridge)."

Thomas J. Norton *Stereophile*

Racking It Up Vol. 14 No. 11 November 1991

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The lack of consistent deliveries, persistent failure to keep commitments, lies about delivery dates (the car was always breaking down...)—these epitomize a complete lack of understanding of retailers' needs and caused us to stop dealing with the company. We also know of at least two other retailers, whom we consider both professional and honest, that had similar problems.

John obviously has a chip on his shoulder about the UK tax man, and Ken's mention of VAT opens John up for scrutiny. For the benefit of American readers, VAT (like your local sales tax) is levied at 17.5% on all hi-fi products sold in the UK—unless your company turns over less than £37,600 per year ($56,000), in which case you don't have to register or charge VAT. John Watson's direct price does not include any VAT, which means the dealer, by comparison, starts off 17.5% down! Hence some of the haggling over margin. During the year that we struggled with John, we were probably his biggest trade customer, selling about 28 Reference tables and 55 Sound Frames (valued in excess of £13k). Can John really run a company that supports himself and at least one other guy with a turnover of less than £38k?

Larry Archibald, in "The Final Word" (Stereophile, October '93, p.354), sums up the probable demise of a business such as Mana: unless it gets its act together, it will never survive—even supposing the tax man doesn't get there first!

David Graham
Director, Graham's Hi-Fi Ltd.

RETAILING IN THE UK #2

Editor
We cannot leave Ken Kessler's piece (October '93, pp.44-45) unanswered. What surprises us is that Ken should submit and you should print such a vitriolic attack on UK dealers without apparently checking the bona fides of the manufacturer on whose views Ken's argument is based. [Regardless of whether John Watson has or doesn't have bona fides, he is as entitled as anyone else to have his opinions aired in print.—Ed.]

We hope that you will have read and chosen to print David Graham's letter about Mana and John Watson. We do not approve of washing the industry's dirty linen in public, but the misinformation Ken has repeated cannot be left uncorrected. To the best of our knowledge, Mana has never had a UK dealer network—let alone one they could close down! See David Graham's letter for the reasons why.

Of the two retailers cited as suitable for John Watson's approval, one has never been a dealer and the other admits to having been a dealer "for a few months" only; according to them, Watson insists on direct supply so that he can make the full profit margin for himself. Both shops continue to demonstrate the products and refer the customers straight to Mana. So much for sloth and greed! The story of the retailer and the spirit-level is a complete distortion of the facts.

These misrepresentations unfortunately mean that no credence can be placed on a view distorted by Mana. We are aware that Ken Kessler, however bilious he may feel about UK retailers, should have rushed into print. Mr. Archibald's sensible comments in the October "Final Word" do much to put Ken's misplaced bias into proper perspective.

No one, least of all BADA, claims that all specialist hi-fi dealers are perfect. But it is relevant to note that, like Stereophile, BADA receives very few calls or letters complaining about bad retailer behavior—and the UK media constantly publicize the BADA "Hotline" phone number, which provides consumers with direct access to a mechanism to deal with complaints, whether they concern BADA or non-BADA shops.

Michael Lewin
Operations Officer, BADA

Considering that neither John Watson nor I mentioned any retailers when I interviewed him, I find it amusing that Michael Lewin, BADA, and Grahams are taking the article as a direct attack on themselves. What does this tell me? Why should those at Grahams think that John Watson was talking about them? Perhaps Watson touched a nerve, eh? Considering the number of phone calls I have had from manufacturers and distributors who agree with him, who thanked me for writing the piece, and who even went so far as to admit that they haven't the nerve to do the same as Watson but would like to, I have to assume that something stinks in UK retailerland.

On a specific note, Mr. Lewin writes that, "Of the two retailers cited as suitable for John Watson's approval, one has never been a dealer and the other admits to having been a dealer 'for a few months' only.' My exact words were: "[Watson] cites only London's Sound Organisation and the Cornflake Shop as dealers he'd trust with his own system." What that means in plain English is that they're the only dealers he'd use if he were a customer. It did not say "These are the only dealers he'd use as agents for Mana."

Aside from that, I made up nothing of what was written and was acting solely as a reporter. I felt no need to phone any dealers to defend themselves because Watson didn't name any. And I will assume that Mr. Lewin's direct attacks on me are down to his inability, like those who equate Salman Rushdie's thoughts with those of his characters, to distinguish between my words and those of the people I write about.

KK

HOME THEATER GOALS

Editor
Like many readers, I have been intrigued by the growing debate in your pages regarding coverage and reviews of Home Theater hardware and software. I think the essay by Robert Harley and the letter by Corey Greenberg in the October issue together constitute a proper direction for Stereophile, especially since you do not plan to publish a video journal in that already crowded field.

The goal for Home Theater is totally different from that of home music reproduction. In the latter, we seek an illusion of music performed in a space, with soundstaging, nuance, timbre, etc. all being of import. With Home Theater, we seek involvement in and enhancement of the film experience, with the sound subliminally adding to this experience without calling attention to itself. I am reminded of the (perhaps apocryphal) story of producer Mike Todd<buttonholing</buttonholing folks exiting from an early screening of Around the World in Eighty Days and enthusiastically inquiring as to what they thought of the sound. To a person, they responded to the tune of "What was wrong with the sound?" In other words, they didn't notice it; they watched the movie, got involved, and although they certainly heard the soundtrack, they did not isolate it from the total film experience.

Mr. Harley is right on the money when he observes that a typical Home Theater might produce sublime viewer involvement in video film reproduction yet be sorely lacking as a high-end music-only system (okay, the Cello systems excepted—but who can afford them?). Right on, Mr. Harley, when you say that a separate Home Theater is the way to go (although I disagree that it should be a cheap system; I still seek to improve my nine-speaker surround Home Theater to achieve even higher levels of involvement). And we can still have a ball with a separate music system, either two-channel or the ever-proliferating multi-channel systems.

So I also agree with Mr. Greenberg when he (and, hopefully, the rest of you) plans to review components designed for Home Theater only. Film (on video) sound is much different from music recordings, having been processed a bazillion times (in the case of the recent Bram Stoker's Dracula, literally hundreds of channels were used to create the final mix). And, as Mr. Harley points out,
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Editor: completely to I versy, Theater system boom-de-booms, please, subtleties speaker optimal film putting space front

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So, there's your answer. If funds and space allow, enjoy both pursuits using separate systems, each designed for optimal use with either music only or film soundtracks only. And always bear in mind that dialogue intelligibility, not boom-de-booms, is the goal of Home Theater (experience the laserdisc of Rear Window on a properly calibrated home system and you'll begin to realize the subtleties that can be achieved). And, please, with cars like those on your staff, continue to review the audio portion of Home Theater, including components, speaker placement, the THX controversy, etc.

RICHARD CLANCY
Ashland, MA

HOME THEATER DEMONSTRATIONS

Editor: I agree with reservations with Robert Harley's October 1993 "As We See It" when he suggests that the ultimate goals to be achieved by Home Theater sound reproduction and music reproduction are completely separate and incompatible. Home Theater's goal is to sound "big," but not necessarily good. The addition of a visual stimulus frequently can distract from the less-than-transparent audio. The main objective of a music-oriented system is to reproduce music with sonic accuracy, taking into account factors like frequency response, width, depth, and image of soundstage.

I have frequently performed a test of Home Theater sound systems when visiting audio dealers that either amazes salesmen and customers or greatly pisses them off. Here it is: I was recently visiting a high-end audio/video dealer in San Antonio, Texas. I asked (tricked) them to show me an A/V demo of their largest Home Theater. I had them put on a laser-disc of one of their "slap-on-the-side-of-the-head" sound-effects demos that I know also contains a well-recorded and -composed musical score. (This particular dazzle-demo utilized the laserdisc of Top Gun. The system was all Sony ES electronics, a 7" Barco projector, and Klipschorns and La Scalas scattered everywhere.)

While the salesmen (plural) were parking their thumbs inside their suspenders like proud fathers, and fellow reviewers (not necessarily listeners) were standing with mouths agape, I reached up and punched the power Off switch on the projector. Big-time reality set in! The audio was bright, harsh, edgy, disjointed in glorious 5.1-channel "Dolby Pro." Did I say "Pro"? Excuse me—Tom Holman of THX would have had heart failure, either from how butchered or how laughable the sound was. Even the jet engine didn't sound natural.

I followed my usual procedure: I reset the system to reproduce music properly, as a system should. When the video was replayed, the sound wasn't as attention-getting as it had been—bad for competition, I suppose, but good for the listener. (It seems all Home Theater equipment manufacturers have adopted the policy that many FM and TV stations have—that he who screams the loudest gets the most listeners. Hang sound quality and program content; if it's loud, it's good. Period.) Everything fell into place. The music was smooth and reasonably accurate, sound effects were natural and lifelike, and the entire experience was more dazzling than before because it wasn't fatiguing, harsh, or edgy. The bass didn't lift the ceiling tiles, but it was "there." The whole experience was different, better than before, and a lot more enjoyable and impressive.

To me, the most difficult thing to reproduce is the tremendous experience of music. It contains far more richness, dynamic range, frequency range, and

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general complexity than anything else we will hear around us. Tweak a system to accurately reproduce an 8Hz note from a pipe organ, or the delicacy of a Vivaldi flute concerto, and the rest of the program sources you are likely to use in a home music-theater system (music first!) will also fall into place.

If you take as great care with your video as with your sound system—"if you build it, they will come"—they will come (damn near), amazed and dazzled for entirely different reasons than before. And you won't have to rearrange the ceiling tiles to do it, either. Ted Kunz  
Vinton, IA

MISSING THE HOME THEATER MARK  
Editor:  
Although I usually agree with Corey Greenberg's forthright opinions, I feel he misses the mark in stating in his October letter (p.20) that the advent of Home Theater will be good for the High End. He predicts that consumers at large will start flocking into high-end retailers, presumably to gain their expert advice, deemed more of a necessity because Home Theater systems are so "complex." Well, my opinion, as well as those of everyone I asked (mostly fellow engineers making decent money), is that Home Theater systems will give consumers even more reason to go for the cheapest stuff available, wherever they can get it. The reasons are simple: people have fixed budgets, therefore they now need to get more components for the same total cost. Also, considering that, most of the time, the system will be reproducing TV sound, who needs high-end equipment? As Robert Harley also stated in October (and I think correctly), Home Theater is best kept separate from the main music system. If this idea gains popularity, then even audiophiles may not go to a high-end retailer to buy a Home Theater system.

I have nothing against Home Theater, and hope that some of its concepts may someday improve the realism of music-reproduction systems. However, it's inevitable that Home Theater will be categorically regarded by the unininitiated masses as "high-end," placing real high-end systems further out of the mainstream than before.

STEVE NADLER  
Plaistow, NH

STOP RESISTING HOME THEATER  
Editor:  
After reading Robert Harley's commentary, "Home Theater, Music, or Both?" (Vol.16 No.10, p.7) on the mediocrity of Home Theater sound systems, I could not help but become outraged by the ever-present resistance to Home Theater's acceptance into the high-end audio industry. Being the owner of Pittsburgh's premier audio store, carrying products such as Audio Research, Theta, Thiel, Martin-Logan, Linn, etc., it would behoove me to join the ranks of other audiophiles/store owners/reviewers! who feel that the fidelity in Home Theater systems is not up to audiophile standards.

It is clear that this minority of people are closed-minded and are becoming fewer by the day. These people have obviously not let themselves enjoy Home Theater for what it is worth on an entertainment level, but only on a critical one.

I am currently in the process of expanding my store, where I will be able to properly display Home Theater systems that will be breathtaking visually as well as sonically. I have planned very carefully so that my audiophile customers will appreciate these rooms as much as my Home Theater (~only) customers.

I think it is time for this industry to accept in full the magnitude of Home Theater and stop resisting it. It is clear that our industry, like it or not, is headed...
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for a new complexion, one that includes Home Theater; not just foolish surround-sound systems, but state-of-the-art equipment designed to produce the best possible sound while letting you thoroughly enjoy your favorite movies.

Sure, Home Theater systems do not sound like true two-channel stereo systems, but then again, they are not designed to. Apples don’t taste like oranges, but there is definitely a large population that enjoys both of them equally.

We need to stop fighting this phenomenon and start supporting it. If not, we will see the continuation of a trend that has already begun. Specialty (stereo-only) shops are diminishing in large numbers because of this fearsome resistance. Then we won’t have any place to listen to or sell our favorite hi-fi products.

HOWARD SWIMMER
President, The Audio Gallery

SACRIFICING THE HIGH END
Editor:
I read with great interest and some amusement the letters of Corey Goldberg and Mark Angioletti which appeared in the October issue. It is enlightening to realize that I am both a fascist and a dinosaur at the same time. What a concept! Levity aside, I would like to clarify something for the record:

I am NOT anti-video!

Please allow me to quote from my own article: I want to make it clear right now that this is not going to be a diatribe against either of these formats [Home Theater and multi-room remote systems]. They are valid additions to the world of 20th-century electronics, and there is no reason why people should not enjoy them and get more use out of their audio-component investment by tying them together. That has never been the issue.

I hope that all of the people in the world who like to watch television will get to enjoy it at whatever level they desire. The issue which disturbs me is the erosion of the High End, as discussed in that article. When, for example, high-end designers deliberately manufacture speakers with midbass humps to exaggerate meter effects, they are, in my opinion, sacrificing high-end standards for the sake of commercialism. No amount of love for video will change that.

In the case of a mass-market company, we can almost excuse that sort of behavior as occurring out of ignorance. In the case of a high-end designer, there is no excuse. Mr. Angioletti is quite correct about one thing—this is not a question of religion; it is, rather, a matter of adherence to certain high standards which define high-end. While there is certainly room for discussion on what those standards are, they unquestionably do not include the deliberate addition of colorations to a component, no matter what the potential market may be. If those designers who do this are still high-end designers, they are only high-end designers part time. And if this sort of slippage continues and further erodes the high end, as discussed in my article, then the outcome is bad, regardless of whether video is fun or not.

Mr. Angioletti says, “None of us can stop technological change.” Of course we cannot stop change; change is inherent in every aspect of life. But change can be good or bad, and it’s the job of every individual to try to influence the course of that change for the better. We are the consumers, and we make the market. If we throw up our hands in resignation, then we have conceded that our piece of the market is so insignificant that it cannot have any possible influence on the nature of progress. That sort of defeatism is counterproductive and not in my nature. Our society is now heir to many wonderful, modern innovations such as rising illiteracy, higher infant mortality, increasing homelessness, and mass murder with automatic weapons. Not everything is good, Mark.
When Denon, with the audio industry’s longest heritage of digital design and music recording, charged its most talented engineers to create a range of cost-no-object components, clearly the goal was not for immediate sales. Instead, Denon applied the most advanced technologies to improve the resolution, integrity and stability of digital data transmission to achieve accurate, transparent sound reproduction and pure musicality.

What uniquely qualifies Denon in this endeavor is that the Company shares the same dedication to music of many esoteric manufacturers, but combines this fervor with the technology and resources gained through 83 years of recording music and building record/playback components. No other high-end or mainstream audio manufacturer can make this claim.

The intensive research and design that has gone into the very limited edition of S-Series components could never be recouped through sales, even at their seemingly lofty prices. Instead, Denon, in keeping with its “Design Integrity” philosophy, will explore ways to incorporate many of these advances in future Denon components. But, for those of you who can afford not to wait...

TOP: The DP-S1 CD Transport is constructed using three levels of mechanical and acoustic isolation and a high resolution laser system to deliver ultra stable, jitter-free data. $8,000.

MIDDLE: The DA-S1 D/A Converter employs ST-Genlock clock and data transmission with Denon’s exclusive ALPHA Converter System to achieve a full 20 bits of data integrity from any CD or other digital audio source. $7,000.

BOTTOM: The PA-81 Monoblocks combine parallel, complementary bipolar power supplies with a full differential power MOS-FET amplifier design to deliver more than 1,400 Watts into a 1 Ohm load. $20,000 each.
Now let's talk about fascism. I invite anybody who is not certain what this word really means to look it up in a good dictionary. The term is so fraught with evil connotations of governmental repression, religious persecution, and single-minded fanaticism that I find it astounding that Mr. Greenberg would apply it to those with whom he has a simple difference of opinion. Fascists killed six million Jews during World War II; they did not burn six million rock albums. If Mr. Greenberg feels persecuted, I am afraid it is within his own mind.

Actually, I am quite glad to have had the opportunity to experience and respond to this point of view. Since my August "As We See It" appeared, we have received literally dozens of phone calls from both customers and total strangers congratulating us for expressing exactly how they feel about the subject. These two letters were absolutely the first expression of any disagreement with that editorial.

Finally, I agree with Robert Harley that a good approach for an audio purist is to keep one's audio and theater systems separate. However, the purchase of two independent systems, one to play music and one for video, is simply not going to happen for the vast majority of people. They will only buy one system, and we all know what that system will probably sound like if theater overwhelms the market. I am not talking about Stereophile readers here, unless they're reading this magazine by accident. They'll be able to get a good-sounding system together. But we've all heard about the necessity of expanding our microcosm of high-end audio by enlisting new devotees from the general population. These folks are not going to buy two systems; they are going to have just one. If they come to my store, I'll try to convince them to purchase an excellent-sounding audio system and then add whatever video components they wish. But I fear that most people will not be so well advised. Their systems will ultimately be one more barrier to the introduction of high-quality audio into American homes.

Dr. Kenneth Gould
Audio Nexus

Review Home-Theater Components

Editor: I have been following, with some amusement, the raging debate as to whether or not Stereophile should review Home Theater products. While I agree that video products (TVs, projectors, laserdisc players, etc.) are reasonably well covered by other publications (though I can think of only one which does so in anywhere near the level of detail that Stereophile applies to audio products), the audio side of Home Theater is not well represented. I would like to see Stereophile review more audio Home Theater components.

Steven B. Lionel
Nashua, NH

As explained in last March's "As We See It," I have always regarded the audio side of Home Theater as a legitimate field for Stereophile to cover. (Indeed, in our December issue, the magazine's writers and editors voted Lexicon's sophisticated CP-3 surround-sound processor the Stereophile "Accessory of 1993.") Tom Norton is currently working on reviews of THX Home Theater sound systems from McIntosh and B&W, and standalone surround processors from Rotel and Proceed, while our publication of JGH's review of the Fogate THX system is imminent. JGH is also planning to review the Kinergetics surround processor. What Stereophile will not be covering are the video components of a Home Theater system: VCRs, laserdisc players, TV monitors, screens, etc. These are already the province of a number of good publications such as The Perfect Vision and Widescreen Review.

-HA

Hi, Steven

Editor: I'd like to take this opportunity to welcome Steven Stone to Stereophile. Over four years ago, when I was still somewhat "uninitiated," I met him when I purchased his pair of Snell A-III loudspeakers. He was the most knowledgeable and helpful audiophile I had met, and the Snells were great, too! Both I and my system have grown since then, and Steven is among those I must thank.

Steve Nadler
Plaistow, NH

New Krell Amps

Editor: I'm going to be very interested in what Stereophile thinks of the new Krell amplifiers. I spent an afternoon auditioning the KSA-100S and the KSA-300S against the KSA-250, and my ears say the new products do not sound much like the old, except for the ability to resolve complex passages and the presentation of soundstage. The new amps are musical!!!

I believe the new amps to be a lot closer to live music in that the midrange is more forward and pronounced, and the balance of the upper midrange and high end is now right. By comparison, the old KSA-250 sounds as though the entire range from midbass to upper midrange has been sucked out, and the high end is too prominent in relationship to the ever-important midrange. Only in one respect did I like the '250 better: the relationship between its deep bass and midbass is better. The new products seem to have a rise in the midbass area, giving a slightly boomy quality.

But the new products are really alive and have lost nothing in terms of their ability to drive difficult loads and resolve complex passages... In all, a real step forward—the first really musical Krells. But what does this say about your comments about earlier products?

Capt. Richard S. Loveland, USN
Woodbridge, VA

I've Heard the Glow!

Editor: I recently bought an old Fisher integrated amplifier and tuner. It was dusty and looked very used, but I had heard that old tube gear was supposed to sound pretty good. Even if it didn't, it would be a good $40 lesson.

After spending about an hour cleaning it up, I couldn't wait any longer. I unhooked my solid-state amp and preamp and hooked up the Fisher. My solid-state stuff isn't top-of-the-line, but I spent many hours of listening before I bought it, and felt I made a good choice. I had never listened to any tube equipment because the price of most, if not all, new tube gear is out of my range.

The sound of this 30-35-year-old tube equipment is unreal! Never before have I heard music like this, except for a live performance. How can an amplifier that doesn't have fancy capacitors, binding posts, and interconnects sound so much better than my new equipment that was rated so well by Stereophile?

The answer: tubes!

I now know what people mean when they say, "If it doesn't glow, it doesn't go." I have heard the glow, and I will never go back.

PA

Grand Rapids, MI
A little voice tells you to buy NHT.

Gun shots and screeching tires don't tell a story, they're just the punctuation. Movies are mostly dialog. So before you buy your home theater speakers, audition NHT. Our critically acclaimed systems deliver the whole story, from spoken word to subtle sound effect. And when the script calls for a nuclear blast, you'll think you're sitting at ground zero. NHT home theater — you really should hear what people are saying.
US: John Atkinson
Dealers promoting manufacturer and designer seminars should Fax me (don’t call) the when, where, and who at (505) 983-6327 at least eight weeks before the month of the event—if you’re putting on something in April 1994, you should get the information to me by February 1. Mark the Fax cover sheet “For the attention of John Atkinson—Dealer Bulletin Board.”

California: The Audible Difference
(805 El Camino Real, Palo Alto) is presenting a series of seminars throughout January. On Thursday 13, Bob Stuart will present the all-new Meridian Series 500 components; on Saturday 15, Michael Kelly will present the Aerial Acoustics Models 5, 7, and 10T, and Dave Nauber of Madrigal Audio Laboratories will talk about the technology behind the new Mark Levinson No.38 remote-control preamplifier and Proceed PAV audio/video THX processor; and on Saturday 22, Richard Vandersteen will answer the question: “Great Music—Great Home Theater; can they coexist?” He will also introduce the new Vandersteen center-channel speaker. For seminar times, call (415) 328-1081.

Colorado: On January 27, at 7:30pm, Gold Sound (4285 South Broadway, Englewood) is presenting Paul Rosenberg, co-founder of Mondial Designs. Paul will be talking about his new Acus and Aragon components. Call (303) 789-5310 for details.

New England: Audio Vision of Arlington, MA and Audio Ensemble of Nashua, NH have merged. Both locations have been renovated and will continue trading under the name Ensemble Music & Video Systems. The merger was made in order to offer a wider range of products and improved services to the New England music lover and Home Theater enthusiast. A series of seminars and workshops will begin in February. Call Walter Swanbon (Nashua) at (603) 886-4742, or Stephen De Furia (Arlington) at (617) 648-4434 for details and/or a newsletter.

US: Peter W. Mitchell
In late October the Grand Alliance of HDTV developers selected Dolby AC-3 coding as the US standard for the sound of high-definition television. AC-3, which is the basis of the Dolby Digital format for movie soundtracks, squeezes five discrete channels of full-range surround sound and a subwoofer channel into a total data rate of only 320 kilobits per second—barely 23% of the data rate that CDs use to represent just two channels.

Supporters of the competing Musicam Surround format had hoped that the HDTV decision might be delayed long enough to allow for a second round of comparative listening tests at Lucasfilm, using a corrected Musicam encoder. For the listening tests conducted at Skywalker Ranch last summer, sounds from an original discrete multi-channel tape were digitally encoded and decoded; then the processed sounds were compared to the discrete original recording to identify any audible imperfections in the coding.

In that test the Dolby AC-3 system outperformed the Musicam entry, reportedly because of an accidental programming error in the Musicam encoder’s perceptual coding logic. (A system from MIT was ranked third, partly because it required a higher bit rate.) Musicam Surround probably will become the standard for HDTV in Europe, and the Grand Alliance decided to conduct further tests with a corrected encoder to see whether the Musicam system might be accepted as a secondary backup format for the US. Conversely, the AC-3 system will also be evaluated in Europe as a backup format for the audio portion of the developing MPEG-2 system of HDTV.

Meanwhile, AC-3 is getting off to a quick start here, in part because Zoran’s one-chip AC-3 decoder was unveiled just a few weeks before the Grand Alliance choice was announced. The Zoran chip handles both old and new varieties of Dolby Surround sound, performing Pro Logic decoding of matrixed analog Dolby Surround soundtracks as well as doing AC-3 decoding of discrete digital surround signals. The home video theater exhibits at this month’s Consumer Electronics show in Las Vegas may include a demonstration of a surround decoder based on the Zoran chip.

The Zoran AC-3 chip was not developed only for consumer products. Already Dolby is using it in a professional Dolby Digital surround processor intended for use in movie theaters. In the new decoder, a single printed-circuit board replaces the five circuit boards that were required until now. Dolby has taken this opportunity to reduce the price of a theatrical Dolby Digital installation by several thousand dollars—halving the large price differential that had existed between the competing Dolby and DTS systems.

If you want to hear digital surround sound at home, you won’t have to wait for HDTV broadcasting to commence (ca 1996). Approximately half of all new movies are now being produced with digital soundtracks in one of the three competing theatrical formats (Dolby Digital, Universal’s DTS, or Sony’s SDDS). During the next few years there will be broad demand to make these digital soundtracks available in home video formats. Films that have been released with DTS or SDDS sound can easily be converted to AC-3 coding when they are re-mastered for home video release. The adoption of Dolby Digital as the standard for HDTV makes it a virtual certainty that it will also be used in non-HDTV video applications.

For example, a couple of years ago Pioneer was rumored to be working on an enhanced laserdisc format, Super Laservision. By using FM carrier frequencies different from the standard laser-disc, it could deliver greater video bandwidth, thus providing higher resolution.
We're Parasound and we believe that the basis of life is something more than a double-helix string of chemicals.

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You see, our products are built by people with a passion for music. People like John Curl, whose legendary designs virtually defined high-end audio.

What are the results of this passion? Without boasting (too much), the summer '93 Consumer Electronics Show awarded us an unprecedented four Design Engineering Honors.

Of course, we wouldn't expect you to buy our products just because they're well-engineered. Or because they're critically-acclaimed. Experience them for yourself. You'll agree we're offering more than a line of high-end audio components. We're offering basic building blocks of life.
(Standard laserdiscs are designed to deliver only slightly better resolution than an NTSC broadcast.) The stratagem of altering the laserdisc's video carrier frequency could also be used to provide space for 5.1-channel AC-3 encoded audio in the disc's signal spectrum.

Similarly, it would be relatively easy for engineers to devise a modified VCR format (either VHS or 8mm) that would record AC-3 code along with the picture. The obstacle, for both VCRs and laserdiscs, is not technological but economic. Would there be a large enough market for an enhanced format delivering 5.1-channel digital surround-sound with a non-HDTV picture, or will consumers prefer to wait a few more years and get HDTV capability too? In any case, the cable-TV industry is already working on methods to deliver digital surround-sound with NTSC pictures so that the sound of today's movies can be delivered to the home video theater.

Only time will tell whether, as I suggested in this space two years ago, AC-3 coding may also become the basis of a new audio-only five-channel recording medium. This could provide greater concert-hall realism than most people are able to achieve now by using a time-delay processor to extract or simulate ambience with two-channel stereo recordings.

US: Thomas J. Norton
Many audiophiles prefer to use, or would at least like to try, ST (AT&T) optical digital links between components such as CD transports and D/A converters. Until recently, components—most of them near the top of the High End—needed to be designed for such an application. Now Bel Canto Design, a small Minnesota company, is marketing an accessory called the Opti-Link™ which converts from coaxial input/output to ST. Both transmitter (digital output) and receiver (digital input) versions are available at $250 each, or $450 for both. We have requested a set for evaluation and will report on it in a future issue, but thought the product interesting enough to inform readers of its existence. Bel Canto can be reached at P.O. Box 396, Excelsior, MN 55331; Tel: (612) 926-0814, Fax: (612) 926-7791.

Canada: Robert Harley
It often happens in high technology that though cutting-edge engineering is at first very expensive, given enough time it trickles down to a more affordable price.

The technology inside the $15,000 Meitner Intelligent Digital Audio Translator (IDAT) is a perfect example.1 The IDAT is packed with innovative engineering that pushed the envelope of digital-processor circuit topologies. The technological innovations included a custom input receiver that virtually eliminated jitter in the recovered clock; a second jitter-reduction circuit just before the DAC; an eight-DAC scheme that shifted the zero crossing distortion away from low-level signals; and, most significant, a new dual digital-filter topology that processed transient and steady-state waveforms independently for maximum signal fidelity. The musical results were stunning: the IDAT set new standards in many areas of digital reproduction, and earned a Class A recommendation in Stereophile's "Recommended Components."2

Ed Meitner is now working on a new processor that incorporates many of the IDAT's innovations, and reportedly improves on some of them. While that's not unusual, what is surprising is the new processor's projected retail price: $1300.

The yet-to-be-named processor is expected to be unveiled at this month's Winter CES. It uses two Motorola 56000-family DSP chips running exactly the same filtering algorithm as in the $15,000 IDAT. The input receiver is said to be an improved version of the C-Lock circuit that reduces jitter in the recovered clock, with an additional C-Lock jitter-reduction stage just before the DACs. The DACs and output stage are fully balanced in the digital domain, with four DACs and four analog output sections. The DAC chosen for the new converter is, surprisingly, the Philips DAC 7 Bitstream chip. According to Ed Meitner, many of the musical drawbacks of Bitstream are the result of poor digital filtering, not the 1-bit conversion method. He believes that by combining his custom digital filter with Bitstream conversion, he can build a better-sounding processor. Indeed, Ed claims the new converter sounds better than the $15,000 IDAT!

Balanced and single-ended outputs are standard, as are all four digital inputs (AES/EBU, coax, ST-Type optical, and TosLink). The unit will be housed in a full-sized Melior chassis. A version for car-stereo use will be available later this year.

Japan: Peter W. Mitchell
Two items of new-product news from Japan, as reported in the industry newsletter Audio Week:

Sony's new $2000 DTC-2000ES DAT recorder is equipped with built-in circuitry for Super Bit Mapping, the requantizing system that has been used in many recent Sony CDs. SBM allows 20-bit master recordings to be transferred to the 16-bit CD format while yielding a minimal loss of resolution and a more analog-like sound. It will be interesting to see whether the version of SBM used in the new DAT recorder is the full circuit, or a radically stripped-down version of the process. The Recording Industry Association of Japan is said to be upset about the plans of several manufacturers (Kenwood, Yamaha, Pioneer, Marantz) to produce CD-R recorders for the consumer market this spring. On our side of the Pacific, the RIAA—the US counterpart of the RIAJ—is said to be unconcerned about this prospect. This is because in the US, the law that mandates the inclusion of SCMS copy-control circuits in digital recorders applies to all digital recording media for the consumer market, including CD-R. Reportedly the Japanese version of the law applies to the DAT, DCC, and MD formats, but not to CD-R. This raises the prospect that Japanese hobbyists could copy CDs onto CD-R without any restrictions.

Actually, this won't be a problem—the new Japanese CD-R decks will include the same SCMS chip as US versions. In fact, both to minimize cost and to make it difficult for potential pirates to bypass the copy-control circuit, the SCMS logic is buried within the chip that controls all recording functions—for example, detecting whether a cassette is in place.
Natural Musical Excitement

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The main effect of the new Japanese CD-R machines may be that Taiyo Yuden and TDK will cut the prices of blank CD-R disks to more reasonable levels. When the CD-R format was first introduced several years ago, the announced list price of blanks was around $40. But as long as CD-R machines were used mainly by recording studios, it was virtually impossible to find the disks at that price, and a couple of years ago TDK introduced its blanks at $80 apiece.

This became doubly curious when Kodak and Philips launched the Photo CD system. Anyone could take a roll of color film to a Kodak processor, get the film developed, and have all of the pictures transferred to a Photo CD, for less than $25. If you subtract from this the cost of the film processing and a reasonable labor cost for doing the transfers, it became obvious that Kodak was charging only $10 or so for the blank disk—a disk which, on inspection, seemed to be the same Taiyo Yuden CD-R blank disk that audio customers were paying $60 to $80 for. Of course there were official denials, and perhaps Kodak was deliberately subsidizing the disk price (at a loss) in order to promote the sale of Photo CD players.

But a lengthy investigation by British audio journalist Barry Fox eventually showed that, in fact, a Photo CD is substantially identical to a CD-R disk. Last year an enterprising British recording engineer, annoyed by the huge price disparity between Photo CDs and CD-R blanks, even reported in Studio Sound that he had managed to obtain a blank Photo CD from a Kodak dealer, placed it in a CD-R recorder, and successfully recorded audio on it. (The "official" story was that Photo CDs wouldn't work in CD-R recorders, and Photo CD dealers are not supposed to sell blank disks for such use.) Anyway, as the population of CD-R machines grows, the peculiar pricing of blanks may finally be rationalized at a price level in the $20 range.

UK: John Atkinson

That grande dame of record-review magazines, Gramophone, was one of the first publications to fully embrace Compact Disc. I was intrigued, therefore, to see tucked away in a corner of their September 1993 issue a notice that they are examining the possibility of producing a magazine aimed at collectors of classical recordings both on LP and on earlier formats. If anyone would be interested in reading or contributing to such a publication, they should write to: Vinyl, General Gramophone Publications Ltd., 177-179 Kenton Road, Harrow, Middlesex HA3 0HA, England, UK.

US: Robert Harley

For the past year and a half, Audio Alchemy has cornered the market on transport jitter-reduction devices with their popular Digital Transmission Interface (DTI). The $349 DTI, a box inserted in the digital datastream between a CD transport and a digital processor, reduces jitter from some transports.

Audio Alchemy’s hegemony is over: Three new jitter-reduction devices are either in the works or have been recently introduced. Theta Digital, Sonic Frontiers, and Digital Domain (the CD mastering and professional equipment manufacturing company founded by Bob Katz, engineer of the Chesky recordings) have all announced plans to manufacture jitter-reduction boxes. Audio Alchemy

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is countering with their new DTI Pro, a product that reportedly is more effective at reducing jitter than the DTI. The DTI Pro also claims to provide “resolution enhancement” by generating new data beyond the 16-bit level.

I'll have full reviews—including jitter measurements—on most of these products in the coming year. Until then, here's a sneak preview of the jitter-reduction devices you'll soon see in high-end stores.

SONIC FRONTIERS ULTRA JITTERBUG
The Sonic Frontiers Ultra JitterBug uses UltraAnalog's AES20 input receiver and additional circuitry that reportedly results in lower jitter than is possible with the AES20 itself. The unit has three digital inputs (AES/EBU, coaxial, and TosLink) and two digital outputs (AES/EBU and coaxial). The $695 Ultra JitterBug will be housed in a 9.5" W by 2" H by 7" D Sonic Frontiers—style chassis. Delivery is scheduled for this month.

THETA DIGITAL TLC TIMEBASE LINQUE CONDITIONER
The Theta TLC Timebase Linque Conditioner is a small box designed to fit behind an equipment rack. With no front panel or attention to cosmetics, Theta was able to keep the price a low $200 in its standard version. The TLC takes coaxial or TosLink input and has coaxial output as standard. AT&T ST-type optical output adds $150 to the TLC's price; Theta's "single-mode" optical output is a $300 option.

Originally conceived as a format changer for laserdisc players (converting TosLink to coaxial), the TLC uses a Crystal CS8412 input receiver and a proprietary clock jitter-reduction circuit. Theta claims an output jitter of 40–50 picoseconds, measured over a 50kHz bandwidth. Theta's Mike Moffat reportedly measures a reduction in word-clock jitter at the DAC (the point where jitter matters) with the TLC in the digital datastream with many CD transport and processor combinations. The TLC began shipping in October 1993.

DIGITAL DOMAIN VSP
The Digital Domain VSP was originally designed as a professional product for digital recording and mastering applications. Designer Bob Katz thought the product sounded so good when placed between a digital source, such as a CD transport, and a digital processor that he decided to market the VSP to audiophiles. Fanfare International, distributor of Jadis and Harmonix, will sell the VSP by mail order.

The VSP is unique in that it uses the new Analog Devices AD1890 Asynchronous Sampling Rate Converter chip. The AD1890, described in my "Industry Update" in Vol. 16 No.5, p. 41, was designed primarily for sampling-rate conversion. Data are clocked into RAM at the incoming clock rate, interpolated by a very sophisticated digital filter, and clocked out at the new rate with crystal precision. Because the chip's input and output clocks aren't tied together, the AD1890 acts as a jitter-rejection device.

The VSP can also function as a digital switcher; it has six inputs (three coaxial, two TosLink, and one AES/EBU) and six parallel outputs (three coaxial, one TosLink, one ST-type optical, and one AES/EBU). The VSP will sell for $1495.

AUDIO ALCHEMY DTI-PRO
Alchemy's new DTI-Pro has all four digital input types as standard (coaxial, AES/EBU, TosLink, ST-Type optical) and three digital outputs (no TosLink). The chassis is the same narrow width as the Audio Alchemy DDE, but is 12" deep with a ¼"-thick faceplate. Suggested retail price is $1295. DTI owners will be given a $250 trade-in credit toward the purchase of the DTI-Pro.

The DTI-Pro is reportedly more effective at reducing jitter than its predecessor, the DTI. This is achieved with a "multistage clock-recovery circuit" that is said to produce a low jitter output. The first Phase Locked Loop (PLL) produces a recovered clock that is then input to a second low-jitter PLL based on a Voltage Controlled Crystal Oscillator (VCXO). Audio Alchemy claims the DTI Pro will reduce the jitter from any transport, even very low jitter models.

The DTI-Pro's second, and unique, aspect is the Digital Signal Processing (DSP) going on in the box. The DTI-Pro uses the Star Semiconductor 1400–50 quad DSP chip running at 50MHz to perform what Audio Alchemy calls "resolution enhancement." The software-driven DSP chip interpolates the Least Significant Bits (LSB) below the 16-bit level based on the information in the 16 bits read from the CD. The technique reportedly produces a 2.8–bit (16.7dB) improvement in resolution over 16-bit data in the bass and midband. Note, however, that this process works best at low frequencies, and less well with high-frequency signals.

Fig. 1 shows the error signal of a 3kHz sinewave with 48kHz sampling frequency. The vertical scale is in LSBs, with the scale encompassing ±0.5 LSB. The deviation from a straight line represents quantization error that always occurs when an analog function is quantized into discrete steps. The DTI-Pro's "resolution enhancement" algorithm generates additional data below the 16-bit level, reportedly reducing this error.

Because the DTI-Pro is software-controlled, future algorithm improvements are realized by changing an Erasable Programmable Read-Only Memory (EPROM) chip. Software upgrades will cost about $50.

As these new products become available, we'll have a full report on their musical and technical performance. As always, the proof is in the listening. And because we can now measure jitter in the output of a transport or jitter-reduction device, we can verify or refute the manufacturers' jitter claims for these products. Stay tuned.

4 Quantization is the process of converting a continuous analog function into a series of discrete functions. In digital audio, the continuous function is the analog waveform; the discrete function is the series of numbers representing points along that waveform. Quantization error is the difference between the actual analog voltage at sample time and the nearest number to represent that voltage. When the analog voltage is exactly halfway between quantization steps, the quantization error will be greatest. In this worst-case condition, the quantization error is half the value of the LSB. It follows that, with a smaller step size between quantization levels, the quantization error amplitude will be reduced.
Founded in 1972, Monitor Audio is one of the UK's most innovative loudspeaker manufacturers.

While many other specialists have come and gone, Monitor Audio continues to design and manufacture products true to the principles of quality in engineering and craftsmanship.

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As part of my trawl through what might be described as the seminal products of our time, I suddenly remembered one, not from the mainstream, but from that remote tributary of hi-fi—that of headphone design. The model I have in mind was the first true modern headphone, one that changed the market forever. My Lords, Ladies, and Gentlemen—the HD414 from the German Sennheiser company.

Prior to the HD414's launch, Sennheiser was practically unknown to the average hi-fi consumer. The successful mainstream, exemplified by market leader Koss, was populated by clumsy, bulky devices which cut the listener off from his environment by encasing him in heavy, tomb-like constructions that were frequently microphonic and often displayed a range of structural and shell-like acoustic resonances. Sound quality tended to be ploddy, coarse, and, irrevocably colored.

The Sennheiser HD414 went on sale in 1968, just as the Apollo program was about to hit (lunar) paydirt, the evil empire was still going great guns, and global warming was an idea whose time had yet to come. Although headphones may now seem sedentary and unexciting, the launch of the HD414 had the shock value of a hand grenade.

The HD414 was that rarity: a genuinely radical design. It set new rules about how headphone transducers were designed. In the bad old days, most headphones were powered by what amounted to miniaturized loudspeaker drive-units, with their legacy of heavy, poorly anchored diaphragms. Bass was produced in the traditional way, with a sealed chamber around the ear and a sealed, damped resonant cavity behind to provide bass loading, aping established loudspeaker design principles. These measures gave the kind of DC-to-light frequency responses and zillions of decibels of isolation that were the criteria by which headphones were commonly judged at the time. It also meant acres of soggy bass and the transient response of wet flannel on speed, as structural and acoustic resonances were coupled more or less directly to the ear canal. But these things tended not to show in classical lab tests of the time and often escaped notice, even in the specialist press.

The HD414 turned things on their head. Sennheiser was, above all, a microphone company, and when Telefunken asked it in 1965 for a headphone to replace their existing (presumably unsatisfactory) high-impedance models, Sennheiser turned to what they had available: 4k ohm microphone capsules originally designed as dictation microphones. Their early experiments used these capsules without an enclosed rear chamber, and the units were joined by a simple headband and wired in mono for direct connection to amplifier feeds. The development staff was so surprised by what it had created that the design was rewired for optional stereo operation and sold under the company name. The Sennheiser HD414, the first true open-back headphone, was born.

The stereo version had two 2k ohm capsules, and since many amplifiers of the time lacked headphone sockets, the HD414 was initially fitted with those horrible two-pin DIN loudspeaker plugs. Environmental isolation was negligible, and the velocity (open-back) operation didn't produce the fruity, resonant bass of the leading headphones of the day. Consequently, when the '414 was first shown at a distributors meeting, the general reaction was not favorable. The US distributor, for example, thought he might be able to shift 1000 units total. In the event, the first thousand were sold in the US within two days.

The rest is history. The word spread, and by 1970 Sennheiser was making 150,000 units a year. By the time the model was discontinued in 1984, four million units had been produced.

There is no mystery to the HD414's success. They were small, light (5oz), and could be worn casually, possibly even forgotten, which was not typical of the brain clamps available at the time. Musically they were lean, clean, and mean, with a penetrating clarity that was simply unprecedented. They could do the 0-60 dash faster than any dynamic headphone around. These little babies could really fly, yet they sold for next to nothing. One of my old reference books, dated 1973, lists them at £10, which was about $24 at the time. And let's not forget style. I recall early HD414s as pumice gray and later ones as black. But the standard yellow reticulated foam ear cushions could be replaced by others in a range of bright primary colors. They could even be dressed in perforated plastic tea cozies. Yippee!

Despite my enthusiasm, I recognize the HD414's faults. I actually got to hear a 414 not so long ago, and have to admit that it has not aged well—it sounded fearsomely bright and not a little colored. Perhaps a degree of disillusion was inevitable—rose-tinted spectacles and all that. But this little revelation, which amounts to no more than a footnote in our story, does remind us that the revolution started by the 414 wasn't finished by it. A lot has happened to headphone technology since. Indeed, Sennheiser's own H400, which was even cheaper and lighter, was a better-sounding, better-balanced design. But the HD400 wasn't the first.

Now revolution and sticking fingers in convention's face are out. Painstaking linear development and design-clinic optimization (a guess in Sennheiser's case) are in. The company has recently introduced a new range of headphones, of which I have sampled one—the flagship HD580 dynamic model. This impressive design ushers in a new diaphragm technology based on dual Mylar layers which form a composite with a number of superior mechanical properties. It's a good headphone, too—honey-toned and quite lacking in the resonances and treble break-up modes that mar so many headphone designs. But it lacks a certain something. There's no snap, no electricity. Everything plays it safe. It's beautiful enough for Mozart piano concertos, but it's altogether too beautiful for the kind of music I listen to when I don't want to just relax. The HD414 was all electricity. Know what I mean?

Switzerland/Austria: John Atkinson

Professional audio company FM Acoustics, which also manufactures ultra-expensive and ultra-high-performance amplification for audiophile use, has moved. Their new address is FM Acoustics Ltd., Seestrasse 5a, CH-8810 Horgen, Switzerland. Tel: (41) 1-725 77 77. Fax: (41) 1-725 77 90.

The British Audio Synthesis line of preamplifiers and D/A processors—including the Passion "passive preamp" that Martin Colloms recommends highly—has a new distributor for the German-speaking countries: Hans Hirner, Mitteraustrasse 3/6/26, A-3500 Krems, Austria. Tel./Fax: (43) 2732-72657. (Audio Synthesis products are distributed in the US by The Cable Company, P.O. Box 579, Point Pleasant, PA 18950. Tel: (800) FAT-WYRE) Herr Hirner is also the distributor in these countries for the Californian BBE line of signal processors.

5 I am currently working on a review of the impressively engineered HD-580. See also my review of the HeadRoom headphone amplifiers elsewhere in this issue.

JA
When you finally discover the right power amplifier for your music system, questions of accuracy, control and impact seem to vanish. And musical conviction begins. Because with the right power amplifier driving your loudspeakers, the system becomes invisible to your ears, leaving you alone with the musical moment. That's as it should be. And that's just what you will discover with any of the three new solid-state stereo power amplifiers from Audio Research: D200, D300 or D400MKII. Each one conveys music with stunning accuracy, vitality and dynamic realism. That's purity of power delivery. With none of the hi-fi artificiality that conventional solid-state amplifiers imprint upon the music. All you have to do is choose the power level that's right for your loudspeakers and listening room, a decision that your authorized retailer can guide you through. Then sit back and enjoy the performance from your favorite chair.

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bit-rate coders (PASC and ATRAC, used in DCC and MD respectively, are examples of low-bit-rate coders). I'll cover the highlights of the paper presentations after a quick survey of professional products that affect the audiophile.

**NEW PRODUCTS**

Sonic Solutions, the company that revolutionized digital editing and CD mastering preparation with their Macintosh-based Sonic System, is offering Sony's Super Bit Mapping noise-shaping technology as part of their editing package. Instead of routing digital audio signals in and out of an SBM box, Sonic System users will install a board inside the Macintosh and merely click on an icon to perform SBM processing. The Sonic System has recently been upgraded to handle 20-bit audio data. This alliance between Sony and Sonic Solutions should bring many more SBM-processed titles to the market; Sonic Solutions has sold more than 750 editing systems worldwide (including one to *Stereophile*, for use in editing our recordings).

Bob Katz showed his jitter-reduction device, called the VSP. Bob is the engineer of the Chesky recordings, and runs a digital editing studio called Digital Domain. He also designs digital products for professional use. The $1495 VSP connects between any digital source and a digital processor, reducing jitter in the datastream. (See elsewhere in "Industry Update" for a brief description of the VSP.)

While we were getting a demonstration of the VSP on the Convention floor, a man walked up to the booth with a hand-held AES/EBU interface analyzer. The analyzer, made by Prism Sound in England, displays almost everything you'd want to know about an AES/EBU interface—including jitter. I had previously measured the effects of the VSP on interface jitter (reported in my "A Transport of Delight" in the November '93 issue), and was curious to see how well the two measurement systems correlated. It was quickly apparent that the Prism Sound DSA-1 was designed more for making sure digital interfaces work and that equipment can lock to other equipment, rather than analyzing the interface with an ear to sound quality. The DSA-1 was measuring jitter in nanoseconds from the VSP, while I had measured several tens of picoseconds. The difference was the measurement bandwidth: the DSA-1 looks at jitter up into the Megahertz region, while the UltraAnalog jitter analyzer I used looks only at jitter up to the maximum frequency at which jitter causes audible problems (40kHz). More-
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over, the DSA-1 didn't have nearly the sensitivity to low jitter levels as the UltraAnalog analyzer (the UltraAnalog analyzer's noise floor is a very low 20ps). Nevertheless, the DSA-1 provides lots of other information about how well an interface is operating.6

I spent an hour and a half discussing jitter and jitter-measurement techniques with Graham Boswell, one of the DSA-1's designers. He measures jitter-induced artifacts in a digital processor's analog output with FFT techniques—which require a higher-resolution A/D converter than in the Audio Precision System One. He reported that the different jitter performances of TosLink optical and coaxial are measurable as the amplitude of jitter-induced spurious sidebands around the test-signal frequency.

Sony showed their PCM-9000, a $40,000 optical-disc–based audio recorder that can store two channels of digital audio with up to 24-bit word lengths. The PCM-9000, which uses removable magneto-optical discs, is designed to replace Sony's industry-standard PCM-1630 processor and DMR-4000 ¼" U-Matic tape machine for CD mastering. With the popularity of inexpensive write-once CDs for making CD masters, however, the PCM-9000 may be too late and too expensive to become the standard format for CD mastering.

PAPERS

Peter Mitchell gave the first paper presentation on the Convention's first day. “The Dynamics of Recorded Music” addressed a fundamental issue of power-amplifier design that the audio industry has neglected. Peter conceptualized the experiment and wrote the paper, and engineers at NAD built the special measurement hardware and conducted the tests. The paper presented power histories of nearly 150 musical samples and related them to power-amplifier output requirements. His thesis is that amplifier output–power capabilities should more closely match the dynamic structure of music. Specifically, he suggests that the most efficient power amplifier should have a low continuous-power rating, but be capable of short (200ms) bursts of high–level output.

As 20-bit digital recording becomes more common, the debate over noise shaping is heating up. Noise shaping is a technique used in converting 20-bit digital audio on professional masters to 16-bit audio for CD release. The method moves quantization noise away from the band where the ear is most sensitive (1–4kHz) to the upper treble, where the ear is less sensitive. Shifting noise to the treble preserves a near–20-bit noise floor in the critical midband. (Sony's Super Bit Mapping is an example of noise shaping.) Few argue against the technique in principle; instead, the debate has focused on what noise–shaping curve does the most good and the least harm. All noise–shaping curves are based on models of human hearing, but researchers disagree as to which is most appropriate.7

An excellent discussion of these issues was presented in a paper called “Whither Dither: Experience with High–order Dithering Algorithms in the Studio,” by James Moorer and Julia Wen of Sonic Solutions. James Moorer is a highly respected pioneer in digital audio and computer–based editing. Because the optimum noise–shaping curves and dither types vary with the program material and intended use of the music, he reasoned, the mastering engineer should have control over these parameters, selecting them on the basis of listening tests rather than adhering to standards fixed in the laboratory by research scientists. We're likely to see much more debate on noise shaping and dithering before the controversy is settled.

How these noise–shaped signals are reproduced in the real world was examined in an excellent paper called “Effects of DAC Nonlinearity on Reproduction of Noise Shaped Signals,” by Eric Benjamin of Dolby Laboratories. Benjamin measured the noise floors of seven popular DAC chips, plotting the DACs' noise over a noise–shaping curve that would be used in making CDs. The experiment's intent was to discover if the inherent noise in commonly used DACs would mask the lower noise floor in the midband provided by noise shaping. If the DAC has a higher noise level than the noise–shaping curve, noise shaping's benefits would be lost, he suggested.

Fig. 2 shows a poor DAC's noise floor in relation to the noise–shaping curve applied to some recordings. The top trace is the DAC's inherent noise, the lower trace is the noise–shaping curve. This DAC's noise is 19dB higher than the noise–shaping curve at 4kHz, suggesting that the DAC's noise swamps any benefits of noise shaping. The performance of the best DAC measured in the study is shown in fig.3: it produced only a 3dB degradation at 4kHz. The curves seem to indicate which DACs are best for reproducing noise–shaped signals. Unfortunately, the UltraAnalog DAC (which has a very low noise floor) was used in a number of high–end processors wasn't included in the study.

None of the seven DACs measured for the paper was identified by name, but one can figure out which ones they were by the short technical descriptions of the DACs. The worst appeared to be the Philips TDA1541, the best the Analog Devices AD1862; the Burr–Brown PCM63 was a close second. Most of the 1-bit DACs performed less well than the multi–bit DACs. The paper also presented the seven DACs' transfer functions, linearity, and noise–modulation performances. Finally, Benjamin looked at the noise spectra of quiet signals from CDs (performing the analysis in the digital domain) in relation to noise–shaping curves. He discovered that none of the small number of noise–shaped recordings surveyed was quieter because of noise shaping. Noisy electronics or processing after noise shaping dominated the noise floor on the discs he examined. The conclusion was that we need quieter electronics and better DACs to take full advantage of noise–shaped recordings.

Jitter was also a hot topic at the Convention, with several papers devoted to jitter specification and reduction. One

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6 The $3795 DSA-I is distributed in North America by Sprocket Digital of Burbank, California. Tel: (818) 566-7700.

7 When Professor Stanley Lipshitz saw the SBM curve at the Super Bit Mapping paper at last year's AES Convention, he said to me, “I don't know what creatures that curve was designed for, but it certainly wasn't for human beings!” Incidentally, HDCD's use in-band noise shaping.
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paper, “Towards Common Specifications for Digital Audio Interface Jitter,” by Julian Dunn of Prism Sound, described new criteria for assessing the jitter performance of the AES/EBU interface. The author is part of an ad hoc task group within the AES to change the existing AES/EBU jitter specification (which currently allows a whopping ±20 nanoseconds) and add new requirements for jitter performance. The paper identified the sources of interface jitter, defined various methods of jitter assessment, and proposed specifications that would ensure a lower jitter interface. Dunn, who also co-designed the interface analyzer described earlier, proposed a dual Phase Locked Loop (PLL) clock recovery system in interface receivers. (A dual PLL architecture is the heart of the Meridian 263’s input receiver, and also of the lower-jitter UltraAnalog AES20 receiver.) Let’s hope the result of this work is a better understanding of interface jitter and tighter specifications in the AES/EBU standard.

Another excellent paper on jitter was presented by Robert Adams of Analog Devices. His paper, “Jitter Analysis of Asynchronous Sample-rate Conversion,” describes the jitter-rejection effects of his AD1890 IC described in my “Industry Update” in Vol.16 No.5, p.41. (The AD1890 is the heart of Bob Katz’s VSP jitter-reduction box.) In addition to outlining the AD1890’s unique architecture that allows the device to virtually eliminate interface jitter, the paper was a superb tutorial on the effects of clock jitter on D/A converter performance. Many of the fundamentals were covered in Rémy Fourré’s article in the October ’93 Stereophile. Bob Adams’s paper made the distinction between the effects of jitter on 1-bit converters with a switched-capacitor output filter and 1-bit converters without a switched-capacitor output filter. Further, the paper stated that a converter’s jitter sensitivity is a function of the clock frequency and oversampling rate. This conclusion confirms the validity of our technique of expressing clock jitter as a proportion of the clock frequency.8

Another fascinating paper showed how missing digital audio data could be reconstructed to make the gap inaudible. Although digital audio systems such as the CD have the ability to interpolate missing data between known good data, this technique is limited to short gaps and often produces audible artifacts (such as clicks) at the interpolation point. The method presented in the paper “A Method for Extrapolation of Missing Digital Audio Data,” authored by Robert C. Maher of the University of Nebraska-Lincoln, shows how very large gaps—1000 samples, or 22.7ms at the 44.1kHz sampling rate—can be replaced with virtually no audible artifacts. This is ten times the maximum gap length concealable by the CD system.

The technique begins by identifying the gap, then performing spectral analysis on the good data just before and just after the gap. Based on the good signals’ spectral content and amplitude, the missing data are synthesized and inserted in the gap. [It is assumed that the music neither starts nor stops during the period represented by the missing data.—Ed.] The author played a five-second section of chamber music that had five 30ms bursts of noise to represent the missing audio data. He then played just the synthesized gaps, then the music with the gaps reconstructed with this new technique. Although the listening conditions were far from optimal, the result was startling: the gaps were filled.

8 Specifically, Adams states, “A rough estimate of the jitter sensitivity can be obtained by simply taking the RMS value of the jitter (in ps, for example) and dividing by the period of the high frequency clock that drives the 1-bit output stage, and then dividing by the square-root of the oversampling ratio. This noise power is then compared to the maximum RMS signal that can be produced by the 1-bit output. A quick calculation of a typical system indicates a jitter sensitivity on the order of 20ps RMS for 16-bit performance! This is more than an order of magnitude more sensitive than for the case of resistive-ladder [multi-bit] converters.”
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in with no audible artifacts.

Fig.4 shows the waveform with a 22.7ms gap. Fig.5 is a frequency-and-amplitude analysis of the signal before and after the gap. Fig.6 is the extrapolation of the missing data inserted into the gap, and fig.7 is the resultant waveform after reconstruction. This is a remarkable achievement, and one that is particularly useful in restoring old recordings.

One paper I didn't attend that looked interesting from the preprint was Josef Standlick's "Macromodeling of Audio Power Amplifiers." The author made a small macromodel (using about 20 parts) of a power amplifier that could simulate all the conditions and parameters of a full-scale power amplifier. The macromodel reportedly models the behavior of a large power amplifier in terms of (among other things) transient response, voltage and current offsets, small signal gain vs frequency characteristics, slew rate and large signal output voltage swings vs frequency, input and output impedance, short-circuit current limiting, and output clipping.

In "Time Delay Compensation of Distributed Multiple Microphones in Recording: An Experimental Evaluation," Theresa Ann Leonard reported the results of listening evaluations of classical music recordings made with a stereo microphone pair and spot mikes that had short delays applied to their signals. When the main pair and slightly time-delayed (a few milliseconds) spot mikes were combined, the author and other listeners reported improvements in sound quality, particularly soundstage depth. Spot-mike signals added to the main stereo pair without delay can confuse the hearing process, resulting in a loss of spaciousness, the paper asserted. The study described in the paper subjected listeners to delay and no delay on the spot mikes, and noted their subjective impressions of sound quality. The results indicated that time delay was indeed perceived by the listeners, and that the delay produced a greater sense of depth and tonal clarity. After the paper's presentation, Leonard was challenged by some who had tried the technique and found it didn't work well for them.

**ON THE THRESHOLD OF A REVOLUTION?**

A revolutionary method of measuring audio equipment was unveiled during a workshop at this Convention. The measurement system demonstrated measures an audio component's distortion, then predicts the audibility of the distortion by subjecting the measured data to a model of human hearing. A real-time color display shows the level of audio errors in relation to the theoretical audibility of those errors.

The audio component's error levels are measured and compared to the masking threshold (derived from the human hearing model), producing an NMR (Noise to Mask Ratio) in 27 critical bands. The NMR reveals how close to audibility the component's distortions are. In the hardware implementation, 27 separate 1024-point FFTs are performed many times per second. The NMR is displayed in each of 27 bands continuously in real time. The display was easily and immediately interpreted, with the display changing color whenever the noise exceeded the masking threshold.

This measurement system was developed primarily for evaluating low-bit-rate coders, but the technique could be applied to any piece of audio equipment. For example, I measured a much higher level of intermodulation distortion from the Sonic Frontiers SFD-2 digital processor from its unbalanced outputs compared to the balanced outputs. I also heard a more liquid presentation from the balanced outputs. It is sheer speculation — although intuitive — to suggest that the higher level of IM products was responsible for the difference in sound quality. Using the NMR technique, however, it may be possible to objectively quantify such differences between components. The prospect is revolutionary.

An example of how much more powerful the NMR technique is compared to conventional testing was dramatically illustrated by the so-called "13dB Miracle." A short selection of linearly coded music was played as a reference, then played again with its signal/noise ratio degraded to only 13.6dB. The sound was grossly distorted. The musical section was played a third time, again with measured S/N of 13.6dB, but this time the noise was virtually inaudible.

The difference in sound quality be-

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9 A pioneer in these techniques is Meridian's Bob Stuart. His seminal papers, "Estimating the Significance of Errors in Audio Systems," "Predicting the Audibility, Detectability and Loudness of Errors in Audio Systems," and "Noise: Methods for Estimating Detectability and Threshold," are frequently cited as fundamental works in this area. Bob is not only a designer of great-sounding products, he's also a research scientist working at the cutting edge of correlating measurements with sound quality. See the discussion of these papers in Stereophile, Vol.15 No.1, p.71, and my interview with him in Vol.14 No.9.
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"Muddy" or "boomy" sounding bass is the by-product of TONAL HARMONIC DISTORTION (THD), the result of an increase in sound pressure level and a decrease in definition. THD is caused when a speaker is unable to accurately reproduce the required musical signal, creating extra harmonics that don't belong in the music. And surprisingly, 25% THD is a typical accepted distortion specification for most of the subwoofers on the market today.

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Traditional testing would show these two signals as having identical S/N ratios—despite their vastly different subjective noise levels. The two 13.6dB S/N signals were then analyzed with the NMR technique. It was immediately obvious that the poor-sounding 13.6dB S/N signal had noise well above the masking threshold, while the good-sounding 13.6dB S/N signal's noise was hidden beneath the masking threshold—it was inaudible. This was a remarkable demonstration, and one that got JA and me excited about the prospects of applying such perceptual measurements to high-end audio products. It’s ironic that research into low–bit-rate coding has produced a measurement method that may one day reveal differences between high-end audio components that are not uncovered by traditional techniques.10

Finally, we attended a workshop on grounding techniques. Although this may seem like a mundane topic—and out of place at a 1993 AES Convention—many designers don't ground their equipment correctly. The workshop presented correct and incorrect methods of grounding circuits, chassis, and cables for minimum noise and interference. Specifically, pin 1 of an XLR connector should never be tied to chassis ground. The discussion included which end of a cable's shield should be grounded (the source when going from a balanced output to an unbalanced input), and how to prevent hum and noise in audio systems. One panelist related an experience that showed just what can happen in a poorly grounded audio system. He measured ten amperes of 60Hz AC in a shield's drain wire, and 100mA of audio signal in the signal conductors.11

High-end audio product designers should attend AES Conventions; they are an invaluable source of knowledge and inspiration. Conversely, AES members should attend Stereophile High End Hi-Fi Shows and hear—perhaps for the first time—just how good reproduced music can sound.

**US: Peter W. Mitchell**

Until now, developers and reviewers of perceptual coders have relied only on listening tests, because conventional measurements provide little guidance. At the New York AES convention two new methods were demonstrated that can provide valuable information about audible flaws in low–bit-rate coders. Both operate on the same principle as the perceptual coders themselves—namely, the concept of “masking” in critical bands (see later).

The cochlea of the inner ear behaves as a bio-mechanical spectrum analyzer. A tone at any frequency can be masked (made inaudible) by louder sounds at adjacent frequencies. A “critical band” is the range of frequencies, approximately a third of an octave wide, over which such masking occurs. This has been well known for decades. Conversely, a sound at any frequency will mask (cover up) any weaker sounds at adjacent frequencies. For example, in the presence of a 1000Hz tone at 80dB spl, a tone at 900Hz or 1200Hz will be inaudible unless it is louder than 50dB. (For more details, see our April 1992 report on the technology behind DCC.)

Traditional audio measurements have employed a test tone at just one or two frequencies at a time, while an analyzer measures the strength of the resulting harmonic or intermodulation distortion components. In perceptual coders the audible frequency range is divided into 30 or more sub-bands, and the available bits are divided among these according to the strength of the signal in each band. If a test signal contains just one or two frequencies, the coder can allocate all of the bits to just the one or two sub-bands that contain those frequencies, coding them with full 16-bit precision. The usual result is that perceptual coders produce virtually perfect measurements with conventional test signals; the test tells you nothing at all about whether a low–bit-rate coder alters the sound.

To avoid this limitation, the new FASTTEST procedure from Audio Precision generates a multi-frequency test signal that contains simultaneous tones at 10 to 15 frequencies, resembling the fundamentals and harmonics of a complex musical chord. This is passed through the perceptual encoder and is also fed to the analysis portion of the Audio Precision system, which computes the masking curve of each component frequency. The composite masking curve produced by all of the tones is displayed on the computer screen. The multi-frequency test signal is subtracted from the output of the perceptual decoder, and whatever remains is displayed on the screen for comparison with the masking curve. If the decoder’s spurious output remains below the masking curve at all frequencies, the perceptual coder’s imperfections may be inaudible. But if the decoder’s spurious output rises above the masking curve, its flaws are likely to be audible.

On the exhibit floor, Audio Precision demonstrated the FASTTEST analyzer by testing a stereo pair of Dolby AC-2 coders. The test signal included an array of tones that spanned the audible frequency spectrum, except for a large gap between 1kHz and 4kHz. The decoders produced obvious spurious output in the gap where there were no tones. The spurious output also rose above the masking curve at high frequencies. This measurement appears to confirm the impression that JA and I reported on p.65 of the December 1992 issue: that AC-2 coding added some brightness and glare to the sound.

Some of the most important work in the development of high-performance perceptual coding systems has been done at the Fraunhofer Society’s Institute for Integrated Circuits in Erlangen, Germany. For example, Fraunhofer engineers developed a variable-rate MPEG Layer III encoder/decoder on a circuit board that can be installed in a standard IBM-type PC/AT personal computer.

During the AES convention's workshop on perceptual coding, Fraunhofer engineers blew the socks off most attendees by demonstrating an amazing digital NMR analyzer. The impact of NMR measurement is likely to resemble the bomb that exploded under the World Trade Center last February: The twin structures of audio design and reviewing won’t topple, but they will be thoroughly shaken, followed by the construction of a more secure foundation.

NMR stands for "noise/masking ratio." In this context, "noise" is anything added to the signal that doesn't belong there—coding errors, various types of distortion, quantizing noise, et al. Like the Audio Precision FASTTEST analyzer, the NMR system looks at the incoming multi-frequency signal and calculates the corresponding masking curve. It produces a continuous on-screen display showing (in different colors) the signal level at each frequency and the amount of unwanted "noise" around the same frequency. At each instant it also calculates the ratio of the noise to the level of the masking curve at each frequency, and combines these results to obtain the overall noise/masking ratio. The NMR is expressed in decibels; if the level of noise is much lower than the masking threshold, the NMR is a very negative number. If the NMR approaches 0dB or becomes positive, the decoding errors are plainly audible.

The Audio Precision analyzer uses a steady-state test signal and is able to operate with existing PCs. The NMR analyzer, which requires several very fast
and powerful DSP processors to do its many calculations (meaning that it is likely to make it a very costly system), can measure dynamically varying signals. This is an important advantage: some of the most important flaws in perceptual coders are time-dependent errors. The design of sub-band filters involves a difficult compromise between bandwidth and response speed, which is why perceptual coders often make momentary errors at transient beginnings where the character of the signal is changing rapidly. [See this issue's "Letters" section.—Ed.]

The demonstration compared the performance of a DCC recorder (with an average NMR of -12dB) to a MiniDisc deck (-8dB). It also showed the much lower error content of a prerecorded DCC tape (-20dB), illustrating the superior performance of the professional PASC encoder that is used to master commercial tapes. The on-screen display also showed the very different characteristics of DCC (whose coding imperfections occur mainly at high frequencies where they are unlikely to be heard) and MD (whose coding errors are distributed uniformly across a broad frequency range). It also illustrated the gradually worsening NMR caused by tandem coding (repeatedly passing a signal through DCC coding).

Every audio reviewer in the room salivated at the prospect of using the NMR analyzer, not only to assess the performance of perceptual coders but also to investigate subtle flaws in other products. For example, it might reveal dynamic (signal-dependent) distortions in power amplifiers that measure identically with steady-state signals. JA and RH are excited about the potential of this measuring system to aid in identifying subtle flaws at the margin of audibility. David Ranada, recently appointed Technical Editor of Stereo Review, hopes eventually to transform that magazine's test procedures until they all are perceptually based, ranking products according to the severity of their audible imperfections.

This won't happen overnight, but the future looks exciting. If the price of the NMR measuring system is too steep for individual product designers or magazine reviewers, perhaps one unit could be installed at a central location and shared among many users—the way that the excellent speaker-testing facilities at Canada's National Research Council are available to various speaker designers and reviewers.

**US: Peter W. Mitchell**

As Stereophile has discussed repeatedly during the last two years, perceptual coding at low bit rates is based on the "masking" phenomenon that is inherent in human hearing. Basically, the presence of a sound at any frequency makes the ear insensitive to other sounds at nearby frequencies. A "critical" band, within which such masking occurs, covers a range of frequencies approximately a third of an octave wide.

The shape and width of the masking curve are known to vary with frequency; for example, the masking curve caused by a 50Hz tone covers a narrower frequency range than the masking curve around an 8kHz tone. But are these masking curves the same for all listeners? And do they vary with loudness in the same way for everyone? These are critically important questions; the answers may affect the entire future of audio recording and broadcasting. The Compact Disc is likely to go down in history as the last digital recording medium for consumers that used direct linear coding of the entire audio waveform. All future audio media, with the possible exception of studio mastering recorders, are likely to take advantage of the vastly greater efficiency of perceptual coding for lower bit rates.

A century of research has shown that, like vision, many aspects of hearing vary greatly from one person to the next. For
example, the threshold of hearing (the level of the faintest tone that you can hear in a quiet environment) is at about 0 dB sound-pressure level (spl) at 1 kHz. But this is only an average for young adults. Some people can hear sounds as faint as −5 dB spl. Many others, particularly middle-aged folks whose ears have been exposed to several decades’ worth of sound, can’t hear anything below +15 dB spl. Anyone whose hearing threshold falls into this 20 dB span at 1000 Hz (from −5 to +15), and into a comparably wide range of levels at other frequencies, is defined as having “normal” hearing. If your own threshold sensitivity varies from the statistical average by more than 20 dB, you have a hearing impairment.

This has consequences. When scientist Floyd Toole used panels of engineers and audiophiles to rank the sound quality of loudspeakers several years ago, and then cross-correlated the judgments of individual listeners from session to session, he found a clear relationship between listening skill and freedom from sensitivity impairments. Listeners who had a measured impairment in an audiologist’s test were more erratic in their judgments of sound quality—although the music used for the speaker judging was played at relatively high volume levels that were nowhere near anyone’s hearing threshold.

Hearing varies in other respects as well. When asked to adjust a volume control until one tone sounds “twice as loud” as another, the average listener needs an increase of 7–10 dB spl to produce this subjective doubling of loudness. But some listeners need as little as 3 dB, and others as much as 15 dB, to produce an apparent doubling.

In some other aspects of hearing, such as perception of pitch differences, people are remarkably consistent. In which category do masking curves fall? Are they relatively consistent, or do they vary greatly from one listener to the next?

Recently, to kill time during a long drive, I played a cassette tape of a conference on digital audio that was part of last spring’s convention of the National Association of Broadcasters (NAB). It featured a talk by Richard Cabot, Ph.D., the leader of a group of engineers who left Tektronix a decade ago to found Audio Precision, with the aim of developing state-of-the-art instruments for making audio measurements. Audio Precision systems are now used by virtually every major reviewer, including Stereophile. Cabot’s NAB talk described his new FASTTEST measurement system for evaluating perceptual coders, which I discuss above.

In the subsequent question-and-answer session, Steve Johnston of Susquehanna Radio inquired about the variability of masking curves. Cabot is a careful and thorough engineer; since the FASTTEST system is based on masking curves, I have no doubt that Cabot and his colleagues at Audio Precision explored the available research on masking curves in the course of developing their new test. Following is his reply, transcribed from the tape: “To be honest, there hasn’t been a lot of work done on inter-subject variability of masking curves. It’s one of the tenuous areas of coding development. Most people have based their coder designs on just a few papers in the literature that were done with only a few subjects. It’s not the sort of area where people have studied thousands of listeners to characterize masking curves. That sort of data just doesn’t exist, to my knowledge. So it’s hard to say how variable they are from person to person. Most psychoacoustic measurements show significant inter-subject variability. In the papers that I’ve looked at on masking curves, when they’ve tested four people the results aren’t the same for all four; there are definite differences. How wide those differences are when you talk about the population in general, I don’t know—and I don’t think anybody does. If anyone has references to papers like that, I’d sure like to see them.”

This is an important and disturbing comment. Apparently audio engineers around the world have been racing ahead to develop perceptual coding systems based on masking curves, an area in which adequate fundamental research simply has not been done. In fact, while scientists have been studying human hearing intensity for more than a century, masking curves have been studied only a little. No one cared very much—until the rapid development of digital signal-processing power suddenly transformed perceptual coding from pie-in-the-sky fantasy into concrete possibility. Now the engineers who are designing perceptual coders need information that no one possesses.

There are good reasons to suspect that masking curves may vary significantly among listeners. For example, when Philips engineers developed the first PASC coders for DCC, they used available information about masking curves; but for some listeners, the resultant distortions were easy to hear. Two more years of refinement and subjective listening, using golden-ear listeners selected from the quality-control department of Philips Records, were required before the PASC system no longer produced readily audible coding errors. Similarly, when engineers described the development of Dolby’s AC-2 perceptual coder at an AES convention a couple of years ago, they stressed that the coder’s sub-band filters had been made narrower and sharper than the standard masking curves, in order to ensure that any distortions added by the coder wouldn’t be heard. Despite this wisely conservative approach, a minority of listeners still hear some added brightness and glare.

If masking curves do turn out to vary greatly between listeners, system designers will face a classic difficulty: how to decide when a new design is good enough. Obviously, designing around “average” masking curves is not good enough, because half of the population may hear the imperfections. Even at the 99th percentile, 1% of golden-ear listeners still might hear flaws. (And if reviewers are among that 1%, they will damn products for flaws that most of their readers can’t hear.) But, to be practical, some cutoff must be chosen; it would be economic folly to design a system so conservatively that its imperfections could be heard only by the five most sensitive listeners in the world.

Designers have a far more important reason to be conservative when designing perceptual coders. Imperfections that seem very slight when a signal is passed through a single perceptual coder may become gross distortions after “tandem” coding—passing the signal through different perceptual coders that embody different sets of compromises. Here, too, new research is needed to discover how tandem coding causes distortions to multiply in severity.

This is a fruitful time to be a young scientist searching for a graduate thesis topic in the field of acoustics or audio engineering. Basic research on the variability of masking curves or on the distortion-multiplying effects of tandem coding could lead to dramatic gains in the useful performance of low-bit-rate digital coders.

UK: Ken Kessler
Under siege or not, the hitherto lumbering and ineffectual Federation of British Audio voted for “change and growth” at its annual general meeting this autumn. This is certainly a good thing if British audio is to survive into the era of multiroom and home theater and all the other stuff in which other countries have taken the lead. The FBA, you should know, is
the only serious industry organization in the UK representing the interests of British hi-fi manufacturers. The organization is also supposed to promote hi-fi audio to a wider public.

So far, the FBA's only visible activities include an annual dinner in the spring and a black-tie venue for the organization's bizarre awards scheme. The money collected at the dinner goes to charity, but otherwise it's an irredeemable waste of time, in my opinion, cherished only by those who leap at any excuse to drink copious amounts of alcohol in a London hotel.

Behind-the-scenes activities are something else entirely. The FBA is a government-recognized body that can voice concerns regarding the very real problems facing European manufacturers. These problems are usually the result of legislation created by the self-interested, detached-from-reality politicians running Europe from Brussels.) In some respects, especially in its global goals, the FBA is not dissimilar to the Academy for the Advancement of High-End Audio in the US. The AAHEA, though, consists of individual members rather than company members, and is concerned solely with true high-end audio equipment. The FBA doesn't distinguish between a state-of-the-art loudspeaker and a $59 boom box.

In international trade matters (or anything concerning tariffs, duties, health and safety, and the like), the FBA can act as a body representing specialist (read: smaller than the Japanese) hi-fi manufacturers—or as a bulwark against import duties, though all but a few painfully honest members would deny this in light of the new open-door policies. This will forever remain a bone of contention, regardless of how much some members would like to reduce the issue to one of mere rhetoric. The group's name is, after all, the Federation of British Audio, and it has, for the most part, been antagonistic toward foreign gear, but with some exceptions notable for their political expedience.

Viewed erroneously from the outside as a bunch of pompous, almost stereotypically John Bull-ish twits who gather together to bitch about the world at large (eg, the Japanese) while congratulating each other for being such clever fellows, the FBA has at last responded to criticism and presented a plan for reorganization. Finally, they have learned that it's not what you do so much as what you're seen to be doing. (Sad but true, as any adult will tell you.) Given that the British hi-fi market is in bad shape despite what the government says about economic recovery, this could be seen by cynics as an act of desperation.

I think not. Most FBA members are export-oriented and worldly rather than hidebound Little Englanders.12 Many are what can only be called Seriously Big and/or Healthy. What puzzles me is why they give a damn about the home market, which they'll be the first to tell you is more trouble than it's worth.

Here's some of what the proposed "New FBA" aims to do:

1) Broaden membership to be more representative of the entire industry. The press release states that "[the FBA] will therefore seek to recruit all relevant parties working within the UK, not just those manufacturing here." So the enemy has been invited to join as Associate Members, with the qualification that reads, "Must be a distributor of branded hi-fi goods active in the UK market." This really isn't anything new, because the FBA has long

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12 Bar one commentator I won't name, who stood up to ask, "Why are the members so export-oriented?" That he couldn't recognize, for example, that the UK's population, relative to the rest of the world, is less than a fraction of a percent, is simply baffling. Someone should have told him something about relative market sizes. But no, this twit was genuinely puzzled. It would have been a waste of breath, however, to point out to him that, were his products sold with true "proportional distribution," America would consume five times the amount that the UK consumes, while his Italian, German, and French distributors would sell quantities almost identical to those he sells in the UK.
recognized so-called “Friends of the FBA”—imported brands which have even figured largely in the awards. Far be it from me to promote xenophobia, but the FBA is now neither fish nor fowl; at least you know where you stood when it smacked of old school ties and Union jacks. Amusingly (see below), the press has also been invited to join, both as publishing houses/magazines and as individual journalists.

2) Present a unified voice for the industry. Translation: Present a unified voice for the members. But this is a definite plus in a world market buggered by vested interests—like the French. (Bone up on the GATT talks if you don’t believe me. To hell with political correctness.)

3) Improve the promotion of quality consumer separates. This was changed from “hi-fi separates.” That’s because “quality consumer audio” is a vague enough term to allow some really low-end manufacturers to join without feeling discriminated against. This is one of the items which saddened me, because I think it’s futile to either take on or cohabit with the garbagemeisters who shift cheapo plastic crap. I’d rather see some pride in British craftsmanship, real wood veneers, solid guarantees, BBC standards, and the kind of service which has kept Quad in an almost unique position for half a century. Whatever the combined might of the FBA, its members will never be able to fight the companies making $29 personal tape players, nor should they want to... I’d rather they change this item back to “Improve the promotion of hi-fi separates.” Even better, I’d love to see them have as a slogan, “Death to crap audio!”

4) Celebrate the industry in a social context. What’s to celebrate?

5) Promote industry awards that are broadly based and independent of hi-fi magazines. Nice one this, a direct dig at the What Hi-Fi Awards, judged by many to be too damned powerful and not fully representative of “the best.” I get a kick out of the What Hi-Fi Awards—you get to see grown men running around like decapitated chickens during the lead-up period, sucking up to hacks who have the power to make or break their crummy little 30W integrated amplifiers, nasty little cassette decks, and tacky little two-way bookshelf speakers. And I simply love witnessing the aftermath, when all of the losers—so cocky the day before with their nominations or short-listings—go around badmouthing the winners.

Far be it from me to defend the What Hi-Fi Awards, but the FBA awards are selected by the public: individuals who have little direct experience of the vast number of products, and who invariably vote for what they’ve just purchased. This hardly makes them better judges than a bunch of reviewers. Unfortunately, the FBA membership itself is unlikely to be the source of unbiased judges, because it’s just not plausible that, for example, one amplifier manufacturer will vote for the products of another. So the only qualified and theoretically unbiased judges with experience of a vast number of products are hi-fi reviewers. This is why we’re stuck with the What Hi-Fi Awards.

The FBA press missives go on to list items about industry training courses, the generating of useful marketing data, improving standards of design quality and craftsmanship, and all sorts of other noble goals. I hope they succeed. But I don’t think they’ve gone far enough...

US: Robert Harley
While in New York last October for the Audio Engineering Society Convention (report elsewhere in this issue), John Atkinson and I visited the engineering and mastering facilities of Sony Classical Productions. The studios provide the

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**AUDIOLAB 8000A**

**Best Integrated Amplifier**

**AUDIOLAB 8000T**

**Best AM/FM Tuner**

**AUDIOLAB 8000C/P** (not shown) **Best Separates**

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Why won't conventional hi-fi speakers work for Home Theater?

You need three front speakers - left, right and center - to achieve realistic home theater. A stereo pair would place the dialog in the center (where it belongs) from only one listening position. You can't use conventional hi-fi speakers for the center channel, even shielded models, because their dispersion patterns prohibit raising them too high or laying them on their sides.

KEF's proprietary Uni-Q® driver, which places its tweeter at the center of the woofer, allowed KEF's engineers to create the ideal center channel speakers, the Models 100 and 90. Their uniform dispersion patterns let them be placed beautifully above or below the screen, creating the impression that the sound is coming directly from the screen. Moreover, the Models 100 and 90 are both Reference Series, which not only ensures their quality and consistency; it permits their use as satellites and their seamless integration with other KEF Reference and Q-Series loudspeakers.

The Uni-Q driver. One of a series of KEF scientific achievements dedicated to one goal: the most realistic performance in your home.
Sony Classical's New York-based production team (l-r): David Smith, Recording Director; Christian Constantinov, VP and General Manager of Audio Operations (seated); Mark Betts, Chief Engineer; and Lisa Maldonado, Production Coordinator.

Sony Classical label with editing suites, a base for location recording, and engineering support.

The visit was an opportunity to see and hear firsthand Sony's advanced 20-bit recording technology. Sony Classical is at the forefront of 20-bit digital recording; all their recent recordings have been recorded with 20-bit A/D converters and 20-bit storage. Handling and storing 20-bit digital audio requires custom-made equipment and new engineering techniques to ensure the best possible CD release.

It was this custom 20-bit equipment that most interested us. David Smith, Sony Classical's Director of Recording Operations (and an avid audiophile), gave us the full tour and showed us the custom-made tape machines needed for storing 20-bit digital audio. Dave also shared with us his experiences with clock jitter, and explained how jitter is a much greater problem in 20-bit recording than in 16-bit recording.

Because no commercially available 20-bit recorders exist (except the just-introduced Nagra D), Sony engineers modified open-reel 16-bit DASH recorders to store 20-bit data. The modified machines record 16 bits on one channel, and the remaining four on an adjacent channel. The split digital words are combined at the output to provide full 20-bit storage. If you've got a Sony Classical CD that says "20-bit" on the back, it was recorded on one of these custom machines. About 15 of them exist worldwide, seven of them at Sony Classical Productions in New York.

After a recording project, the 20-bit data are read into large hard-disk drives connected to a Macintosh-based Sonic Solutions editing system in one of three editing suites. The data are kept at 20-bits during editing and processing. The edited 20-bit data are then converted to 16-bit data for the CD release using Sony's Super Bit Mapping (SBM) technique. SBM is an in-band noise-shaping technique that moves quantization noise away from the midband, where the ear is most sensitive, to higher frequencies where the ear is less sensitive. The result is a near-20-bit noise floor in the critical midband. SBM attempts to preserve some of the 20-bit master's sonic qualities on the 16-bit CD release.

Handling 20-bit data requires more careful attention to clock jitter than with 16-bit recording. In fact, jitter can set the lower limit of resolution of a digital system. You could have 20-bit A/D converters and 20-bit storage, yet have much less than 20-bit resolution if jitter isn't kept to a minimum.

We were told of the efforts to reduce clock jitter through the entire Sony Classical recording and production chain. For example, the studios don't transmit digital audio on the SPDIF or AES/EBU interface. Instead, they use the SDIF II format that keeps the clock on a separate line from the audio data.13 Much of their equipment, including the 20-bit A/D converters, has custom circuitry to reduce jitter. In fact, when we stuck our heads in the electronics workshop, an engineer was measuring clock jitter in a piece of recording equipment. We were shown a custom SBM processor Sony's engineers were working on that kept jitter to a minimum with optical isolation techniques. Incidentally, all of Sony Classical's A/D and D/A converters are built around UltraAnalog 20-bit devices.

The analog signal path is also tweaked for best sonic performance. The analog tape machines (used for transferring analog masters to digital) are modified Studer units fitted with Cello electronics. The monitoring systems use the Cello Duet 350 power amplifiers, and monitor loudspeakers include B&W 801 Series III and ProAc Response Ones. The D/A converters are custom, with an UltraAnalog DAC and an analog output filter to get the oversampling digital filter out of the signal path.14 The rooms are acoustically isolated and treated. In addition, Dave Smith's office was filled with vintage tubed microphones, some of which he was modifying and rebuilding. He also had a stock of tweaky parts for building and modifying recording products. Dave also listened to more than a dozen of the top microphone preamplifiers before choosing those used on Sony Classical's recording projects.

We were given the rare treat of hearing full, 20-bit master recordings through these systems, including James Taylor's new live album and a recent recording of a Sibelius violin concerto recorded at Heinz Hall in Pittsburgh.

The sound was excellent, with an ease and resolution of low-level information not heard from 16-bit digital audio. On the James Taylor selections—dubbed from analog masters—the ability to hear fine detail with clarity and transparency was remarkable. With the Sibelius, the continuous background was the hall's acoustic, not a layer of grunge or a truncation of ambience to dead silence during quiet. The ability to hear deep into the lowest levels of information greatly influenced the musical perception.

JA and I were very impressed by the level of care and attention to sound quality shown at Sony Classical. It was gratifying—and refreshing—to see audiophile values among those who have so much control over the quality of recorded music.

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13 SDIF II stands for Sony Digital Interface Format, the interface used in CD mastering equipment. Digital data is carried on three BNC-terminated lines (left channel audio data, right channel audio data, and word clock), and the input impedance, output impedance, and cable characteristic impedance are tightly specified. This is the right way to transmit digital audio, not embedding the two audio channels and a clock in the same RCA-terminated line.

14 Though the Crystal and UltraAnalog digital data receiver chips will process 20-bit data, the currently available digital filters (the NPC SMS803, for example) only accept up to 18-bit input words.
The Meridian High Definition Music System realises for the first time the full potential of digital sound recording. No other audio system carries the digital signal from a compact disc to the heart of the loudspeaker. The benefits are clear; no distortion or compromise; easy instant remote control; and error free adjustment to match your room acoustic. Soon, all sources will be digital. Today, the Meridian High Definition Music System shows the way.

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SAM'S SPACE

SAM TELLIG ADDRESSES A THORNY PROBLEM

“Could you recommend a CD player?”

It was my non-audioophile friend, Thornton, on the phone. “My old Mission player gave up the ghost and the store says it would be too expensive to fix.”

“How much do you want to spend?”

“How much do you want to spend?”

“Oh, you could buy a Mark Levinson No.30 processor and No.31 transport. The proughly is, ah, $14,950.”

Thornton gasped. “That’s just for the processor, Thornie. You need a transport. The No.31 is a bargain—only $8495.”

“How about a serious suggestion?” Thornton asked after recovering himself. “A few years ago you recommended the AR ES-1 turntable and Rega RB-300 tonearm.”

“The Mark Levinson transport and processor are very serious indeed.”

Thornton did some calculations. “Assuming tax-free interest on the $25,252 at 5%, that’s $1262.60 a year. For that money, I could buy twenty-one $60 tickets to Carnegie Hall.”

“You haven’t figured-in depreciation.”

“That’s right. What do you assume the equipment would be worth after five years?”

“Who knows? Let’s be generous and say that it’s worth 40% of its original cost.”

“All right,” said the calculator whiz. “The $25,252 will depreciate by $15,151.20 over five years. That’s $3030.24 per year.”

“On top of the $1262.60 in foregone tax-free interest,” I hastened to add. “So you have a grand total of $4202.84 per year. Roughly seventy-two $60 tickets to Carnegie Hall. But look at it this way: that’s only $11.51 per day. Have you thought about leasing?”

“You can do that?”

“I don’t know. But some dealer is bound to think about it when sales get slow. Lease a Mark Levinson 30/31 for $299 a month. I like that. It’s only a matter of time. Then we can never stop paying for our stereo systems, the way we never stop paying for our cars.”

“I was thinking along more modest lines—like a one-time outlay of $299. Can you get a good CD player for that?”

“I’m not so sure. It’s a thorny question (heh-heh). I like the Pioneer PD-65, but it’s $800 and twice your budget. Or hey—you’d probably do fine with a less expensive player from Philips, Magnavox, or Marantz—all made by Philips.”

No sooner had I gotten off the phone with Thornton than I got a call from David Birch-Jones of Marantz. How would I like to audition the new Marantz CD-63, suggested retail $399? Of course I would.

Marantz CD-63 CD player

MARANTZ CD-63 CD PLAYER

This might be just the player for Thornton—a little more than he wanted to pay, but not by much. Might be worth it. And, of course, I might have another player I could recommend to you.

In Europe, Marantz has been a premium line for Philips, and Marantz CD players have enjoyed a reputation there over the years. British reviewers have praised a number of Marantz models (not always available here) as being a cut above their Philips-branded counterparts—selling for a premium, but considered to be worth it. Please note, though, that the Marantz models that have been the rage in Britain were generally made by Philips in Europe. The Marantz CD-63 is made by Philips in Japan.

The CD-63 incorporates the new CDM-12 drive. Tracking is said to be terrific, which should mean less error correction. Marantz is touting the CD-63 as an ideal transport. The player is fitted with coaxial and TosLink digital outputs.

“I just saved you $8096, Thornton. You could buy the Marantz CD-63, use it as a transport with the Mark Levinson No.30. The Marantz CD-63 can be your front end.”

“And you can be my rear end. How about the Marantz CD-63 on its own?”

“Not quite in the same class, I’m afraid. You should be writing for the stereo rage—then you might get to borrow this stuff.”

Skipping the technotalk and promotional hype, the CD-63 uses a new TDA-7345 decoder chip that drives the digital outputs directly. Most other CD players use a separate digital-output chip. The TDA-7345 is said to reduce jitter—I mean jitter. (Say it, Lars: jitter?) We all know jitter is bad; it adds yunk.

Also, the CD-63 uses what they call a “high-definition amplifier module”—a discrete output circuit in an integrated package—instead of el-cheapo op-amps, which are said to be slow slewers.

Before we get to the sound, one

1 Although it has a factory in Japan where its Marantz-branded CD players and DCC recorders are made, Philips is transferring main production of its inexpensive CD players from Europe to Singapore.
The latest ACROTEC Stressfree 6N Copper Reference Cables and Accessories to maximize your system's true potential.

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(The use of high purity copper (99.9999% or greater) in audio and video products in the US is patented by Nikko Kyodo Co., Ltd., U.S. Pat. #4,792,369.)
unusual feature is worth mentioning. The machine can locate the loudest peak on a CD so you can set the recording level accordingly. Takes about three or four minutes, depending on the disk's length. Doing this used to be easy in the days of LPs (nostalgia!)—you could always spot the loudest passages by looking for the widest grooves. Well, now you have a way to set your recording levels for CD. In my opinion, this is not a frivolous feature, like Philips's Favorite Track Selection, which is mercifully missing from this machine.

How do I like the Marantz CD-63? I like it a lot—for a $399 player. First of all, it's free from clutter. Unlike the European-made Philips players, which, to me, always seemed clunky, this player looks clean, without a lot of dumb front-panel buttons. (It sounds clean, too.) The remote control is logically laid out and offers a variable volume control. (There is no fixed-volume analog out.) While this player is certainly no heavyweight at 13 lbs, the quick-on-the-drawer transport avoids the flimsy feel of so many players that sell for $300 or less.

For all the talk of superior tracking in its promotional literature, the CD-63's performance on the Pierre Verany test disc was not so impressive. It skipped on track 29 of disc 2—that is, with a drop-out of 0.5mm. The Pioneer PD-65, by contrast, didn't start to glitch until track 32 (1.25mm). The CD-63 didn't skip on any of the music discs I used, however. And now...the sound.

I was surprised by how good a $399 player could sound. The Marantz CD-63 completely avoided the rough, ragged treble characteristic of so many budget machines. It was nicely detailed, free from fuzziness, and sounded fast on transients. The Brit critics, who are big on pace, or timing, or whatever their mis-hages is, would probably like this machine. To borrow a useful phrase from Alvin Gold, this player “lets go of the notes.”

Dynamics were good, though not outstanding. Bass was adequate—again, everything you could realistically (and I don't mean that as a brand name) expect from a $399 machine. When you pay more for a player—like twice more—you can expect to get more and bigger power supplies, which translates into better bass and wider dynamics. Inexpensive machines have a tendency to squash, if not squelch, the music. The Marantz CD-63's tendency in this direction was not severe, though it did tend to rein in the music. Moreover, the retrieval of low-level detail, while very good, was not the best I've heard.

In my system, the CD-63 did not have the fullness and richness of the Pioneer PD-65, which retails for twice the price. The Pioneer had better dynamics and more extended, more ample bass. Most significant, the Pioneer had more of a sense of air there. You can hear it on some recordings before the music starts: you hear the hall, the sound of air in the room. I didn't “hear the room” to the same degree with the Marantz CD-63. In this regard, the Marantz is a typical CD player: it drew the air out of the room.

But things are never so simple. If the Pioneer was richer, fuller, warmer, with more air there, the Marantz sounded crisper, cleaner, quicker, with less smearing of detail. Perhaps this was due to the absence of Legato Link distortion (tailed distortion, to be sure).

On the whole, I'm favorably impressed, and may keep this player for my second system. Meanwhile, I told Thorn-tom—who originally wanted to spend $299—to investigate the Marantz CD-63. It's worth the extra $100. I also told Thorny about two less expensive Pioneer models with Legato Link: the PD-54 at $500, and the PD-M53 at $460. Of course, it's unlikely that the performance of either of these machines approaches that of the $800 Pioneer PD-65.

As for dedicated audiophiles, well, you
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Most people don't handle it well. Neither do most digital processors. On the other hand, Sonic Frontiers' new UltraJitterbug handles rejection - jitter rejection - verifiably well.

Jitter, time variations present in a digital signal, degrades the sound quality of your music. The UltraJitterbug verifiably rejects and reduces transport jitter in a digital signal, from 1 kHz up (using the new UltraAnalog AES20 Digital Receiver and a proprietary data decoding, signal processing and encoding algorithm) and feeds your digital processor a significantly improved signal.

As with all Sonic Frontiers' products, the UltraJitterbug is constructed with the highest quality components. It features 3 digital inputs (Coaxial-RCA, AES/EBU-XLR, Optical-Toslink) and 2 digital outputs (Coaxial-RCA, AES/EBU-XLR). Particular attention was paid to the input source selection circuitry to assure optimum input impedance matching and level sensitivity for all three digital interfaces. In addition the PCB layout was optimized to prevent crosstalk, minimizing potential interaction between sources that could further degrade jitter performance. Moreover, the UltraJitterbug can be used as a digital "switch box" to re-route your digital signal to a low jitter interface at the output.

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The Sonic Frontiers UltraJitterbug - it rejects jitter - and we can prove it!
might think about spending more than $400 for your main player. But if you’re on a budget, or if this is to be an interim purchase, your money would be well spent. As I said, I was surprised at how good a $400 player can sound.

My system, during this period of listening, consisted of: Audible Illusions Modulus 3 preamp; Audion 300B Silver Night mono tube amplifiers (direct-heated triodes, man—the way to go!); Quad ESL-63 USA Monitor speakers, without subwoofers, on Arcici stands; Highwire interconnect from analog out to preamp and from preamp to power amps; very short (less than 1m) lengths of Kimber 8TC speaker wire from the amps to the Quads; Kimber AGDL Digital Link to the Alitis processor (see below); and Kimber power cords wherever possible (Quads, amps, processor).

**Late News Flash**

All components take some time to burn in, and CD players sound best when left on all the time—Bitsream players maybe more than most. After another 10 days or so of being left on, the Marantz CD-63 became even smoother, sweetnessounding—with greater apparent clarity and resolution. It did not change character, it just improved in those areas where it was already strong. Its sound was clear, clean, and harmonically accurate. It took on more warmth, more body, however, after burn-in.

For $399, the Marantz CD-63 is an outstanding CD player. If you want a decent-sounding player and think, like me, that it’s dumb to spend $4000 for a processor (any processor) and $3000 for a transport—or even $800 for a player that will be superseded by another reviewer-favorite next month—the Marantz CD-63 is the player for you. Put your money into speakers—like the Quads—or amplifiers—like the Silver Nights.

This is a great CD player.

**Alitis Audio DSP-5t Digital Processor**

This is the newest $3950 digital processor from Alitis Audio. The head honcho of Alitis Audio is Howard Mandel, not to be confused with Howard Mandel the comedian. (“Alitis” itself means nothing—it’s just a pleasant-sounding word beginning with “A.” There is no Mr. Alitis.)

Alitis is synonymous with Bitsream. I’ve been somewhat partial to Bitsream—or, more accurately, single-bit. I think you get great clarity and a certain freedom from . . . I don’t quite know quite what it is—a freedom from edginess.

(The Marantz CD-63 is a good example of what Bitsream has done for the sound quality of relatively inexpensive players.)

But single-bit, as opposed to multibit, is said (by those with an investment in multibit?) to be lacking in dynamics and ultimate resolution.

The truth of the matter is, the sound quality of any player or processor depends not just on the technology, but on its execution as well. Alitis is an example.

The DSP-5t completely gives the lie to those who say that Bitsream is lacking in dynamics. This is one of the most dynamic-sounding processors I’ve heard. Bass extension was excellent, too—full, if not outstandingly tight. This was probably a function of power supplies as much as anything else. Listen to this processor—you tell me if Bitsream inherently lacks dynamics.

The DSP-5t has balanced and unbalanced outs; accepts coax and AT&T digital in; and has two Soviet 12AX7 tubes in the all-tube buffer output stage. Build quality is very neat and professional. The finish is more functional than flabbergasting.

Howard believes that the most important thing in a hi-fi product is not timing or pace or even soundstaging—the mistsages of so many American critics—but timbre. Lars and Howie call it tonality, but it’s the same thing. You get that right, and everything else usually falls into place.

“I sit in Carnegie Hall and I listen,” said Howie. “What does a cello sound like? What is its tonality? That’s what I want to get right.” To tell you the truth, I don’t think Howie did get quite right until he turned to tubes in his analog output section.

The Alitis DSP-5t is very good. For just under $4000, it should be. It’s sweet, smooth, dynamic, and detailed. It can boogie on rock, yet sounds sweet and delicate on chamber music. If you want to hear the Quad ESL-63s rock out, put an Alitis DSP-5t into the little 20Wpc Audion Silver Nights.

If I have reservations about the Alitis DSP-5t, they relate to soundstage depth and sound compression during complex orchestral passages. Let’s take depth. Howard admitted to me that the DSP-5t tends to place instruments immediately in back of the speaker. Moreover, I did not hear the greatest amount of layering. The DSP-5t seemed to compress everything—not exactly on one plane, but, compared with such soundstage-champ processors as various multibit models from Krell Digital, Theta, and PS Audio, the DSP-5t did seem to shrink, if not squeal, the soundstage.

Compared to the Pioneer PD-65 on its own (which I used as a transport with the Alitis), the Alitis processor did sound more dynamic, with more extended bass. Midrange and treble were smoother and sweeter. Resolution improved—there was less fuzziness, less smearing of transient detail. All these areas improved somewhat further when an Alitis transport later joined the Alitis processor.

What I heard from the Pioneer, though, was a little more ambience, more air around the instruments. Maybe it was that Legato Link again. Also, I noticed a little more sense of depth, of soundstage layering, that I didn’t hear with the Alitis to quite the same degree. Don’t get me wrong: On the whole, I prefer the Alitis to the Pioneer. Considering the price disparity, indeed I should.

I especially enjoyed the Alitis when I gave all the audiophile pap the heave-ho and listened to the Columbia Sinatra box—the crate of 12 CDs with everything Sinatra recorded commercially from 1943 to 1952. Sony did a magnificent job of transferring this material to digital, and charges accordingly. But I don’t mind having spent the $299. (Actually, I don’t mind having spent the...
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Stereophile, January 1994

**Audio Insights #4**

### Cure-alls for the Jitters

"Since last January, the pages of Stereophile have been replete with articles on the omnipresent problem of digital jitter (and its attendant LIM*—Logic Induced Modulation) in the playback of CDs, and all digital media. As I said in Audio Insights #2 and #3, significant audible jitter reduction occurs only when you use the Melior CD-deck with its exclusive and unique C-Lock circuitry—and/or our Melior D/A Converter with C-Lock. Better yet, use both the deck and D/A for total elimination of audio degradation due to jitter and LIM. It took me five years to perfect C-Lock. It'll take you five minutes to install it!"

**Melior D/A Bitstream Converter with C-Lock**

An outboard D/A converter with two switchable inputs. Uses the Bitstream conversion method. Ideal for one or two products with digital outputs. Eliminates jitter and LIM. Outperforms built-in converters on all CD players.

**Melior CD-Deck with C-Lock**

A CD drive with die cast aluminum mechanism. Superb mechanical construction along with C-Lock provides a jitter-free digital data source for any outboard converter. Fiber optic and coaxial output are standard. Programmable.

---

Ed Meitner
Vice President, Research & Development

a/d/s Technologies
Analog and Digital Systems/Muscle/edit/DeltaLab

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$199—I bought it on sale.) Listen as Sinatra sings "Once in Love with Amy"—the first version, disc 9, track 10, piano-only accompaniment—every syllable, every sibilant was beautifully articulated with the Altis. It just sounded cleaner, clearer, quicker than the Pioneer.

But what about soundstage? Howard raises an interesting point about soundstage. He claims that many digital recordings do not have particularly deep soundstages. So what you get with the Altis processors is, in effect, what's there.

Maybe he's right. With analog, I've noticed that soundstage depth and width are not particularly great with my Shure Ultra 500 cartridge, compared with certain audiophile-fave moving-coils. But the Shure sounds more natural to me. Maybe the deep, wide soundstage is an exaggeration—an artifact of phase distortion. Who knows? Or maybe a compressed soundstage, as opposed to compressed dynamics, is a hallmark of single-bit as opposed to multibit.

Another common objection to single-bit is that it tends to rein in the music—if not dynamically, then spatially. During complex orchestral packages, the sound is said to have a tendency to congeal—to clump up and lose transparency. According to this line of criticism, instruments have a tendency to come together rather than stay separate. Ultimately, I still had questions about the Altis. Yes, it sounded better than my Pioneer PD-65. Obviously... it has to at its price. But how would it compare with a similarly priced multibit processor?

At Lars's suggestion, I took the Altis over to Lou's—just to get a further basis for comparison.

Lou has a $3650 Krell CD-DSP Mk.I integrated transport/processor. A big benefit, for me, is that I know his room and his system well. In this system, the Altis's shortcomings became clear. I don't mean to overstate this: The Altis is a very fine processor, but the Krell seemed to have superior resolution, particularly on complex orchestral passages. In fact, to my ears, the Krell seemed to have superior resolution overall. (I used the Krell as a transport to drive the Altis.) Moreover, the Krell was no slouch when it came to dynamics. Its bass seemed tighter, more weighty, than the Altis's.

Bear in mind that Krell gives you an integrated package: transport and processor together for $4900, only $1000 more than the Altis DSP-5t. Plus you save money by not having to buy a digital data link. I don't want to say that the Krell is cheap, but this does begin to look like relative value. (The Krell is multi-bit.)

Who knows? Maybe Bitstream is best reserved for inexpensive or moderately priced players and processors. If I stop short of recommending the Altis, it's mainly on the basis of price. Is $4000 a bit much to pay for single-bit?

On the plus side, the Altis sounds clean, handles transients and sibilants well, and has a certain harmonic richness that may be due to its tube analog output stage. It's easy and unfatiguing to listen to. For $2000, or even $2500, I could easily recommend it. Nonetheless, I recommend an audition. These things are subjective: because of its sweetness, smoothness, and overall musicality, you may find the Altis DSP-5t just your ticket. But do make a side-by-side comparison with a similarly priced multi-bit processor.

STOP PRESS!

Sometimes you appreciate a product more after it's gone. Such was the case with the Altis DSP-5t processor. Soon after Howard came to collect the Altis, I received another processor—this one a multi-bit—that retails for roughly the same price.

This processor underscored both the Altis's weaknesses and its strengths. The mystery processor has more body, more warmth, more bottom end—more dynamic get-up-and-go. It doesn't sound dynamically compressed, but on the other hand, it doesn't sound quite so open and detailed as the Altis.

But it seems you can't have your cake and eat it too, even for $4000. If you want great dynamics and big bottom end, you may sacrifice delicacy and detail. If you want delicacy and detail—it, superior resolution—you may have to sacrifice something in the way of dynamics. As I'm finding out these days, that's just as true of amplifiers as it is of digital processors. Of course, it's always been true of speakers. I used to joke, "Screw the bass. I don't want bass. It only muddies up the sound." Well, that may also be what dynamics and bass tend to do in amplifiers and digital processors.

Where does that leave the Altis? It's expensive for a processor that appears to sacrifice some dynamics. But other similarly priced processors may be expensive for processors that sacrifice resolution. At least the Altis is detailed without sounding harsh or hard. Perhaps you need to spend much more than $4000—on a processor alone—to get really great digital sound. If that has you running in retreat to something like the Marantz CD-63, then it may not be the worst idea.
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APRIL 29 - MAY 1, 1994

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You’ll hear new products. You’ll meet designers, manufacturers, importers. You’ll feel a part of the entire high-end audio community.
That’s what makes HI-FI ’94 such fun—it’s where friends get together. Everybody you meet shares your love of music and your quest for good sound. Just being with so many nifty people makes you feel great.

Enjoy discussions, panels, live music.

The editors of Stereophile are coming—John, Gordon, the Bobs, Harley and Deutsch, DO, TJN, Sam, Corey... the gang. You get to meet them. Ask questions. Express opinions. Watch the sparks fly.

We’ll have panels with noted designers. Discussions organized around topical themes. We’re organizing continuous live music and a surprise grand finale concert. Best of all, there’s no extra charge for any of these events. This year, even the parking is free. And one ticket admits you all three days.

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Jack English asks why music lovers at large seem unaware

Slowly, painfully, high-end audio seems to be dying. We all know it but we're apparently unable to resuscitate the patient. US dealers are closing at alarming rates—it must be the economy. Women continue to avoid the High End—it must be the technobabble combined with male equipment fetishism. Younger people aren't hopping aboard—it must be all those other things competing for their money. (Then again, it might be the High End's abhorrence of rock'n'roll.)

While it seems we're quick to point fingers and find scapegoats, we haven't addressed the primary causes of high-end audio's apparently inevitable decline. In the minds of most music-loving Americans, the High End simply doesn't exist. And for the minority who are aware of it, the High End is simply too expensive.

To illustrate this, Table 1 shows a top-quality system assembled from the most recent Stereophile "Recommended Components" listing (Vol. 16 No. 10):

<table>
<thead>
<tr>
<th>Component</th>
<th>System Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cartridge</td>
<td>$5000</td>
</tr>
<tr>
<td>Tonearm</td>
<td>$2550</td>
</tr>
<tr>
<td>Turntable</td>
<td>$8900</td>
</tr>
<tr>
<td>CD Transport</td>
<td>$13,000</td>
</tr>
<tr>
<td>Digital Cable</td>
<td>$595</td>
</tr>
<tr>
<td>DAC</td>
<td>$14,950</td>
</tr>
<tr>
<td>Interconnects</td>
<td>$5400</td>
</tr>
<tr>
<td>Preamplifier</td>
<td>$8750</td>
</tr>
<tr>
<td>Amplifiers</td>
<td>$15,950</td>
</tr>
<tr>
<td>Speakers</td>
<td>$26,820</td>
</tr>
<tr>
<td>Speaker Cable</td>
<td>$4500</td>
</tr>
<tr>
<td>Total Retail Price</td>
<td>$105,215</td>
</tr>
</tbody>
</table>

The system listed uses the shortest possible cable lengths, omits accessories like power conditioners, and doesn't even include any of the megabuck gear—like the Genesis Model One loudspeakers, Rowland Nine and Jadis JA 500 amplifiers, FM Acoustic phono preamplifier, or Rockport turntable—none of which are listed in "Recommended Components." Many people could almost buy a home for this kind of money—but would have to take out a mortgage to do it! The system's intentionally short wires come to $10,495—a price most people would consider spending for a car. To 99% of Americans, the upper price range of high-end audio is otherworldly.

Does the average American recognize any of these brand names? Ask a few friends who aren't into audio. Chances are, they've heard of none of them. High-end audio has failed miserably at making the public aware of its existence. The irony is, some of these companies are the best in the world at what they do.

The automotive industry seems to be treated differently. Car magazines spend a lot of time covering the Ferrari Testarossa, Lamborghini Diablo, McLaren F1 (only $750,000!), and high-powered Corvettes. (How about those Gulstrand-modified ZR-1s starting at a mere $134,500?) Yes, we're all voyeurs and dreamers, secretly harboring hopes of winning the lottery or inheriting an estate from a long-lost relative. More pragmatically, we believe much of this incredibly sophisticated technology will filter down to the real-world cars we're likely to buy in the future. This has actually happened: Consider the Honda Civic's computer-controlled variable-valve timing; the Ford Probe's 24-valve, six-cylinder engine; and airbags, anti-lock brakes, tour-heel steering, and many other wonderful features that carefully balance the often conflicting demands of performance, safety, and the environment.

High-end audio might actually be better positioned than the automotive industry to provide immediate benefits to everyone. Unfortunately, we seem hell-bent on shooting ourselves in the foot. Far from cutting-edge audio technology benefiting the world of affordable audio, the High End has done its best to disassociate itself from mid-fi. ("Mid-fi" is...
OF THE EXISTENCE OF HIGH-QUALITY SOUND REPRODUCTION

...even used as a term of abuse.) As a result, high-end audio has rendered itself essentially irrelevant to most Americans.

Any automobile can get you from A to B, but not necessarily in the same manner. Most people can appreciate the major differences between four- and eight-cylinder engines. But how many people realize the differences between solid-state and vacuum-tube electronics and the desirability for both to coexist?

Most non-audiophiles believe all audio equipment pretty much sounds alike, hence the mass-market's emphasis on selling components by features and price. But people actively involved with audio know that quality differences do exist. Nearly all audiophiles agree that amplifiers sound different from one another under real-world conditions of use.

The audible effects of as-yet-unmeasurable performance parameters and the importance of very small differences that may well be inaudible to some are continuing points of contention in the High End. Unfortunately, we continue to fight among ourselves over such matters rather than spreading the word to the mass-market consumer. The entire audio community would benefit if we emphasized those points on which we agree. Just as all automobiles are not built to the same levels of quality, handling, or efficiency, all audio equipment does not sound the same. The High End must be responsible for making people aware of this fact.

The best way to do this is to let people hear high-end audio for themselves. But the audio industry is structured in such a way that people can do this only through high-end dealers. It's unrealistic to ask high-end dealers to tie up their listening rooms educating the masses one at a time, knowing full well that many of these people will never buy. And the typical manufacturer's presentation at a local high-end shop preaches only to the converted. There must be a better way for the average Jane or Joe to hear what the High End is all about.

The High End should reach out to those unaware of our industry. Larger groups of people should hear demonstrations such as those sponsored by the EIA/AAHEA at the 1993 Summer CES. I envision open sessions run in conjunction with music-appreciation courses through adult education programs at high schools nationwide; a variety of full-length concerts played on quality high-end systems and offered through local radio stations and/or cosponsored by software manufacturers; discounts or other perks to customers who bring new patrons to high-end dealers; a sales force regularly demonstrating products outside the audio store; audio systems providing music at a variety of large meetings during cocktail hours—and I'm sure each of you can come up with other ideas.

While most other industrialized countries recognize the preeminence of American audio equipment, our own citizens fail to appreciate how much we've accomplished. We're headed in the right direction, but we haven't been able or willing to get the news out. High-end audio has made remarkable progress. You need to look or listen no further than the breakneck advances in sound improvement coming from the "perfect sound forever" digital medium. In less than a decade, improvements have bordered on the monumental. More importantly, a good deal of these innovations are now available at reasonable prices.

This is where the high-end industry continues to be misunderstood. High-end is not simply audio equipment that costs more. In fact, audio equipment deserves to be called "high-end" only if it sounds superb. Much of the audio gear which fits this definition is not outrageously expensive. In fact, many sonically splendid high-end audio products cost less than their mass-market competition. We continue to obscure this critical point.

Stereophile's biannual "Recommended Components" listings appear to paint a different picture. In general, better things do cost more, and audio is no exception. However, the relationship between price and performance is complex.
When we listen to music, we share an experience that is uniquely human. We seek out that experience in the concert hall. In the cozy atmosphere of our favorite club. At home, in our listening room. But no matter where we are, our objective is always the same—to reach beyond the performance and rediscover that wellspring of emotion which inspires musicians everywhere to bear their soul.
If one product costs twice as much as another, it is unlikely to be twice as good. Stereophile’s loudspeaker recommendations clearly illustrate the price/performance relationships in high-end audio. Table 2 lists speakers I believe to be excellent values:

<table>
<thead>
<tr>
<th>Table 2</th>
<th>Recommended Component Class</th>
<th>Loudspeaker</th>
<th>Price (pair)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>PSB Alpha</td>
<td>$200</td>
<td></td>
</tr>
<tr>
<td>D</td>
<td>Epos ES11</td>
<td>$850</td>
<td></td>
</tr>
<tr>
<td>C</td>
<td>Vandersteen 2Ce</td>
<td>$1300</td>
<td></td>
</tr>
<tr>
<td>B*</td>
<td>Ensemble PA-1</td>
<td>$3200</td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>ProAc Response Three</td>
<td>$6500</td>
<td></td>
</tr>
<tr>
<td>A*</td>
<td>Sonus Faber Extrema</td>
<td>$12,500</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>Wilson WATT/Puppy/WHOW</td>
<td>$25,000</td>
<td></td>
</tr>
</tbody>
</table>

*Restricted low-frequency (LF) extension

While I recognize that the “Recommended Components” classes are subjective (and categorical and non-linear and multidimensional and . . .), I feel they are meaningful enough to convert to numbers. For example, let a score of 6 represent the sound quality of live music. The highest-rated loudspeaker still won’t fool listeners into confusing its sound with the real thing, so let us score it as a 5. The ratings for the letter classes are therefore assigned from 1 (E) to 5 (A). Since the restricted LF classes are a bit of a hedge, I’ve graded them in between the other classes (eg, Class A, with restricted LF, becomes 4.5 instead of 5).

Using these numerical ratings, the performance of the speakers listed in Table 2 is depicted by the graph below, which clearly illustrates the relationship between price and performance:

The PSB Alpha has the lowest performance rating (1 for Class E), coupled with an extremely modest price: $200. At the opposite extreme, the Wilson WATT/Puppy/WHOW has the highest performance rating (5 for Class A), as well as a very high price of ca $25,000. Ideally, the higher the price, the better the performance. But this is not the full story—the price/performance relationship is not a straight line. The curve is clearly asymptotic. It approaches perfection (a score of 6) but never gets there, regardless of how much the component costs.

Initially, as you upgrade from the PSB in Class E (with a numerical performance rating of 1) to the Vandersteen 2Ce in Class C (with a rating of 3), you get a significant increase in performance that is proportional to price. The curve mimics a straight line. As you spend more than the cost of the Vandersteen to move into still higher performance classes, however, the relative amount of increased performance is minimal. This plateau is the sweet spot in the price/performance relationship.

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decreases dramatically for each additional dollar spent. The shape of the curve changes to one representing diminishing, though nonetheless real, returns. You pay a tremendous premium to approach the state of the art.

A speaker’s placement on this curve is influenced by many factors. For example, imported speakers will cost relatively more on the price axis, because their prices must include increased shipping costs and a profit margin for the importer. Smaller manufacturers usually cannot take advantage of volume discounts when buying parts. This must be accounted for in the retail price. Companies that sell direct are able to eliminate dealer margins, though the possible return-shipping costs have to be factored into their margins.

The performance axis is more complex. Whether aware of it or not, most people listen for a host of different sonic qualities: bass, midrange, treble, soundstaging, dynamics, transient response, resolution of detail, etc. The speaker designer has to balance each of these parameters to achieve the desired level of overall performance.

Many people believe that speakers that lie along the price/performance curve in fig. 1 are high-end simply because they are listed in Stereophile’s “Recommended Components.” Yes, speakers at the top of the curve do outperform those at the bottom. But this curve is designed to identify speakers at all prices that outperform their competition. “Recommended Components” effectively tells you how to get the most performance for your money, at any price.

Using this curve, loudspeakers located below the horizontal line may cost less but clearly do not perform as well overall. Speakers located above the horizontal line cost more but perform only marginally better. You have to spend a great deal more money in order to realize significant increases in overall performance. The Vandersteen 2Ce or the similarly priced Thiel CS1.2 are located at the optimum price/performance position (indicated by the vertical line). Yet they are likely to sound very different from one another because they are designed differently. Stereophile’s reviews of these two speakers (in Vol. 16 Nos. 4 & 9, and Vol. 12 Nos. 1, 6, & 11, respectively) make it abundantly clear that each has a distinct sonic character. The important thing is to understand what your priorities are so that you can select the best product in your price range.

To further complicate matters, price and performance alone are not enough to make a buying decision. If they were, you could rely exclusively on the opinions of reviewers you trust. Other factors that must be considered before purchase include visual appeal, size, compatibility with your existing equipment, availability, reliability, and resale value. For example, two very differently priced speakers may perform identically in all parameters. The more costly speaker, however, may look better to you, be more compatible with your existing power amplifier, work against the rear wall (which you may require), and so on. In addition to letting you hear the speaker, a dealer should help you sort out all your other concerns. No matter how good the review, there is no substitute for seeing, touching, and listening to the speaker yourself. The only way to do that is to visit a good high-end dealer.

The reviewer’s task is to audition everything he or she can. A composite of this information—like “Recommended Components”—should help you narrow your search by identifying a small number of speakers that satisfy your basic price and overall performance concerns. The final buying decision must always be yours.

What does all this mean for high-end audio? Plenty.

• At any price, high-end equipment should be able to outperform similarly priced mass-market equipment. The customer should get more for his or her money, regardless of what they are able to spend. The PSB Alpha is a good example of high-end audio equipment’s inherent value at even extremely modest price levels.

• The more you spend for high-end audio equipment, the substantially better the sound should be, as long as you are at or below the optimum price/performance level (as seen from the vertical line in fig. 1).

• The following generalizations have been verified by years of Stereophile reviews: all audio equipment does not sound the same; sonic compromises must be made at defined prices; the higher the price, the fewer design constraints; breakthrough technological advances do filter down to less expensive equipment over time. (These points are weakened somewhat by the realities of the high-end audio market. Manufacturers’ costs must be met, despite lower unit sales. Higher-volume sales can be expected to lower per-unit prices.)

• Finally, the best of anything in absolute terms will always be very expensive. This is as true for high-end audio as it is for anything else. Since so few people pursue the state of the art, very few of the best units will be sold. In addition, research and development costs of innovation can be staggering. The best parts are costly, and building by hand takes time. Products that push the performance envelope need to be reviewed and discussed—we need to learn the limits of what is possible from the industry’s ground-breakers and pacesetters. But we don’t all need to buy their highest-end equipment. Ultra-expensive cutting-edge products are only a small portion of the high-end audio market.

High-end audio equipment can improve the quality of music heard in the home. It provides more enjoyment every time you play a record, listen to a CD, hear a cassette, or turn on the radio. Those of us involved with high-end audio need to relay the message that great-sounding audio equipment can be affordable, reliable, and easy to install and use.

Contrary to popular opinion, I do not believe that the marriage of audio and video threatens the future of high-end audio. The explosion of home entertainment is a wonderful opportunity to introduce more people to the wonders of high-end audio. The same can be said of interaction with computers, midi, video games, and anything else that involves the reproduction (or production) of sound. Whatever sound is being made, high-end audio gear can make it better.

Is high-end audio dying? Audio equipment is better than ever. There is great gear available at virtually every price. The equipment isn’t the problem. The high prices aren’t even the problem. We are the problem. We aren’t getting the right message out. We aren’t effectively communicating the value of high-end audio. We focus on the ultra-expensive without spending adequate time on truly affordable equipment. We are elitist snobs about our equipment and the music we enjoy. We put down video and interactive games and midi and computer interfaces because they aren’t important to us. We are making a tragic mistake.
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— John Atkinson, Stereophile

High End Show
San Francisco, CA, March 12, 1993

Referring to the 9300 THX “… image focus is exceptionally good. You get a wide deep soundstage, but it is not a vague presentation. Instrumentalists are precisely located. All very, very fine.”
— Sam Tellig

Stereophile, May 1993
Vol. 16, No. 5

"The Hafler 9500 joins that select group of moderately priced amplifiers which make life difficult for manufacturers of higher ticket electronics."
— Thomas J. Norton

Stereophile, April 1993
Vol. 16, No. 4

*THX is a registered trademark of Lucasfilm Ltd.
Try to imagine the first musician. He was not playing for an audience, or a market, or working on his next recording, or touring with his show, or working on his image. He was playing out of need, out of his need for the music. Every year the number of musicians who remember why they play music in the first place gets smaller, and the greatest loss from this handfull was Miles Davis, who died last year. His death, among other things, prompts these remarks.

More recordings are being made than ever before (nowadays a musician has to record to be taken seriously), but there is less meaningful music. We have substituted quantity for quality, and to make up for the lack of real "voices" on these recordings and to keep people thinking there are alternatives, new categories are constantly being invented. I suppose people say to themselves, "Well, maybe this alternative will be better than the last. We're tired of that last one." Of course they are. There is no music there. We all need variety sometimes, but when every channel has nothing, shouldn't we notice?

Music has nutritional value, and without artists who need the music (and therefore have a "voice"), there will be no value in it.

Listeners are swindled by the music industry's insatiable need to stay alive no matter what the quality of the music. If it can find talented young players, the industry will tell them how great they are and give them lots of money to keep them satisfied (more correctly, buy off their souls, if they have any left). We must remember that music is not the music industry.

It's impossible to address the jazz category directly without seeming divisive, since the media are saturated with only a few names, names of musicians who seem to have taken over jazz. This is only a media reality: it has nothing to do with the music. Unless radio, television, newspapers, and magazines stop falling over like dominos, happy to have a "marketable" story, we will see two separate cultures: the popular culture and the underground culture (the underground for the music, the popular for the hype). Wasn't there a time when producers became producers because they loved music (and not another five-letter M-word)?

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Music seems to have slipped out of the hands of the true makers and into the hands of the producers and promoters, although the promoters now include the musicians themselves, who seem to love to dress up and watch themselves in the mirror. The craft of building a resonating instrument has fallen into the hands of toy manufacturers, and the music itself has taken on the character of Disneyland; there are New Age Land, World Music Land, Fusion (Con-fusion) Land, and others. The original musician ain't got a chance here. In fact, human beings cannot even survive here: there is no food.

This is a good place to mention that “Do your own thing” came from Ralph Waldo Emerson, who actually said, “Do your thing, and I shall know you.” In other words, you reveal yourself to others through what you do. Emerson’s statement was not meant to be a kind of carte blanche to follow our shallowest whims: it’s not about life style or fashion or technique or casual choices. His statement contains a warning: I will only recognize you if you have your voice; I will not recognize you otherwise. Listeners should be more discriminating (since record companies are not). Musicians should be less accepting of the new and, instead, check their own credentials. John Coltrane could not have led a television world to be liquid (ie, not made up of discrete entities). We see the world as “bits” of information, either/or, yes or no, digital. We seem to have no desire to experience time. We trade this experience for the “accuracy” of “bits” of time: it’s either 9:19 or 9:20, never almost 9:20. So we think that time is a straight line and, eventually, that everything has edges. Something stops here, something starts there. But the natural world is essentially circular; our heartbeats are not like a click-track or a drum machine: there are different kinds of time, and we don’t only die when we are dead.

Life is a process. We’re losing the concept of “becoming” because this, too, is circular. We have a world in which one “bit” is replaced by another; one alternative leads to another, and the thing we recognize as “value” is our chase to the next edge, the next “bit.” We hear “bits” of others’ voices instead of real voices. We hear synthesized sounds (“Waiter, a side order of natural overtones, please”), market strategies, position-paper excuses, well-dressed images, traveling salesmen (using ethnic musicians to sell their wares), and planetary spokesmen. We hear young neo-pseudo-be-boppers fresh from the convention, nuevo-string-quartetists in Armani-wear, computer freaks, deadheads who succeed by calling

band, and J. S. Bach would not have appeared on talk shows or showed up at photo sessions to promote his new harpsichord concerto. New Age music is Jell-O, world music is a hoax, and avant-jazz (whatever that means) doesn’t exist. (Please listen to Ornette Coleman, guys! There is natural intelligence and nutrition.) Hiding behind a new category is the only way most of this music would ever get into stores.

We live in an age in which only results seem to count, not processes. An age of objects and productions, a visual culture of images, television, speechwriters; a culture that thinks it can create security with insurance, lawyers, and banks. But life is liquid, not solid; a process, not a result; the present, not the future. Ezra Pound once said: “Nothing counts save the quality of the affection.” Think of this, think of Miles (not Miles’s image, his music), and then think of the rest of the music world. Where is the music?

Music isn’t categories or technology. It isn’t the result of the market or an image or a theory. It’s not productions or records. It’s not even talent. (An old jazz player—I think it might have been Lester Young—said to a young player he had just heard: “You really can play, but what’s your story?”) It is the individual voice, present to itself, that needs to be heard. We need to hear the process of a musician working on himself. We don’t need to hear who is more clever with synthesizers. Our cleverness has created the world we live in, which in many ways we’re sorry about.

We need to be smart, as listeners and musicians. Let’s not allow self-appointed experts to tell us what jazz is when we can hear in their music that they have no voice. Let’s not let the appearance of names and faces over and over in the media make us think that these are the forces in music at present. Let’s remember that music is not the music industry.

The original musician was not looking for his image; he was using his voice to learn about the world. He knew the themselves the Deadheads, born-again everythings, lottery winners, opera singers (I don’t care if they are black) trying to sing black spirituals (even I am embarrassed, and I’m white). We hear pianists trying to play “acoustic” again, after trading in their bodies for volume controls and their souls for wires.

We hear jazz musicians dabbling in world music and American Indian music. Minimalists filling as many sheets of paper as they can before they run out of “idea,” industry reps dressed as players, players dressed as movie stars, indeed becoming movie stars (their next “bit”), black musicians without soul, and countless “studio” musicians reading newspapers in the control rooms (and getting paid handsomely for it; you might say being paid for their patience). We hear all of this, but where is that voice, that original voice, that individual, primal need? Where is Miles? Where is the music?

Whatever clothes Miles wore, it was always Miles in those clothes. Whatever noise was around him, Miles still played from that need, his sound coming from that silence, the vast, liquid, edgeless silence that existed before the first musician played the first note. We need this silence, because that’s where the music is.

Keith Jarrett is a pianist and composer who has worked in jazz, classical, and improvisational music for 25 years, including a stint with Miles Davis in the early 1970s.

There are four things I would like to say about this article: First is that it was written expressly for lay readers such as the perusers of the New York Times’s “Arts & Leisure” Section. If I were to write an article for Stereophile, this would not be it. Second, my point is that the heart of music is the desire for it, and this won’t change no matter how many recordings are released each year by the industry. Third, there are musicians and there are pawns of the industry. Usually the general public knows the victims, not the creators. And fourth, even since the summer of ’92, when the preceding article was written, the scene has changed; I would perhaps have emphasized different aspects of the continuing cult of musical personalities.

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2As of Nov 14, 1993, Keith Jarrett wished to clarify this statement:
“The category ‘World Music’ is an industry creation intended to allow a sort of ‘ethnic fusion music’ to be marketed along with true ethnic music, which is local music.” —KJ

LET’S NOT ALLOW SELF-APPOINTED EXPERTS TO TELL US WHAT JAZZ IS WHEN WE CAN HEAR IN THEIR MUSIC THAT THEY HAVE NO VOICE.
REELING IN THE YEARS

Donald Fagen & Walter Becker
TALK WITH Hank Bordowitz
I n a way, the ID Donald Fagen did for New York’s WNEW-FM (arguably the best album-rock station in a city with little choice in the matter), speaks volumes for his current status: “Hi, this is Donald Fagen from Steely Dan, and you’re listening to WNEW-FM, where rock lives.” The legends printed on the tickets for the tour supporting the release of Kamakiriad—his first album in over a decade—are also telling: “An Evening With Steely Dan.” Not bad for a group that really hasn’t existed for 14 years.

The live show revealed even more. Fagen did fully three songs from Kamakiriad, and only one from his previous solo record, 1982’s The Nightfly. Walter Becker did a couple from his own forthcoming solo project. The rest of the three-hour show comprised faithful reproductions of tunes from a lifetime ago. Yet songs like “Hey Nineteen,” from Steely Dan’s 1980 swan song, Gaucho, took on even more resonance 14 years down the road. Lesser-known tunes like “Third World Man” and hits like “Reeling in the Years” were substantially reworked.

However, the very enjoyable show from the first live Steely Dan tour in nearly two decades provoked nearly as many questions as it answered. Why a Steely Dan tour at this point in Fagen’s and Becker’s careers? Wasn’t that tantamount to looking backward? To their credit, both of the band’s principals managed to project something akin to warmth from the stage. Becker “uh”—ing his way through the band introductions, Fagen cracking wise about the songs. Despite doing the old songs, the whole affair managed to avoid the moribund pall that often creeps over shows by bands that haven’t played together for a long time. The sheer power of Steely Dan’s music prevented that. What fans feel for this music transcends nostalgia. So did the show.

But the alleged purpose of the tour—to promote the new solo projects—seemed lost in the shuffle. Even as they played to sold-out arenas across the country, Kamakiriad slipped from its opening high of #10 on the Billboard charts to land in the mid-’80s by the time the tour hit New York several weeks later. After the initial rush of excitement about Fagen breaking ten years of relative silence and working with Walter Becker again, it seemed that everyone was now waiting for the inevitable: the ascension from the ashes of Steely Dan. Even Becker—who played bass and lead guitar on Kamakiriad and, more to the point, produced the album—and Fagen felt it as they made the record.

“It was, essentially, pretty much, exactly the same as the old Steely Dan projects,” Fagen remarked about working in the studio with his off-again/on-again partner of over a quarter of a century. “Except for the fact that, because I had developed the concept, Walter played more of a producer’s role than an artist’s role, aside from his own playing. We both basically worked the way we used to. We’d say, ‘How does that sound?’ ‘I don’t know. I’m not sure.’ ‘Well, should we hire this guy?’ ‘Well, let me try it.’ ‘Okay, if you can’t do it, we’ll hire somebody else.’ Okay, maybe. I’ll tell you what.

Let’s just go to the lounge and talk on the phone for a while instead.’ Which is essentially how it always went.”

“I think the most tension-producing thing in the Steely Dan sessions was the times we’d be cutting the basic tracks,” added Becker. “Because that wasn’t part of the process for Kamakiriad, in that way I would say it was more relaxed. Other than that, it was pretty similar.”

There were several primary differences between Kamakiriad and the seven official albums Becker and Fagen cut as Steely Dan. Despite the lack of basic tracks that Becker alludes to, Kamakiriad uses a band even more than Steely Dan did at their 1972 debut, Can’t Buy A Thrill—the same musicians, track after track. Fagen wrote and arranged the bulk of the new material himself.

“There wasn’t this kind of technology when The Nightfly came out, or at least it was in a very primitive stage,” Fagen said of the early stages of making Kamakiriad. “I wrote the songs on the piano with a vague kind of feel to it, then arranged it using a cruddy old sequencer and a cruddy old synthesizer. Then, I actually used a delay on each element of the drum kit to get a very specific, relaxed kind of groove. I did the best I could with the delays, and then I ended up with a model of the tune, pretty much fully arranged, with most of the essential parts sequenced. In some cases, I just did the drum track, and put the parts on in the studio, ‘live’ so to speak, because I couldn’t find a good feel on the sequencer. I’d have to do whatever I could to just make a model that I could then play for musicians.

“Then I had musicians come and just play to the model. I asked them to be very specific with regard to the groove and where the backbeats fell. That way, it was as if I could play all these instruments, like drums and guitars and so on, but with actual good drummers and good guitar players doing it. Because of that, I think it has a very unified feel to it. Then, for the first time, I did the horns without help from any professional arrangers. It was more work for me, but I just wanted to make sure that my conception was what would end up on the record—voicings and where the horn lines would lay in relation to the vocal. I didn’t want to step on the vocal.”

“The first parts of the production process were incorporated in his songwriting,” Becker concurred. “He basically arrived, not just with songs, but with songs and the fundamental parts of the track.”

Which leaves the question of exactly what Becker did. Over the last 20 years or so, the record producer’s role has become somewhat nebulous. Once the person who chose the tunes, arrangements, studio musicians, etc., someone now billed as “Producer” on an album can be anyone from a record-company A&R person (usually credited as “Executive Producer”) to a synthesizer programmer.

“It’s a different job every time out,” Becker remarked about production assignments. He has worn that hat for artists ranging from Rickie Lee Jones and China Crisis to Lost Tribe

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**Production is whatever part of the job the artist isn’t able or willing to do himself. Sometimes I just order in food to the studio. — Becker**
and Bob Sheppard (a jazz saxophonist who toured with Becker and Fagen during the post—interim Steely Dan era).

"It's whatever part of the job the artist isn't able or willing to do himself," said Becker. "There's some times—some of the jazz things, basically—where I'm just the custodian of the menu book, ordering in food to the studio. There's other times where one takes a much more active role."

As avid Steely Dan fans and liner-note literati know, Gary Katz produced nearly every Steely Dan album—except for the pre—Can't Buy A Thrill albums that occasionally crop up, like the You've Got to Walk It Like You Talk It soundtrack, and demo albums Becker and Fagen made when they were selling songs to the likes of Barbara Streisand and Steppenwolf. Becker had Katz as a role model, but in the nearly 15 years since Gaucho, the need for what Katz did with Steely Dan has shifted.

"Being the producer of Steely Dan records and of Donald's records more and more came to be an impossible job," said Becker. "We were figuring out what needed to be done ourselves. As far as that part of Gary's job went, he was basically just keeping the record companies off our backs and contributing in a musical way. We were more and more becoming our own producers. I would say that was as true making Kamakiriad. I was just trying to help Donald do what he had figured out to do, in the same way as Gary was, in the old days, trying to help us do what we had figured out to do."

"We don't like to feel like anyone's got a gun to our heads while we're making a record," Fagen added.

Internally, Becker and Fagen seem to be looking at the years between the old and new Steely Dans more as having taken a vacation from each other than as remarrying after a divorce. Becker spent some time getting free of drugs, part of that spent incarcerated. Fagen felt he had to make a solo statement, which turned into The Nightfly, an album about coming of age in the '50s and '60s. It was one of the few really personal revelations he has made as a songwriter.

"Aside from 'The Nightfly,' I think 'Deacon Blues' [from the 1977 Aja album] was very personal," Fagen admitted. "That was actually a song about growing up in the suburbs. 'Deacon Blues' could have easily been on The Nightfly, though it was co-written by Walter and myself."

Like Nightfly, Kamakiriad is a concept album. But rather than taking place during Fagen's adolescence, the new record's action takes place shortly after the turn of the coming millennium—it's an odyssey in a futuristic, steam-powered automobile. This is not the first time Fagen has employed science-fiction imagery in the service of his songs (or even his band's name), but never before has he used it to this extent. "Speculative fiction automatically allows a certain detachment from the material," Fagen said of using such themes.

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A certain detachment from the material is something that makes for good art as opposed to bad art. It reduces the sentimentality problem. — Fagen

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80 WorldRadioHistory Stereophile, January 1994
"To me, that is something that makes for good art as opposed to bad art. That is to say, it reduces the sentimentality problem. And then, of course, you can invent technologies as metaphors for things you want to say. It's fun."

One of the adventures/songs in Kamakiriad's futuristic travelogue is "Snowbound," a swank, laid-back groove that also marks the first recorded Becker/Fagen collaboration since Gaucho. Still, the song is seven years old.

"Walter and I wrote that together in '86," Fagen admitted. "But that song fit right into the concept."

As Becker, Fagen, and Steely Dan reveled in irony, their current situation — getting back together after all these years, the sellout crowds on the current tour, the adulation for Steely Dan — should appeal to that aspect of their makeup. However, the circumstance is only apparently ironic. Although they haven't recorded together since the late '70s, they've been working together, on and off, since Nightfly.

"We would get together once in a while," Fagen said. "I spent — it would have to be a month and a half — at Walter's place in Maui once, and he came to New York a couple of times. We actually wrote together throughout the '80s. So working together in the studio wasn't that weird or anything."

As soon as they get off the road, the next joint project they'll tackle will be Becker's solo debut. Even that smacks of irony. It's just like Walter Becker to wait almost 15 years, until he and Donald Fagen are working together for publication again, before putting out his own project. Initially, Fagen was supposed to produce it, but that may not work out.

"As it happens," Becker remarked, "because he wasn't finished at the time I had to start, he wasn't really in a position to do that. It wasn't done by this summer [before the tour]."

I'll probably have to come back this fall and finish it up. But when Donald finally finishes his interviews and videos and other commitments related to his album, he will be coming out here and doing some stuff with me."

Working together like this has fueled speculation that Steely Dan may once again become a discrete creative entity. Roger Nichols, who since Can't Buy A Thrill has engineered everything Becker and Fagen have done, together and separately — including many of the records Becker has produced over the last decade — mixed all the audio for the tour. That, along with the big remote trucks outside the halls they've been playing, has fueled speculation of more live Steely Dan music than just the rushed, mediocre version of "Bodhisattva" on the Gold package and the flip sides of several singles that may someday be reissued. If a live Steely Dan record doesn't result from this tour, perhaps a new studio album lurks in Becker's and Fagen's crystal ball. To hear them tell it, there's certainly enough material for one.

"There are songs from the '70s that we either never finished, or we had written and never recorded," said Becker. "I would cop a line or a chorus or some part for my new album. I basically rewrote with new verses or new lyrics or whatever."

"We also actually have some other material from the '80s that we're holding," added Fagen. "We didn't do anything with it. It's really interesting material. I'm not sure what we're going to do with it, but we've got a lot of stuff that we worked on — ideas for stuff, fragments, things that are almost finished. We might search through that stuff and see what we can do with it."

So start stoking the boilers. Once Kamakiriad cools down, William S. Burroughs's steam-driven marital aid, the Steely Dan, may once again ride the rails.
GROUCHO: So, why do you have 18 children? LADY: I love my husband! GROUCHO: I like my cigar, but I take it out of my mouth once in a while!

Whoops! It was a Marx Brothers kind of day. I logged onto CompuServe’s Ceforum (Consumer Electronics Forum) and noticed a “conversation” (called a “thread” on-line) whose Subject Header was “Forsell Turntables.” Naturally, I downloaded the thread. But instead of pointed Forsell ramblings, I found an exchange between Corey Greenberg and Sysop E. Brad Meyer concerning the relationship between Groucho Marx and S.J. Perelman, who evidently wrote a lot of Groucho’s movie material. (Ceforum can wander a bit from a thread’s original topic, which is why I spend most of my audiophile log-on buck visiting The Audiophile Network!)

That same day Kathleen and I kept a rendezvous with a friend of ours at Barney’s, Manhattan’s upscale department store. Among the dross and schlockes for the shop-till-you-drop crowd were a number of fancy photo frames, and every one of them was filled with pics of the Brothers Marx! It gave me a chill (the prices of the frames, not the Marx connection).

Returning home, I cued up my Air Force One Mk.II and asked myself that immortal question, “Why a duck?” Or, more appropriately, “Why a Forsell?” Don’t talk-a to me about segues!

Why a Forsell indeed. It’s surely one of the most sophisticated yet misunder-

stood turntables in the High End. When I left a message on Ceforum asking what the original Forsell thread had been about, I was told that it had revolved around rumors of purported problems with construction, reliability, and strange usage foibles. When I heard what some of these were, I laughed myself silly.

GROUCHO: I know; I know—you’re a woman who’s been getting nothing but dirty breaks. Well, we can clean and tighten your brakes, but you’ll have to stay in the garage all night.

Before I clear the air about some of these knee-slapppers from the Electronic Sar-gasso Sea that is CompuServe, I’ll describe the ‘table as it appears in our system. Although I’ve heard it called everything from Drop-Dead Gorgeous to Rube Goldberg-like, my wife and I find the Forsell very elegant in its high-gloss acrylic black and gold. Kathleen is from France, Beland, where they have taste, yes, no, isn’t it so? To me, it looks like a work of art—a piece of true craft designed with the love of music in mind, not a mass-produced, cookie-cutter look-alike.

As Dr. Forsell asserts, the Air Reference (no Flywheel) and the Air Force One (with Flywheel) are based on very simple principles. Just “Think Swedish,” and all the elements fall into place. Remember, for years Saab placed the ignition key of their unique designs on

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1 (818) 988-0452; 8 data bits, 1 stop bit, No parity, 1200–38,400 baud.
the transmission tunnel! I can hear the smiling, blond, lab-coated Swedish engineer who thought that one up: "It works for me!"

The 'table is either a one- or two-chassis design, depending on whether you opt for the Air Reference or the all-out Air Force One with the separate Flywheel. Each chassis comprises two sections: The lower base has metal discs on its top surface which are dimpled to accept the upper section's locking adjustable leveling spikes. The lower section contains an umbilical and, if you're an Air Reference owner, the electronics to support the air and motor switches. If you're not Flywheeling, the lower section also comes with the internal motor attached to a gantry-like structure set upon the left rear. This pokes up through a hole in the upper 'table. Naturally, if you use the Flywheel, the umbilical, switches, and internal motor (if supplied) are redundant and not used. The power supplies for the Air Reference and the Air Force One are not interchangeable.

The upper section—the turntable proper—is where you'll find the business end of the hardware. On the right rear sits the fully adjustable, gold-plated arm tower, which supports a similarly gold-plated air bearing and cueing arm in basic black. A short, stiff wire gantry is located midway on the rear panel behind the arm bearing to hold the arm wire aloft and keep it from fouling the arm as it traverses your treasured LPs. A slider fits over the arm bearing, and four screws and two metal "straps" secure the arm wand to the slider. The upper structure's left side-panel has an enormous gold-plated knob charged with splitting the air between the arm and the platter.

On the rear panel are two air-intake nipples for the air supply to platter and arm, and a cutout where the RCA terminal block is fitted. The plinth is glass, but it appears to be the same high-gloss black acrylic as the side panels; only manicural squinting reveals its silicon nature.

HAMMER (GROUCHO): Now, here's the main road leading out of Coconut Manor—the road I wish you were on. Now over here—on this site we're going to build an Eye and Ear Hospital. This is going to be a sight for sore eyes. You understand? That's fine. Now, right here is the residential section.

CHICO: People live there, eh?

HAMMER: No, that's the stockyard. Now all along here—this is the river front—all along the river—those are the levees.

CHICO: That'sa the Jewish neighborhood.

HAMMER: Well, we'll pass over that.

Like the 'table, the Flywheel is a smaller, but also a gut-bustingly heavy, two-tiered structure. It's as deep but not as wide, with the same high-gloss black acrylic side-panels. The Flywheel itself is gold-plated, as is the air-control knob. The base on which the Flywheel sits has the same leveling spikes for positioning. Right rear is a small, mechanical, three-digit counter with + and − pushbuttons on the top and bottom of each of the three-digit readout segments, used to control the Flywheel's speed. A front-to-back "bridge" straddles the Flywheel and supports its motor. An on/off switch lives on the left side-panel near the power umbilical, and the right side-panel houses the air connector. The Flywheel should be placed with its side-panel about 7" from the turntable's side-panel. It drives the platter via a stiff thread—more later.

About mounting: The basic idea is that energy should be directed down to the floor. Marble or granite table tops aren't a good idea, as they can reflect vibrations back up through the table and prevent the spikes' "mechanical diode effect" from working. I've heard much mirth and Big Audio Astonishment leveled at the 22cm² Ikeas "Lac" table recommended by Forsell Mediphon, but it works fine, as will any light table (à la Linn) if your floors are hard, solid, and non-compliant. It has something to do with the material the tables are filled with, which is similar to that found in the Forsell's lower base. If you use the Ikeas table, make an MDF or wooden base for it, glue the Lac table to this base, and add spikes or cones to couple the table to the floor. With the Flywheel, the Ikeas tables may need to be weighted at the base to prevent them from creeping toward each other.

If your floors sag and moan like my Aunt Sophie (who I hope doesn't read audiophile magazines), then a heavier, mass-loaded stand will be better. We use two similar—order, shortened Arcici Lead Balloons filled with a combination of steam-cleaned pool-filter sand (hygiene, hygiene!) and #9 lead shot in alternating layers. The 'tables are coupled to the floor with the supplied SuperSpikes. The spikes emerging from the bottoms of these legs are set into the tops of leveled sheet-metal screws wound down through the upper, compliant plywood layer of our loft's flooring to the very solid subfloor. The Arcici table-tops are epoxied directly to the tops of the stands, and the lead bars supplied with the Balloons are placed on the lower crossmembers—near the floor rather than under the turntable itself, as would be the case with other 'tables. In one word, solid.

The number of pumps and surge tanks will vary, depending on which 'table configuration you choose. The Air Reference comes with a single pump, a surge tank, and a splitter that feeds both air intakes on the 'table top and allows the large golden knob to do its work. My favored hookup is two pumps and two surge tanks to the 'table, with a regulator to control air flow to the arm. This hookup still lets you adjust platter pressure, but because you can operate arm pressure independently, mostly you leave it wide open. Of course, the air-bearing Flywheel requires a third pump and a smaller surge tank.

Music lovers, don't let the air supply to the Flywheel go south of the border while it's spinning, hey? GRAUNCH! Know what I mean, Vern?

I can hear you asking, "What about the noise from all those cute little Japanese fishtank pumps?" If you've ever seen a high-pressure, high-flow turntable in action, you may have noticed that the pump is often very far away from the listening area to avoid noise pollution. Like New Jersey. The three pumps you wind up with if you have a maxxed-out Forsell Flywheel system are almost totally silent while operating. Mine are clustered like guppies around the Arcici equipment stands—a mere 6-8' from the listening chair—and I hear only faint, low-level buzzing late at night between LPs. And I'm not sure that's the pumps I'm hearing! [rimshot]

HAMMER: You're a peach, boy! Now, here is a little peninsula, and here is a viaduct leading over to the mainland.

CHICO: Why a duck?

HAMMER: I'm all right. How are you? I say here is a little peninsula, and here's a viaduct leading over to the mainland.

CHICO: All right. Why a duck?

HAMMER: I'm not playing "Ask-Me-Another." I say, that's a viaduct.

CHICO: All right. Why a duck? Why a—why a duck? Why—a no chicken?

But what are all those gnomically-looking things stuck on your 'table, Scull! Being an invertebrate tweakster, my 'table, like the rest of my system, is dotted with resonance-control devices. Let's see... on the rear panel four Combak/Harmonix RF-56 Tuning Bases describe a square surrounding the RCA terminal block—two each on the upper and lower arm supports—and a final RF-57 dot on the vertical endcap of the arm bearing.

Not done yet. I use a Shun Mook Mingo Disk on top of the VTA adjuster, logo facing front (6 o'clock—they're directional), and three on the plinth.
arranged about the platter in a triangle with the SM logo facing in the direction of platter spin. The umbilical from the power supply to the Flywheel has an Original Cable Jacket around it, as does the arm wire (a cute little one), grounded to a binding post tied into the iso-grounds of the hospital-grade receptacles, and from there to a nice clean ground: a cold-water pipe. The 'table looks unbelievably COOL, and nails unexpected visitors in their tracks. Talk about a conversation piece!

MADAME: I don't like this innuendo.
GROUCHO: That's what I always say. Love flies out the door when money comes innuendo.

Okay, let's begin the disabusing section. As I kill each rumor, I'll take a moment to delve further into the 'table's setup and use. How 'bout beginning with the Forsell Belt Guffaws on the Air Force One? (The Air Reference uses a simple silicone-rubber belt wrapped around platter and internal motor.) Everyone seems to dissolve in laughter or look like they just filled their shorts with Gatorade when they learn that the currently recommended material for the Flywheel belt is "Yonson & Yonson" Waxed Dental Floss! On CompuServe this was thought to be an "improvisation," but truth is often stranger than fiction.

The original belt was silk, worked perfectly fine, and gave a slightly softer sound than the floss. Here is one of the wonders of the 'table: its ability to change its sound with small adjustments and changes in configuration. (More on this to come.) From what I understand, a bad batch of silk that tended to stretch made its way across the pond. Actually, dental floss is not so crazy a material to use as a substitute—it doesn't stretch, and frays very slowly. I'd estimate a fresh belt would last about four to six months under normal audiophile use. Dr. Forsell, a typically frugal European (I know, I'm married to one), simply used what worked without getting hung up on what people would say about a robust material that keeps its shape and tension for long stretches [hahaBOOM] of time. I use mint green—it looks refreshing and environmentally correct against the black and gold—but feel free to experiment. (Christmas is a nice time to try Cinnamon Red.) In general, you should use round waxed floss rather than tape. You can try the tape, but then you use only one loop rather than doubling the run, as is normal for maintaining good friction.

Although a little tricky, making a belt is not so hard. You blow it a few times in the beginning, but after a couple of tries, it becomes second nature. I can make one in ten seconds. Well, mebbe 20. Loosely drape the floss around the Flywheel and platter twice, then tie the floss together and tighten it up by pulling on the two loose ends. After cutting off the excess, carefully apply a flame to the knot. The wax melts slightly to seal the knot, and you're in business. That's the tricky part—too close to the sun and your wings melt.

With the air on, rotate the platter by hand, making sure that the belt forms two separate paths around the platter. Check that the knot rides on the outside of the platter and doesn't "hump up" the belt as it would if it was turned inward, and arrange for the belt's crossover point to be at the front, between Flywheel and 'table.

On both the Air Reference and the Air Force One, the belt should ride as low as possible on the platter, just a bit above the plinth. If it rides too high, the playback can sound dark. I was having trouble with this darkish sound quality when an acquaintance and fellow Forseller came over and yelled at me that the belt was too high. He's Herman. Hat getting chewed out in a Herman accent. We lowered it, and Presto Changó! See how sensitive it is? If you have anything nasty to say about it, just make sure you whisper.

BARAVELLI (CHICO): Hah! I got a co-ed. Last week for eighteen dollars I got a co-ed with two pair of pants.
WAGSTAFF (GROUCHO): Since when has a co-ed got two pair of pants?
BARAVELLI: Since I joined the college.
WAGSTAFF: Baravelli, you've got the brain of a four-year-old boy, and I bet he was glad to get rid of it.

Another no-brainer I picked up from that CompuServe thread was the notion that wax was used to "control" the tonearm bearing clearance (the "bearing" being the tube, drilled with air holes, that supports the slider and tonearm). Applying Liquid Lustre—a Teflon-free, Carnuba car wax from Texas—to the air bearing is a useful tweak, but it doesn't control anything. It's one of the arm bearing's user-friendly elements: because of its low-pressure, high-flow design, it doesn't need super-tight tolerances. Your bearing a little dirty, bucky? Turn up the air pressure and relax. The wax makes for a smoother surface on the bearing and seems to allow the arm to "float" a bit better. Although some competing designs require fanatically frequent cleaning of their air-bearing tonearms, this is simply not the case with the Forsell. The larger air gap means the arm bearing only needs to be cleaned once every few months—or maybe a bit more often in New York, where I notice the air filters get pretty clogged after a month or two (we have a smoker in the family).

Although the lowest pressure possible to the arm is generally best, you need only increase the arm pressure a bit if it begins to stick. Mine never has, but this may be due to the slightly higher-than-average pressure used with the heavy-weight Grasshopper Gold we've got tied to the arm's business end. This slight increase in pressure will have a minimal effect on the sound. When you get around to cleaning the arm bearing, use pure acetone (no oils) on a soft cloth, and optionally follow with a light application of the Liquid Lustre? Put the initial glop of the pink stuff on the bearing's underside, but don't dunk up the air holes. Keep the air pressure on during cleaning/waxing, then use a strand of wire to make sure the air holes are not blocked. I'll cover how to set correct arm pressure in the "Tip Sheet" section.

FIRELY (GROUCHO): Not that I care, but where is your husband?
MRS. TEASDALE: Why, he's dead.
FIRELY: I'll bet he's just using that as an excuse.

Now, let's murder some other rumors concerning the Flywheel's reliability. My "original" double-bearing Flywheel (top and bottom) has been running strong and silent since the day it was delivered. It's true that it's been redesigned, perhaps fueling gossip in "Other Table Land" about the first iteration, but Dr. Forsell claims this was done to make things simpler. The 'table and Flywheel come with a ten-year guarantee, and the single-bearing Flywheel is easily replaced in the field by the customer. It's pretty simple—no matter how much you spend on bearings, they'll eventually wear out in this high-speed application. Having only a single bearing at the top of the Flywheel makes removing the "bridge" (which contains the motor) and replacing the entire assembly easier to effect. Piece of Swedish Pound Cake. I'm not a Flywheel-of-the-Month type, so I won't change unless I have to. That seems unlikely any time soon.

But the Flywheel 'table does require involvement. It's alive—not a plug'n play special. When starting up the Flywheel, 2 Liquid Lustre, Barker, TX, (713) 391-8023; or Santa Ana, CA, (714) 543-2434. A 32oz bottle costs $20 via credit card.
you'll have to give it a few minutes to get up to speed and stabilize. Most days when I check it with my strobe, it's rock-steady at the same speed setting as the day before. Some days, however, it's a bit slower or faster, so I adjust the speed using the three-digit, pushbutton numeric control.

What makes the Flywheel change from time to time? I dunno. . . The humidity? What I had for breakfast? How Kathleen feels? How the 'table feels? The position of the planets? Minute changes in the distance between the Flywheel and the 'table brought about by expansion and contraction of the floor? I don't care. It just wants to be loved. Ya gotta talk to it a little while you're chatting with your plants. I check the speed every couple of hours, especially if I started it up during a warm day and the evening turns cool. If this is "unreliability," lemme have it every time.

This may be a long way from flipping a switch and taking it for granted that your kilobuck turntable is doing 33.33, but if you want the stunningly beautiful richness and imaging of the Forsell, ya gotta pay for it with a little attention to your Flywheel, bub. If it's too much for you, get the Air Reference without the Wheel. It has two switches to get it going (air and internal motor), but I bet even The-Only-Screwdriver-I-Want-Is-One-In-A-Glass types can manage it. Besides, with the very small speed changes possible with the Flywheel, you can compensate for records that were recorded off-speed. Need it a little sharper? Up the speed by two or three clicks. That tenor sounding like Alvin the Chipmunk? Turn it down ten clicks.

DRIFTWOOD (GROUCHO): Well, uh, I want to sign him up for the New York Opera Company. Do you know that America is waiting to hear him sing?
FORELO (CHICO): Well, he can sing loud, but he can't sing that loud.

I think we've dispatched the Rumoroid Audio Nay-Sayers into the weeds, so now a bit of background on the Forsell Air Reference's construction, gleaned from an interview with Dr. Forsell.

The lower base on which the turntable sits is specially constructed to "transform" low-frequency vibrations of 3Hz and above into higher-frequency vibrations which are then transmitted upward toward the turntable's top chassis through the adjustable leveling spikes. Put 3Hz into the lower base, and 100Hz comes out of it. That's a little like my Aunt Sophie—ask her how she is, and three hours later . . .

Next, the 'table's upper chassis provides damping for vibrations of 100Hz and up, via internally mounted Sorbothane feet which separate layers of a special patented damping material. You can't make energy (or my Aunt Sophie) disappear, but you can turn it into heat; this is what Dr. Forsell's damping material does. The chassis' multiple-damping layers act to eliminate the higher-frequency vibrations which have been "transformed" and have traveled upward from the base. As Dr. Forsell described how the air-bearing platter removes yet another 30dB or so of disturbances, he used a Swedish phrase that his assistant, Jan, smilingly translated as "ambience on the fish." After I regained my composure, I realized he probably meant "the icing on the cake."

GROUCHO: I wish to announce that a buffet supper will be served in the next room in five minutes. In order to get you in that room quickly, Mrs. Schmalhauslen will sing a soprano solo in this room.

Some note with astonishment that the Forsell eschews vacuum hold-down. The good Doctor thinks it absolutely destroys the sound, removing the natural bloom and creating a less musical, more mechanical sound. As he points out, "live" music is not "dead." Vacuum hold-down, he states for the record, is "for a technician good sound, not for a musician." Thank you, Groucho. Besides, there still seems to be some controversy over a vacuum platter's tendency to press dirt and other noxious particles right up into those squiggly little grooves.

A little Flywheel theory: Most of the time, in the pre-dawn of turntable design (last week), manufacturers would upgrade their 'tables by slapping on a more massive platter. For example, let's say you increased a platter's mass by a factor of ten, from 3kg to 30kg, say, thus increasing the rotational "energy" in the same proportion. But if, instead, you were clever and Swedish and increased the rotational speed ten times, you would actually increase the "energy" by a factor of 100 times 10, or 100, without increasing the platter's mass. To do the same trick by just adding mass, you'd wind up with a platter weighing an incredible amount, which no bearing could support. Instead, you achieve the same rotational "energy" by spinning less mass at higher speed, giving an "enhanced" platter-plus-flywheel system. The basic theory is simple and easy to understand—if you're a physicist—and boy, does it work! This enhanced platter effect is one of the main reasons the Air Force One sounds so superior to any other 'table I've heard.

The air-bearing philosophy is critical to the Flywheel's operation. It would be impossible to achieve the silent high speeds required without that special frictionless bearing—unless you resorted to a large, noisy motor. The ambience on the fish, of course. An object spinning as fast as this must be carefully balanced, and the Flywheel is dynamically balanced—like an airplane propeller. Otherwise, as Dr. Forsell charmingly puts it, it would shake the cups in the kitchen. Forsell's air-bearing Flywheel concept is patented.

The Flywheel's small DC motor requires feedback to maintain the speed as set by the three-digit counter. The problem with feedback loops, as all high-enders know, is that it can destroy the sound if used in too heavy-handed a manner. The design therefore incorporates 20-step filtration and an additional three regulation steps to stabilize the voltage. Whew. I was worried about that.

Do you like stable relationships? You'd better, especially if you own the Mk.I. I asked Dr. Forsell why he simply didn't suspend his 'table on springs, but he explained that sprung 'tables just don't stand still. They vibrate and move around, and a turntable, especially this one, should stand quite still. This is especially important to the workings of the Flywheel, as will become clear. The Mk.II, the subject of this review, has the evolutionary self-adjusting bearing that has been in production since the beginning of '93, and is more immune to small movements of the Flywheel toward the 'table—movements caused by vibration. You also don't have to play with the bearing tightness in relation to the belt tightness, as you do with the Mk.I.

The distance between 'table and Flywheel should remain relatively constant with both the Mk.I and the Mk.II, but the Sorbothane feet inside the chassis, which separate the layered damping material, need a little time to stabilize as they are pulled toward the Flywheel by the thread. That's why it's important to run the Flywheel continuously for at least 48 hours when first setting it up. You'll find that you'll need to tighten the belt several times over this period as the electronics run in and the Sorbothane feet take their "set." This is accomplished by moving the Flywheel a small distance away from the 'table, as needed.

THE FORSELL TIP SHEET

Although you should use a good level to rough any 'table in, leveling an air-bearing arm is a bit more involved. First,
level the plinth using the adjustable spikes under the 'table top, but don't lock them into position as yet. After the 'table itself is leveled, make sure the arm bearing is level as well. This should arrive from the factory set correctly, but it always pays to check. If the arm bearing needs a tweak, you'll find the adjusting screws at the arm's base. A strong drink during the process helps a lot.

Once both of these guys are level, snap the air on and move the tonearm (with cartridge installed at approximate VTF) to the lead-in groove position, but leave the cueing arm up to avoid disaster. Never move that arm around without air pressure—you have been officially warned! Slowly lift the headshell up as far as it can go with your thumb, then let it drop. The correct left/right level is achieved when the slider/armtube doesn't tend to move one way or the other when released. Do this several times until you're sure you know what you're seeing (that is, if you're not totally incapacitated by that drink you just had)—you have to be gentle, and not unintentionally affect the direction when you let it go. Adjust the spiked feet on the right or left side until you achieve perfect equilibrium, then tighten the spike locks. If you have trouble with this, you can zero out the arm weight, which makes the left/right slide even easier to see. However, veterans can do this very quickly at normal VTF. Although the back/front level is less critical for the Flywheeled version, it should still be level. When using the internal motor, make certain the 'table does not tilt down in front. The pressure of the compliant silicone belt is just enough to balance the platter against the bearing to achieve a vertical position of the platter bearing.

The 'table arrives factory-fresh with the air-pressure knob on the turntable's side set at a point where you can begin to experiment. The knob acts as a splitter, directing varying amounts of air to the arm and platter. Turning the knob clockwise increases the flow of air to the tonearm—at full clockwise rotation, the platter freezes. Using the set screw as a guide, note the knob's position so you can return to its original position if Audiphilia nervosa sets in. With the air on but the belt off, and counting the rotations as you go, screw the knob clockwise until it's flush against the side of the 'table. At this point the platter will not be able to move, since you're directing all the air to the arm. Back the knob off counterclockwise, perhaps a quarter turn, until the platter can spin freely again. Now rotate the knob 1/2 turns counterclockwise; this should return the knob to the initial factory setting. At this point you're directing sufficient air to the platter, and high flow to the arm.

To set arm air pressure, gently and slowly move the arm back and forth on the bearing. Don't yank and swoosh it around like Errol Flynn brandishing his sword, as it will surely feel like it's binding. To lower the air pressure to the arm, turn the knob counterclockwise until it feels as if it's not floating freely, then turn it clockwise a tad. The arm should have a nice, floaty feeling—you know, like after that first bottle of Veuve Cliquot, the champagne of Marcel Proust (and JA—Ed.). Or you can play the lead-in groove and lower the pressure until the tonearm sticks, then bring it up a touch. Another method is to squat at the arm as it tracks an LP and lower the pressure until the arm "ratchets"—ie, the cartridge end moves, then the bearing end plays "catchup." The arm should move smoothly as a whole. I quickly developed a feel for correct air pressure, and now just move the arm around on the bearing. Lighter cartridges will sound fine with very low air pressure dialed in, but the heavier the cartridge, the more float you should give it. You can slightly change the tautness and amount of bass energy by tweaking the arm air-pressure during play. Not tweaky really, just so adjustable—you can make this furshluginner 'table sound any way you want it to sound. No wonder it scares the pants off the Audio Fascists.

MRS. TEASDALE: I was with him till the very end.

FIRELY: Huh! No wonder he passed away.

MRS. TEASDALE: I held him in my arms and kissed him.

FIRELY: Oh, I see. Then it was murder. Will you marry me? Did he leave you any money?

Answer the second question first.

Just to take this adjustability thing even further, the Forsell is available with arm tubes of different diameters to match your cartridges. There are no hard and fast rules, although Dr. Forsell and associate Jan Sjolund have amassed a wealth of knowledge on the subject, and will be happy to share their thoughts and suggestions via Fax. Forget their answering machine. The first time I called Alvsvjo, Sweden for some advice, the measured, pleasant, low-key voice of Dr. Peter Forsell requested that I leave a message at the beep. Soon after I began my somewhat rambling questions, I was cut off by the answering machine—clearly not one of those "talk-as-long-as-you-like" types. I've since found the good Doctor to be quite loquacious, in a Swedish sort of way.

Never mind. The arms are supplied with a selection of Teflon spacers—also of different thicknesses. One of these should always be used between cartridge and headshell. Unlike other arms that try to eliminate resonances that have been put into the arm by the cartridge, the Forsell's Teflon spacers keep these nosious vibes from ever getting to the arm in the first place.

The easiest and safest way I've found to mount the cartridge in any arm: forget about using clumsy and potentially dangerous needle-nosed pliers, campers—too dangerous. Instead, use a jeweler's screwdriver to pry the connectors on and off the cartridge pins. Reform the arm's connectors with a small pliers after inserting a toothpick into the connector to restore tightness, if necessary. After remounting the arm/slider assembly, follow the manual's directions for setting overhang and VTF. Check the position of the loaded stylus on the template by peering at it from the right side with the supplied magnifier (the Forsellope?) and a small flashlight. It may not be obvious from the Forsell's amusing manual (which I understand was translated directly from Swedish and is currently undergoing much-needed revision), but you can move the entire air bearing back and forth by grasping it at the unsupported end and giving it a slight nudge one way or the other, or by just tapping it lightly. Repeat your nudging or tapping until the stylus "point" is just to the rear of the dimple's center. Welcome! Don't worry about the resulting angle of the air bearing—any way you slice the pie, it's straight!

Another cartridge-mounting tip for any arm: Once you've got the correct tracking force dialed in, set the cartridge down on a mirror laid flat on the platter, and check the stylus' orientation. Many high-end cartridge styli stick out all over, rarely pointing front and center. The Parnassus is an exception. It's so Scantech-Japanese-Perfect that everything lines up just so, and it even comes with a little rice-paper diaper to protect the exposed wires on its bottom! In contrast, the Ever-So-Made-By-Hand-looking vdH Grasshopper Gold looks like it was fabricated by my nephew at summer camp—the generator goes one way, the stylus another. But man, how the 'Hopper sounds! I think the Parn sounds like it looks. 'Nuff said. If you find your cartridge of choice suffering
from Stylus Directionlessness, loosen the screws holding the beast, adjust it laterally to achieve a straight-ahead stylus, then tighten up them nuts. You may notice that some cantilevers actually deflect to one side or the other when tracking weight is applied, so don't freak. Just find the spot that gives you a straight-ahead stylus with the recommended VTF applied.

If you have a Signet Cartridge Analyzer, now's the time to get your azimuth set. I place a small bubble level on the headshell so I can see how far clockwise or counterclockwise I’ve rotated the arm and after loosening the two securing screws, azimuth can also be set by ear (a good thing, as they don't make the Signet anymore). This takes some practice, but it can be done by aficionados and an Eared. Since azimuth can affect focus and dynamics, the best way to listen for and adjust it without electronics is to listen for “how clear the spaces between the singing and the dancing” are, as Dr. Forsell puts it. So folkloric, so sylvan. He went on to suggest that it's like listening for the difference between standing in New York smog or in the clear, fresh Swedish air. I wondered if he'd been to New Jersey. After zeroing-in the azimuth by either method, regardless of the air quality, recheck the overhang in case you've unintentionally upset it while loosening the retaining screws. It'll take a while, but be patient—it's worth it!

Can we get away from this rampant adjustability for a sec? NO! Cartridge adjustment creates huge differences in sound on the Forsell. Today's high-performance trackers are affected strongly by very small differences in VTF and VTA. In my experience, the Grasshopper and the Parnassus can be made to sound dark, bright, full-bodied, or lean, depending on downforce and VTA. I suggest beginning with what sounds like a reasonable tonal balance, then moving the VTA adjuster knob (which moves the whole tonearm assembly up and down) 1/8 of a turn at a time—clockwise for up, counterclockwise for down. It's easy to miss the point by going too far, so between each twist of the VTA knob, listen carefully for how free and bloomy the sound is (female voice is good for this). If the sound is withdrawn and bright, you're too high; if withdrawn and dark, you're too low. When it's just right, the sound should be free and in full bloom. At this point, you're looking for openness and bloom, not focus. Too many of us approach the right spot, find acceptable focus, then stop the adjustments. This is a mistake.

Although focused, the voice might sound 1mm or 1m wide. It doesn't matter. Adjust first for sound, as above, then, when you're in range, continue to carefully adjust the VTA knob. As many as 20 small adjustments in 1/8-turn increments may be necessary until the focus is finally correct and that soprano doesn't have a mouth a yard wide (like my Aunt Sophie).

Once this has been done, you can adjust the sound even further by increasing or decreasing the VTF. On the Grasshopper, you can affect the “body” of a cello, for instance, with slight deviations from the cartridge's recommended 1.2gm tracking force. Using a trick I learned from a fellow Audiophile dementicus, I put little dots of Mortite on the headshell to find that magic spot where the soprano doesn't sound like Roseanne Arnold.

Such easy adjustability comes in very handy. While the Forsell has been merely spinning away, I've used my CAT, a Jadis JP 80, Jadis JA 200s, a pair of wired-for-mono Defys, my stereo Defy, and a pair of Gryphon monoblocks—each with its characteristic sound. Switching amps has a profound effect on the system's overall sound; and for analog replay, it's wonderful to be able to minutely adjust the 'table in every respect. Need to adjust the "body"? Just play "Dialing for Bodies" and wind it in or out ...

More adjustments: The clamp used on the Forsell can also be used to tune the sound. The heavy, gold-plated metal weight supplied with the 'table has a rubber ring around the bottom which, in my humble opinion, overly dampens the sound. I'm afraid I'm guilty of turning Dr. Forsell on to the Shun Mook record clamp, which he acknowledges as quite excellent, and the only weight he's found better than his own in any respect. It's to die for, dahling. Pricey, but it sounds oh-so-open, airy, and alive! He was so impressed he took our clamp back to Sweden. We were stuck and "over-damped" until we replaced it.

As the manual suggests, proper mains polarity is critical. "There is a red dot marked on the connectors both from the power supply and the air pump. It is very important to locate the Phase in your electrical environment for best sound and for proper function of the filters." Hmmm. I hate when I lose the pesky Phase in my environment. Where the heck did I leave it? Another super-effective way to tweak the mains is to use Original Cable Jackets between the power supply and the 'table or Flywheel. These amazing devices are very effective at lowering the noise floor, widening and deepening the staging, and eliminating Groeningus disgustus. They wrap around cables like a small blanket or diaper, and include a grounding wire which attaches to a foil protruding from the wrap. I've got them scattered throughout the system, and use them in conjunction with Shun Mook Mpingo discs. You can adjust the soundstage and remove the seams from the frequency response.

Another thing to watch out for with air-bearing arms is static build-up. In the deep of winter, when Mother Static reigns, grounding the Flywheel to one of the screws of the "bridge" which supports the motor will get you safely out of trouble. Placing the arm and cartridge with a few squirts of the of the Zerostat Antistat Gun also works wonders if you hear rimshots of static coming out of your speakers from the arm's movement along the bearing. Grounding the tonearm itself with the supplied grounding wire will also help. While the supplied heavy-gauge wire works, Andy Chow of the Original Cable Jacket Company attached the Forsell wire to one of the thin grounding wires supplied with the jackets, wrapped that wire, and ran it from there to the grounding point. This effectively speeded up leading tran senders, quickened the entire presentation, and opened the sound up a bit more.

My advice on grounding: for the noxious stuff, use thin wire for faster escape! Try it—it works.

WOLF (GROUCHO): Martha dear, there are many bonds that will hold us together through eternity.

MARTHA: Really, Wolf? What are they?

WOLF: Your Government bonds, your Savings bonds, your Liberty bonds... .

What are the Flywheel's benefits? Is it worth the hassle?

I'm glad you asked. I ran my Forsell for about six months before taking the plunge into Flywheeling, and enjoyed it immensely while I got to know the ins and outs of the setup with the internal motor. Having gone the full route, I'd never go back. I'd say the basic Forsell Air Reference is on a par with a Basis Debut Gold with a Graham arm—a combo I had here for a while. That setup lists at about $10k, and sounds like it too—it's a great arm on a beautiful 'table. You can make the case that the Air Reference is a little better, due to its linear air-bearing arm and air platter, and I'd agree with you. But with the Flywheel in place, I really found myself over the top in the "I can't believe it's Memorex" sweep.

(continued on p.91)
The Quad FM-66 tuner is the successor to the highly regarded Quad FM-4. In their redesign, Quad had two goals in mind: modernize the FM-4, and make the new tuner compatible with the remote-controlled Quad 66 preamplifier. As a result, the 66 can only be operated with a remote unit—a unique feature.

The analog-tuned FM-4 received glowing reviews in these pages (Vol.8 No.4, pp.61–63; Vol.15 No.9, pp.151–152). Cost-effective at $849, the FM-4 was distinguished for its simplicity of design, ease of tuning (both rotary dial and seven presets), high sensitivity, excellent SN ratio, low distortion and smoothness, superior imaging, and low listener fatigue. This early product did not offer a narrow-bandwidth IF option, which limited its ability to decode adjacent FM signals. A Closed-Circuit FM Broadcast (CCFMB) musical evaluation in the Vol.15 No.9 Stereophile review (pp.151–152) found that the FM-4 rolled off the deep bass and introduced coloration into male voices. Would the new, remote-controlled FM-66 maintain the FM-4’s smoothness and high signal sensitivity while correcting these minor colorations in its audio circuitry?

**TECHNOLOGY**

While the FM-66 retains the FM-4's compact gray chassis, it matches the Model 66 preamplifier in color and shape. The styling is distinctive and attractive: a light-gray panel with two dark-gray accents; a semicircular On/Off switch at the bottom left; and a triangular pattern on the panel's right. The 12.5" wide panel is much smaller than the standard rack-mounts of the Day-Sequerra FM Reference or the Pioneer Elite “Reference” F-93 tuners. Status display is via an LCD screen that shows the preset position number, the tuned frequency, the signal strength, and whether the tuner is in stereo or mono mode. The main window displays the preset numbers across the screen. The number of the selected preset is surrounded by a box and indicated by an arrow. A small screen to the right shows the preset frequency and number. A small ladder, or bar-graph, signal-strength meter sits at the bottom of the main display with the Stereo/Mono indicators. There is no linear tuning scale showing frequencies, and no tuning knob. The 66 has one switch: On/Off, at the right side of the back panel. This means that the tuner is fully remote-controlled by Quad's system remote.

Operating the FM-66 from the remote is straightforward enough. The two Track buttons allow the user to move back and forth between preset stations. A station is stored in the tuner's memory by pressing one of the two Search buttons, thereby placing the tuner in search mode. Pressing both Search buttons simultaneously causes the tuner to step through the frequency band in 5kHz steps for fine-tuning. Once a station is located and centered-tuned, press Store until the tuner confirms—by drawing a box around the preset number on the LCD display and showing an arrow pointing to the preset number—that it has stored the station in memory. Then press Stop to return the FM-66 to its normal search mode, in which just pushing the Track button will select the station. Fortunately, this tedious, nonintuitive “addressing” need be done only once per station. The manual provides a place to write in station and frequency next to the preset number.

Although it has no front-panel controls, the FM-66 has two more features than the FM-4. Using the remote, the FM-66 can be toggled from stereo into mono by pressing the remote's Pause button. Muting will be defeated if the tuner is put into the special 25kHz search mode. The tuner will automatically switch to this mode if, during search, it’s allowed to return to the initial frequency without a station being stored. However, like the FM-4, the FM-66 lacks a selectable IF bandwidth and has no user-defeatable automatic frequency control (AFC).

**REMOTE ÜBER ALLES**

Remote control has become a desirable feature in high-end preamplifiers, as seen in the Krell KRC, Mark Levinson's new No.38, the Jeff Rowland Design Group Consummate, and the new Sutherland C-1000 (which I felt to be the “hottest audio product” at the 1993 Summer CES in Chicago; Vol.16 No.8, p.107). The centerpiece of the Quad 66 line of remote-controlled electronics is the 66 preamplifier. Although the hand-held remote is supplied with the 66 preamp, it is not shipped with the FM-66 tuner. (It costs $250 extra.) But because the remote is necessary for the operation of the FM-66, it must be described to explain the tuner's functions.

Quad's hand-held control, several times larger and heavier than the typical TV or CD-player remote, measures 9.5" by 6.5" by 1". Unlike the usual soapbar, the Quad remote is sculpted, beveled, beautiful, and pricey. Its size and weight require two-handed operation; you can't just “point and shoot.” It has 22 circular pushbuttons for controlling line-level input selection, standby, CD play, tone, and volume. The 9V battery must be changed more frequently than the one in your TV’s tiny remote. (I had...
The FM-66's complete dependence on a remote makes it unique among audiophile FM tuners. Lose the Quad hand-held remote and you can't operate the tuner. More to the point, this dependence binds the FM-66 exclusively to Quad 66 system electronics. Audiophiles don't necessarily favor such an approach; it's part of the hobby to mix and match components from different manufacturers.

What if you don't want to buy Quad's big, avant-garde remote? Brian Tucker of Pro Audio/Quad USA, which imports the FM-66, shipped me a universal remote programmed to run the tuner; it managed most of the more expensive Quad 66 remote's functions. Brian suggests that a local dealer can provide a suitable universal remote if you don't want to spring for the deluxe $250 control. Even so, surely it would've been better for Quad to provide a basic remote at no cost for those customers who buy the FM-66 for use in a non-Quad system.

**DESIGN**

Derek Jones of Quad provided details on the FM-66's design. The new tuner is no longer voltage- (analog-) tuned, as was the FM-4, but now uses a digital synthesizer. This results in far better frequency stability. The new tuner also features 25kHz channel spacing to provide the best results in cable systems (common in Europe) which do not conform to the 100kHz channel spacing of American broadcast stations.

The FM-4's adjacent-channel selectivity was not up to the congestion of the European FM band, particularly around Stuttgart, Germany. (FM broadcasters in such urban areas overmodulate to beat out the competition.) The FM-66's improved adjacent-channel selectivity is achieved by increasing the number of poles in the IF filter. Derek noted that an L-C Bessel filter is used as the main IF selectivity block. A PIN diode is employed in the front end to protect against strong RF signals. This diode is driven from a diode detector connected to the mixer output.

The FM-66 uses a discriminator coil with a redesigned "birdy filter" and lower distortion than in the FM-4. The filter in the FM-4 had more ripple and phase distortion in the FM band. The new filter does not use the FM-4 filter's adjustable terminating resistor, but a fixed Butterworth filter with unequal terminating resistors. Both the gain and phase of this filter are better controlled than in the FM-4, with a resultant improvement in stereo separation. The FM-66's output circuitry has been upgraded with low-distortion operational amplifiers for gain. This, in turn, allows the circuitry to conform more closely to the 75μs de-emphasis specifications. The FM-4's older-op-amp-based audio circuit has been replaced by FET-based components, which permit a lower output impedance for the FM-66's audio section.

**AUDIO SYSTEM**

The Quad FM-66 tuner was reviewed in a system that included Quad USA Monitor ESL-63 loudspeakers driven by a Mark Levinson No.27.5 stereo amplifier or by Woodside M-50 tube monoblocks. The speakers were positioned 26' from the back wall and 72" apart. My listening room is 26' long by 13' wide, with a 12' semi-cathedral ceiling. An 8' by 4' doorway at the back of the room opens into the kitchen, which adds another 25' by 15' space. This provided a large area for the Quad systems to drive.

Parallel-output interconnect cables were plugged into the Krell KBL preamplifier's dual main output jacks to allow both balanced and single-ended outputs. One set of single-ended AudioQuest Topaz interconnect cables was used with the Woodside amps, which have only single-ended inputs. Cogelco Yellow balanced lines were used when the Mark Levinson No.27.5 was the system's amplifier.

The FM-66 tuner was compared to the Day-Sequerra FM Reference and to a direct bypass using the closed-circuit FM simulated broadcast (CCFMB) method. The CCFMB compares a "bypass" (direct) signal from the CD player to the same signal processed through a stereo FM tuner (see Sidebar). In addition, an outside rotary antenna was used to pick up standard FM stations! Ancillary equipment for this test included a Sound Technology M-1000 FM Alignment Generator, signal splitters, and a Dan D'Agostino--designed pre-emphasis network. The FM Reference stereo FM tuner has been listed in Class A of "Recommended Components." Though its $4800 price tag makes the FM Reference far more expensive than the tuners reviewed here, it provides standards of performance, operation, tuning ability, and sonic for any tuner to aspire to.

The FM-66 listening sessions employed the same suite of CD's used in the FM tuner reviews mentioned in footnote 1. Soundstage depth and width were evaluated with Holst's Chaconne, as played by the Dallas Wind Symphony under the direction of Howard Dunn (Reference RR-39CD). The male voice is a stern test of midrange and upper bass; for this I used Harry Connick, Jr.'s "I Don't Get Around Much Anymore" (track 6, When Harry Met Sally..., Columbia CK 45319). The ability to create a chorus's wall of sound is important, and for that I used the opening Kyrie of Misa Criolla (Phillips 420 955-2). Wynton Marsalis's Standard Time Volume 3: The Resolution of Romance (Columbia CK 46143) tested the system's ability to reproduce cymbal sheen and trumpet brashness. I used other CDs to test deep bass and dynamics (Owen Reed's La Fiesta Mexicana, from Fiesta, Reference RR-38CD), and the ability to create proper soundstage perspective (J.A's recording of Anna Maria Stanczyk playing the Chopin Scherzo in d, Op.31; track 10 from Stereophile's first Test CD).

**SOUND**

Installing the Quad FM-66 was simple. Quad products shipped to the US are fitted with RCA-terminated cables that allow them to work with US equipment. Two 4-amp-rated AC power jacks are available for powering other gear. The antenna input was the standard British "J" connector. Although the semicircular On/Off power pushbutton was loose on the unit Quad shipped to me, the tuner went on with no difficulty. The FM-66's remote-control configuration means that many users will keep the unit turned on once it's installed. For this reason, I left the FM-66 on for the entire period of time the unit was under review. The Quad FM-66's 700mV audio output was less than the FM Reference's 2V, so I carefully matched the levels for comparison purposes.
The FM-66 was then put through the three-part CCFMB listening test. First, stations received were tallied and listened to for their sonic quality by sweeping the FM band with the FM Reference and the FM-66, both yoked to the outdoor antenna. The FM-66 was switched into its 25kHz search mode, which allowed me to scan the FM band with its muting defeated. The Quad's bar-graph gave proportionally similar signal-strength readings when signals were centered. Unlike the Quad FM-4's rotary tuning dial, punching the search button on the remote to step the FM-66 up the band was tedious. The FM-66's bar-graph display was helpful, but could not compete with the much more expensive FM Reference's built-in oscilloscope, which reveals multipath interference, overmodulation, and excessive pilot-tone power.

The FM Reference pulled in 45 stations to the FM-66's 42. Even so, the FM-66 was quite sensitive, picking up very faint stations with impressive fidelity. Sensitivity was not even, for the FM-66 proved more sensitive at the upper end of the FM band, above 106.0MHz. On the other hand, the FM Reference's three bandwidths gave it the ability to tune out the interference in a number of situations where reception was marginal. This was not possible with the FM-66. The FM-66 consistently delivered a smooth signal, and could tune in a number of closely spaced stations.

In contrast to the Quad's overall smoothness in playing FM stations, the FM Reference often revealed small differences—such as slight hashiness, boosted bass, excessive reverb, and overmodulation—between signals. Also, the FM Reference continued to have the most dynamic, detailed, and powerful bass response of any tuner I've auditioned. But it does cost four times as much as the FM-66.

Second, to evaluate the FM-66's signal sensitivity, a Sound Technology M-100A FM Alignment generator was turned on to broadcast an FM signal, using the Krell MD-1 CD player as signal source. As with the review of the FM Reference, the idea was not to measure the ultimate sensitivity of these tuners in a standard test-bench setup (which requires an expensive screen room), but to carry out a subjective and qualitative appraisal of each tuner's quieting characteristics. The FM Reference was able to pick up signals as weak as 5dBf; the stereo light came on at 10dBf. The Quad mostly met its specifications: it first detected a signal at about 10dBf, and its stereo light came on at 20dBf. Best stereo quieting occurred at 32dBf in the FM Reference, 35dBf for the Quad.

I next evaluated the quality of the FM-66's "Quieting Curve." First, I raised the M-1000A's gain until both tuners quieted completely; usually this level was 65dBf, accounting for insertion loss. Then, as I gradually decreased the M-1000A's RF signal output, I listened for the FM-66's character (smooth, spitty, hashy) as its quieting action shut off. The subjective impression of the quieting curve's slope depends on the tuner's behavior—either a sudden burst of noise, or a gradual and smooth increase in noise. The FM-66 exhibited very smooth quieting. Reversing the process, the FM-66 quieted gracefully as the signal strength was brought up. The background was hash-free, smooth, and free of "birdies" or static.

The third and final procedure was testing via CCFMB. Like the earlier FM-4, the FM-66 sounded smooth and detailed on the Wynton Marsalis selection, re-creating the cymbal's sheen and the trumpet's natural timbre. Even so, it didn't produce the transparency heard with the FM Reference tuner. Harry Connick, Jr's solo vocal had been thin and reedy on the FM-4, but was more robust and rich on the FM-66—almost as natural as on the FM Reference and the direct listen. The FM-66 also captured the speed and attack of the bass drum in La Fiesta Mexicana, but without the FM Reference's deep bass. Soundstage depth was quite good, the FM-66 reproducing the opening Kyrie of the Missa Criolla, and the lateral soundstage placement of the "Well done!" at the end of the Chopin Scherzo matched the placement afforded by the FM Reference. Bypassing the CCFMB setup revealed only a minimal reduction in frequency extremes.

CONCLUSIONS

The Quad FM-66 continues the British tradition of producing small FM tuners with quality sonics and few user controls. The tuner costs $201 more than the FM-4, and another $250 if one buys (as one
must) Quad’s remote. The FM-66 bettersthe FM-4 in its increased sensitivity, improved adjacent-channel selectivity, switchable stereo/mono, and defeatable muting. The FM-4 offered seven presets and easy rotary-dial tuning—features highly praised in its Stereophile review. The FM-66 replaces these user conveniences with “preset-or-scan” remote operation and no rotary-dial tuning—which may not be the owner’s preference. And, of course, the FM-66 cannot be used without Quad’s expensive remote. But owners of the Quad 66 preamplifier, who already possess this remote, should seriously consider adding the FM-66 to their systems. The FM enthusiast looking for a stand-alone stereo tuner with manual tuning, switchable IF bandwidth, defeatable AFC, and/or multipath detection won’t find them here. The lack of switchable IF bandwidths means the FM-66 will not do as well at picking out closely spaced stations in a crowded FM band as some of the competitively priced tuners that include this feature.

With these caveats in mind, the FM-66 can be recommended for its sensitivity and hash-free signal. It produced a very smooth, clean FM stereo signal during the CCFMB test, and the bypass revealed none of the colorations and roll-off at frequency extremes found in the Quad FM-4. It also delivered a very musical, involving signal from local classical-music FM stations. Those interested in FM stereo tuners in the $1000 price range should audition the Quad FM-66, along with the new Audiolab Model 8000, the Magnum Dynalab Etude, and the Meridian 404. $  

_Forsell (continued from p.87)_  
stakes. Images took on a 3-D solidity that made me think I could walk around the performers in the soundfield, like when I put on that slicky Sade (Promise, CBS Portrait FR 40236). While Kathlen wasn’t looking, I thought about making a grab for the singer’s naughty bits. I could feel her body heat! Or was that the amps?

Because the ‘table is adjustable and you can give it practically any sound you like, I haven’t rounded up the usual suspects throughout most of this review to write the customary litany of musical examples illustrating its sound. The Forsell’s sound is your sound, depending on how you like it. In any case, I’ve pulled a few scribblings from my listening notes to illustrate the Air Reference/Air Force One transition, which certainly does bear illustration.

The bass was much more tight, deep, tuneful, and detailed. The entire musical foundation became rock-solid, due to the Flywheeled platter thinking it now weighed several thousand pounds. That’s stability, brother, and it came across in the musical presentation. The “Drum Thunder Suite” on Art Blakey’s Moanin’ (Pathé Blue Note BST 84003) rattled the rafters while maintaining total transparency and vividness. This same extraordinary stability in the bass could be heard on Echoes of Enja (German Enja/PolyGram 4000), a compilation that includes the Bennie Wallace Trio doing a fab modern update of Monk’s “Round About Midnight.” Eddie Gomez’s bass was powerful and compelling; when he plucked the strings, it felt resonant and alive. Thoughtful, laid-back, intellectual, brooding, noodling over the basic theme, I got so involved it was hard to believe it was a recording.

Flywheel palp-factor? Kathleen adores ex-opera-singer-turned-demon-rocker Nina Hagen, and I love to put her album Love (CBS UK 460454-1) on the Forsell and play “TV Glotzer (White Punks On Dope).” The Forsell covers with seeming ease this record’s heavy bass line, enormous soundstage, and forward-right-to-deep-left, transparent 3-D imaging—not to mention Nina’s incredible, superhuman vocal range. In the crushing silence that usually follows this cut, I take a minute to vacuum up all the hair that’s fallen out of my guests’ heads, then cue up “My Way.” You’ve absolutely never heard Frank’s signature song until you’ve heard Nina doing it. It’ll blow your mind to track the instantaneous changes in timbre, pitch, and volume; the way her voice emerges clear as a bell from the cacophony of the wild rock mix; and the sense that she’s wildly gyrating right there in front of you as the speakers disappear completely! What a knockout! She’s so cool! BEAVIS AND BUTTHEAD EXPIRE FROM TERMINAL MORNIN G WOOD!

Another palp-factor tidbit: While listening to a 1966 recording of Poulenc’s Piano Concerto and Aubade, with Georges Prêtre (EMI ASD 2306), I perused the latest issue of Stereophile. Suddenly the orchestra came in so far to the right and rear, and with such a startling bang, that I jumped—then had to sit through an adrenal rush that had my heart palpitating.

The midrange blossomed in an almost impossible manner. Great Jazz Artists play Compositions of Cole Porter (Riverside RS 93515) has a super-plush midrange cut—“Get Out of Town,” with Herbie Mann—at the end of side A. Herbie’s bass clarinet sounded so beautiful I felt my neck hair stick straight out. I just didn’t want it to end. The highs were certainly airier and more open than I’d ever heard. I have an old 1965 pressing on UK Decca/London FFR of Vladimir Ashkenazy and Izhak Perlman (they look so young and cute—like a classical Simon and Garfunkel) which contains Franck’s Sonata for Violin and Piano in A. Ahhh, Gawd, the third movement (Recticativo—Fantasia) was unimaginably romantic, rhapsodic, brooding, and heartfelt with the addition of the Flywheel. “Nuance, paging Mistah Nuance!” The ‘table’s enhanced stability enabled the violin tone to bite, caress with sweetness, and soar with aplomb. (Hey—no fruit when soaring! [rimshot]) And the details! But that oh-so-real imaging, the enormous palpability factor, and an overall sense of greater musicality and truth to the music’s intent stick in my mind as the Flywheel’s most astounding effects.

_Belafonte at Carnegie Hall (RCA LSO-6006) tranhusted us before the speakers, his voice so full of warm, tender emotion. His rapturously harmonic rendition of “Cu Cu Ra Cu Cu Paloma” nearly brought us to tears. And the presence! The stage width! We never heard that old war horse “Guantanamera” on The Weavers: Reunion at Carnegie Hall (Analogue Productions APF 005) sound so perfect. After thousands of plays, I keep saying I’m going to quit listening to that dang record, but you can’t beat it for breathtaking imaging. Ellington’s Jazz Party in Stereo (Columbia JCS 8127) had us jumping out of our chairs with the performance’s exuberance at the same time we were admiring the spread of the musicians across and throughout the enormous wide and deep soundstage. My Charlie Byrd collection on early Riverside took on an uncanny spaciousness. Blues Sonata (Riverside RS-9453) was natural, ambient, and tremendously focused. The sound of Keter Betts’s bass was very natural way out to the back and right, while Charlie’s guitar was left; it was a snap to tell that he was using his fingers without a pick.

For the enthusiast, it just doesn’t get any better than this.

MARSHA: I’m afraid after we’re married a while, a beautiful young girl will come along and—you’ll forget all about me.  
WOLF (GROUCHO): Don’t be silly. I’ll write you twice a week.

Happy Forselling!

StereoFile, January 1994
Krell KSA-300S & KRC

TJN listens to Krell’s latest monster stereo power amp & top-of-the-line remote-control preamp

KSA-300S: Solid-state stereo power amplifier. Power rating: 300Wpc into 8 ohms, doubles with each halving of load impedance down to 1 ohm (24.8dBW). Frequency response: 20Hz-20kHz, +0.008dB, -0.46dB. THD: ≤0.01% at 1kHz, <0.3% at 20kHz, full power. Slew rate: 100V/µs. Input sensitivity: 3.5Vrms. Gain: 25.3dB. Damping factor: >120. S/N ratio: ≥100dB. Input impedance: 47k ohms. Power consumption, idle: 130W. Dimensions: 19" W by 8.5" H by 24" D. Weight: 185 lbs (net). Warranty: 5 years. parts & labor. Serial numbers of samples tested: 34-40334 & 34-40346. Price: $8900.


It was a dark and stormy night. A biting, cold wind cut through Sam’s skimpy jacket; ice crystals clung tenaciously to his bushy moustache. As he approached his front door, visions of a toasty-warm, Krell-heated listening room softened the chill. He could feel the glow already; his Krell amp had been on all day, awaiting his return.

As he entered his listening room, Sam recoiled in horror. Psycho-esque strings crashed into the silence of his imagination as the chill of the room hit him. On the floor between the loudspeakers was not his trusty Krell KSA-250, but a new KSA-300S. But how? A belated visit from a practical-joking Santa and eight tiny, but persistent, reindeer? A swap made by a weary fellow who just couldn’t carry the new 300S’s 185 lbs any farther and decided that a 145-lb 250 would be a relief? An unexpected home trial from trusted dealerfriend and part-time Olympic dead-lifter Jim, who only the other day had nearly convinced Sam that he just had to try out this big, new Krell amplifier?

Sam gingerly approached the interloper, its blue pilot light a cold reminder of the drafts he had to navigate as he crossed the room. He felt the heatsinks—hardly even warm. His shivering spirits were briefly calmed by holographic images of cool, summer listening sessions. “But where’s the fun in that?” he blurted.

As our hero has just discovered, owning a Krell amplifier may never be the same. The new KSA-300S reviewed here —along with its companion piece, the KRC preamplifier—is, in at least one respect, a dramatic change from earlier Krells: it no longer doubles as a space-heater. But Krell has not abandoned the concept on which it built its reputation: class-A operation.

KSA-300S

Class-A amplifier operation is extremely inefficient, in terms of both build cost and power consumption. While class-A is often put forward as a sonic touchstone, not all experts agree that the gains are worth the trouble and expense. In class-A operation, the output transistors are conducting at all times, the current through them only dropping to zero at maximum power. This requires large amounts of power dissipation in the amplifier’s heatsinks, even with no input.

The class-A amplifier does, however, operate with the maximum linearity of which it is inherently capable, and little feedback is generally required to achieve acceptable distortion levels. Most audio power amplifiers operate in class-AB, in which each half of the push-pull output stage conducts for slightly more than a half cycle. This allows them to operate in class-A up to some small percentage of their total rated power. Even the Krell KSA-250—Krell’s top, last-generation stereo amplifier—was subject to this limitation. (See J’s footnote to LL’s and RH’s review of the KSA-250 in Vol.14 No.1, pp.179-180 for more on this.) To operate in full-class A up to 250Wpc output at 8 ohms (the KSA-250’s power rating) would require unbelievably large heatsinks. But the earlier Krell amplifiers still operated deeply enough into class-A to run very warm—even hot—at idle. When, just before the model was discontinued, Stereophile’s early KSA-250 was exchanged early in 1993 for the most recent version, the new sample ran decidedly hotter than the old—an indication that it was biased more deeply into class-A than the earlier sample—the one we measured for our ‘91 review.

When they designed their new Audio Standard monoblock amplifier, Krell realized that a new approach was needed to maintain class-A performance while at the same time increasing efficiency. The so-called sliding bias design—in which the bias fluctuates rapidly up and down in response to the input’s requirements—has been available for a number of years. Krell rejected this approach in favor of a related, though unique and perhaps more elegant, concept, which they have dubbed Sustained Plateau Bias. Following its successful implementation in the $32,500/pair Audio Standard amplifier, the technology has been incorporated into Krell’s new “standard line.”

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S-Series amplifiers. Each of these, the KSA-300S included, is designed with five bias “plateaus.” Circuitry within the amplifier analyzes the input signal and selects an appropriate bias level to keep the amplifier operating in class-A.

The most obvious question here is: How is the amplifier able to respond fast enough to keep it from being “fooled” by the input into setting too low a bias and thereby dropping into class-B? According to Krell, the bias is set by what they call an “Anticipator” circuit, whose fast (1800V/μs) slew-rate is said to be at least ten times faster than the maximum slew-rate of any musical signal being handled by the output stage. By the time the output voltage has risen, therefore, the bias has already been increased to the appropriate level.

While an upward jump to a higher bias plateau can occur at any time the input demands, a drop to a lower level does not occur immediately upon a drop in demand; plateaus are sustained, by predetermined time constants, long enough to ensure that the drop is likely to be prolonged. While a restoration of higher demand will “reset the clock” and maintain the present (or higher) bias, there are bound to be instances—given music’s unpredictable nature—in which the bias is dropping just as a new musical transient is coming along. In this case, it would appear that the fast slew-rate of the amplifier will again come into play, reversing the drop and reestablishing the higher bias. Krell’s promotional literature states that “downward changes are made only when the next lowest bias level would accommodate the input for approximately 20–30 seconds”—this would clearly be “anticipation” more worthy of a psychic than an electronic circuit. The KSA-300S’s owner’s manual states—more reasonably, I think—that the plateaus are held for 15–20 seconds unless continuing demand requires otherwise.

In any event, the new design topology makes the KSA-300S a cool operator except when called on to deliver high power, and its heatsinking is more than up to the latter. If, however, under high demand its heatsinks reach a temperature of 80°C, the top two bias levels are disabled until the heatsink temperature drops. In this case, the amplifier will still put out its rated power, but in class-AB, not class-A—with the bias rising no higher than the second plateau. Indicator lights on the front panel show both power-on (in blue) and plateau levels for each channel (the plateau changes are performed independently for both). According to the owner’s manual, the first bias level indicates approximately 25% of rated power, the second 50%, the third 75%, and the fourth 100% (or 300W into 8 ohms). Krell must have changed this subsequent to the manual’s printing, however, as our measurements showed that the bias—plateau changes occurred at significantly lower levels (see “Measurements: KSA-300S”). In fact, the top bias level never came on in any of my auditioning, and the third level was triggered only occasionally.

A remote control is provided to either shut down the entire amplifier or shut off the dancing plateau lights for those bothered by them. (The blue power-on light cannot be shut off without powering-down the amplifier.) While this simple, two-button remote seems superfluous, the ability to check the plateau indicators, then shut them off again, might be useful.

The other aspects of the KSA-300S’s design are more conventional, though by no means conventionally executed. The amplifier is direct-coupled; there are no capacitors in the signal path. Instead, electronic servos are used to eliminate unwanted DC. The circuit is fully complementary from input to output. Front-end driver circuits are high-bias, true class-A. First-rate materials are used throughout, from the anodized and hard-coated (a process said to be much harder than simple anodizing) front panel to the four-layer printed circuit boards.

But exotic, expensive parts are not used where, according to Krell, they wouldn’t have real benefits. Protection circuitry is provided for DC, short circuits, oscillation, AC power problems, high ground resistance, or out-of-phase ground. There are no fuses—only a single rear-panel circuit breaker.

Both balanced and unbalanced inputs are provided, and two pairs of output terminals are furnished to facilitate bi-wiring. The latter are superior-quality, gold-plated custom units optimized for spade lugs (they do not take banana plugs). They are also designed with a hex-head and may thus be easily tightened with a nut-driver—unlike some of the otherwise excellent custom output connectors we have seen which omit this feature and therefore can only be hand-tightened. (A nut-driver is not a torque-wrench, and should be used only to ensure a secure connection, not a permanent one.)

But the KSA-300S’s power supply is its most awe-inspiring feature. The 5kVA transformer occupies a huge portion of the amplifier’s interior (and a large portion of its weight). The filter capacitance is 272,000μF (more than a quarter of a farad). Heavy bus bars connect much of the critical power supply and output circuitry. The supply is fully regulated. The net result is an amplifier rated to deliver power into loads down to 1 Ω, with a power supply so prodigious that the output is specified to continue to double for each halving of the load impedance below 8 Ωs (300Wpc into 8 ohms, 2400Wpc into 1 Ω).

One might easily argue that the KSA-300S’s design is engineering overkill. Do you really need, for example, its race-car–like performance into low impedance loads? Or a backbreaking weight that requires two strong people to move it? Clearly, not all loads are difficult loads, and not all listening situations require enormous power reserves. Poten-

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1 Listening to the excellent sound of Apogee Divas being driven by the similar but lower-rated (200Wpc) KSA-205 at Hudson’s Audio in Albuquerque, 1 did note that four of the bias levels were being exercised at loud but not unreasonable sound levels. —JA
tial buyers of an expensive, bulletproof amplifier such as the KSA-300S should remain conscious of what they’re buying and approach such a purchase with their eyes open. But the KSA-300S is an amplifier which is unlikely to be taxed by any conceivable load, now or in the future.

KRC PREAMPLIFIER

Compared to the KSA-300S, the KRC preamp’s design is, at first glance, almost conventional. But its thoroughly high-end internal design has been equally well thought-out and executed. Its main, four-layer, glass-epoxy circuit board is

For the audio signal, DC power, and ground—two layers for the latter are said to minimize noise. The gain stages are pure class-A and complementary. As in the amplifier, the circuit is direct-coupled, with servo circuits controlling the DC offset. The fully regulated power supply is housed in an external chassis. Seven inputs are provided: four single-ended, two balanced, and one single-ended tape. All inputs are line-level except for the optional, single-ended phono stage. (This review will address the line stages; a Follow-Up next month will discuss the phono stage’s operation.) There are three outputs: balanced and single-ended main outputs, and a single-ended tape output.

The KRC is set apart from previous Krell preamps by its remote-control capability. Level, balance, mute, input selection, tape-monitor selection, absolute phase, and gain (the LED-illuminated high position provides an additional 6dB of amplification) are all accessible either from the front panel or from the hefty remote control. The latter also duplicates the bias-level meter on/off controls found on the Krell S-Series power amplifier remotes.3 The balance “control” provides up to 4dB of attenuation in 1dB steps, or off, for either channel. The volume is controlled via a custom-designed, motor-driven, continuously variable potentiometer. When the volume is operated via the remote, a red LED on the control knob illuminates, so

Why a Preamp?

In high fidelity’s early days, preamplifiers were often separated from what we now call power amplifiers for very practical reasons: to avoid the heat and transformer-generated hum of the tube amplifiers then in universal use. This was especially prevalent in high-power designs—those days, anything over 30W (mono, of course). The heat reduced the longevity of not only the preamp stages, but of the power amplifier itself, though the latter’s gradual deterioration was unavoidable. The hum problem was even more pressing, especially in phono stages. Up until just recently, remember, for most listeners the phono stage—which is very sensitive to induced hum—was the input most frequently used for critical listening.

Smaller integrated amplifiers continued to dominate the affordable end of the market, later to be largely superseded by the receiver, especially after the advent of FM stereo and the transistor. But the separate preamp soon took over the High End—though no one called it the High End in those innocent times. Putting the preamplifier circuitry in a separate chassis—first powered most often by the power amp via an umbilical, later by its own internal dedicated power supply, permitting more universal use—eliminated both the heat and hum problems, at least as much as they may have been caused by proximity to the power amp. The preamplifier thus became a fixture in the highest-end equipment, an arrangement which continues to this day.

While the preamp persists as much from custom as from practicality, there is still a method in this madness. While it is certainly possible today to assemble a system without a preamp, there is still a need for one in many, if not most, applications. Ignoring for now the question of integrated amplifiers and receivers, which combine in a single chassis a preamp, power amp, and, in the case of the receiver, a tuner (a more practical arrangement with today’s solid-state circuits than with yesterday’s tubes), the justification for a separate preamp is today based on issues of gain and impedance incompatibility.

No one will argue that passive attenuation and switching avoids the perhaps unnecessary complication of a preamp with gains. The simpler the better, the philosophy goes. Devices for performing this function, known as passive attenuators, or the more appropriately descriptive but nonsensical “passive preamps,” have carved out a small niche in the marketplace. But they are not appropriate in all applications. There is no widely adhered-to standard for line-level output voltage or line-level input sensitivity. While many line sources—CD players especially—will easily drive many power amplifiers to their maximum outputs, there are situations in which you won’t quite be able to get the level you desire from the system.

* 1 Cynics have said that this simply cuts the sales pie into more pieces, and perhaps even bakes a bigger pie. But that’s another article.

* 2 A can of worms for thought. Does the combined 350-lb weight of the KSA-300S and the KSA-250, side by side between the loudspeakers on the suspended floor of Stereophile’s listening room, have any effect on the system’s sound by damping loudspeaker-induced floor vibrations? Methinks it does.

* 3 The owner’s manual cautions against turning the amplifier on or off with music playing—easy to do inadvertently with the remote switches. However, Krell advises that they have always had such a caution, and that the likelihood of damage from this action is, ah, remote.
the setting can be seen from across the room.

The KRC also provides an unusual degree of input and output protection. Faults are sensed, disabling the offending input or output until the problem is cleared. Problems are indicated by means of flashing input LEDs (for input faults) or a flashing blue pilot-light LED (for output faults).

Interestingly, the KRC (and its outboard power supply) is now the "hot" performer, running not alarmingly hot, but definitely more than warm—even in idle.

**Sound: KSA-300S**

"Get a grip," said Sam as he peered more closely at the KSA-300S's strange yet familiar visage. As he put aside thoughts of those dark-side forces that must have replaced his space-heating KSA-250 with this cooler, yet oddly seductive, new presence, he turned to the rest of his eclectic yet clearly high-end system: the Wilson WATTs/Puppies, the Rowland Con-solvate preamplifier, the CEC TL 1 transport, and the Levinson No.35 D/A processor.

"You should have waited," Jim had bellowed as he walked into his stock room with a newly arrived Krell Audio Standard monoblock amplifier under each arm. Jim, Krell dealer and pundit, had chided Sam for selecting the Levinson. "We've got the new Krell processors coming in next week." But Sam's system was working great. What would the new Krell amplifier do for it—or to it?

My reference system began like the one described above. In addition, Kimber AGDL digital cable linked transport and processor, TARA Labs Master RSC (unbalanced) linked processor and preamp, Cardas Hexlink (balanced) connected preamp and power amp, and TARA Labs RSC loudspeaker cable ran between amp and speakers.

There was no question, even from the opening bars of the first musical selection I played, that finding fault with the KSA-300S would be an uphill battle. Its reproduction was graceless and three-dimensional, without a hint of stridency, dryness, or identifiable coloration. Its soundstage was focused and tactile, with a neutral—neither forward nor recessed—perspective and, when the recording allowed, a full, spacious ambience. Its top end was silky and liquid, sounding sweeter than previous Krell amplifiers of my acquaintance, yet in no way lacked for detail. Nothing was veiled or obscured: voice, in particular, popped out of the sonic fabric in a manner that sounded natural, unforced, and alive, without a

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I have encountered this with two different "passive" preamps. A preamp with at least a moderate amount of gain will solve this problem, assuming that the amps and loudspeakers are up to the user's demands.

Impedance compatibility is the relationship between the output impedance of the source and the input impedance of the amplifier it is driving. This more complex problem is not unrelated to the gain dilemma described above. It is generally not desirable for the two impedances to be identical, though such a matching might be intuitively appropriate. In fact, if the output impedance of the source is too close in value to the input impedance of the amplifier it is driving, demands may be made on the source for more current than it was designed to deliver, with a resulting increase in distortion.

There will also be a decrease in effective gain as the voltage-divider effect takes place and more of the available source voltage is wasted across the source or output impedance instead of across the input of the power amp, where it is needed. (The situation is actually even more complicated than this; increased current demands may cause the source voltage output to sag.) The system may also become more sensitive to the cable used to connect the source and amp in this situation. An input impedance ten times that of the output impedance of the preceding component is commonly considered a reasonable figure to aim for. Though this is not universally accepted, it will generally minimize such impedance interactions.

The impedances of many, perhaps most, of today's sources do match up reasonably well with those of most modern amplifiers. But not all.

If this isn't enough to be concerned with, the varying resistance of the system's level control, whether incorporated in the source or in a passive attenuator (you'll need some way of setting gain), also enters the picture. This level control may be buffered, as in the variable outputs of some CD players and such devices as CG's buffered passive preamp, but in truly "passive" preamps it is not. In addition to gain, an active preamp generally provides a consistent, and low, output impedance independent of the level control setting, relieving these concerns. (In the real world, of course, not all preamps are equally successful at all of these tasks.)

It simply isn't possible to completely ignore, as I was asked to do for the sake of this discussion, such convenience functions as switching. If you have more than one input, you do require switching of some sort—unless you actually enjoy plugging and unplugging inputs. And for those audiophiles who still value vinyl, how can I ignore the LP preamplification stage, which is still most conveniently incorporated into a "preamp"? The switching, of course, can be done by a "passive" preamp, with the above concerns still applicable.

But a phono stage requires a more active approach. Here is yet another example of the division of functions. The rise of CD has forced many preamp manufacturers to delete phono stages and, in many cases, market the latter as separate components to those who require them.

Again, in the right system, you may be able to get along without a "preamp." If you have the gain and some means of controlling it, know that your impedances are compatible, and don't mind the potential inconvenience (in a situation where no switching is provided), this system will not be compromised by the lack of a preamp. It may even be the better for it. But most audiophiles still desire a preamp which gives them flexibility and predictable system interactions.

—Thomas J. Norton
hint of edge or bite. And the 300S’s bottom end was powerful and full-bodied—not super-taut. But this limitation seemed more a function of the room and loudspeaker than of the amplifier. There was certainly nothing lean or mean about the sound.

Christmas Time with the Judds (MCA MCAD-6422-2-R) has some of the cleanest, most lucidly recorded upper octaves around. While impressions of a slightly reticent extreme top continued, nothing really seemed to be missing from the 300S’s treble reproduction on this recording. Again, nothing was obvious or overdone, but fine details—the delicate touch of fingers on guitar strings, the gossamer-smooth sibilants, the slightly breathy quality of the children’s chorus backing the Judds on a number of cuts—left no doubt as to the Krell’s capabilities. I couldn’t have hoped for a cleaner, more subtly shaded performance. On the other hand, the Krell’s clean coherence—it’s complete refusal to slice and dice the sound—benefited more pristine recordings as well.

Willie Nelson’s City of New Orleans (Columbia CK 39145) is a classic example of a good bad recording. It’s totally unnatural, with Willie’s voice awash in artificial reverberation, little bottom-end weight, and more than a trace of lower-treble edge. Although I suspect this album will be unlistenable on many systems, it has certain strange attractions—not the least of which is its almost spookily focused vocal track floating eerily between the loudspeakers. The Krell captures this quality with eerie precision. And its slightly forgiving top end makes the recording more than listenable. Of course, no amp I know of (including the Krell) can be expected to salvage truly bad bad recordings. Accuracy demands that the good, the bad, and the merely ugly be distinguishable.

The Jurassic Park soundtrack (MCA MCAD-10859) belongs in the “good recording” category. It falls shy of excellence, but I’ve been using it a lot lately because of its exceptional bottom end and well-developed, atmospheric soundstaging. The Krell, despite its apparently forgiving nature, didn’t conceal this recording’s slightly fizzy top end. But it left nothing to be desired—within the extension limits of the Wilson WAT’s/Puppies—in its deep, solid bottom end. Nor did it do anything to conceal the topflight soundstaging performance of the Wilsons (and the recording).

Everything came together with the KSA-300S in the reproduction of “On the Boardwalk” from Rickie Lee Jones’s Girl At Her Volcano (Japanese Warner Bros. CD WPCR-37710). The 300S’s superbly smooth yet detailed high end was tied to a punchy bottom end and stunning dynamic range. But I came nowhere near to using the Krell’s maximum power output. While peeling myself off the listening room’s back wall, I noted that only the second-level plateau indicator lights on the front panel had illuminated—indictive of, at best, half power output.

I could tell something special was happening in my system, but the KSA-300S must be compared with its peers to really tell the whole story. Fortunately, a late-production KSA-250—Krell’s predecessor to the KSA-300S as their top-of-the-line stereo power amplifier—was available. Indeed, the KSA-250 is the amplifier I’ve used most frequently over the past several months—I know its sound pretty well. Though out of production, the 250 remains a formidable performer, and, given the current state of amplifier design, I would not expect any new amplifier to better it by a dramatic margin. But though it held its own against the new KSA-300S in a closely matched comparison (at equalized levels), the new amplifier was the winner in all respects save one. The 300S is richer and more full-bodied through mid- to upper bass, less laid-back and more timbrally right. The older amp is leaner and less palpably real—even slightly threadbare—in comparison.

Initially, however, the KSA-250’s leaner sound gave an impression of a bit more openness and spaciousness; a leaner tonal quality will often produce this effect. (This is one reason why producing a good, big loudspeaker with extended bass and a clean, open top is such a delicate balancing act; the same is true, though generally to a far lesser degree, of electronics.) On vocals, the 300S’s fuller sound clearly won out; the performers simply sounded more human, more touchable, less electronic. Voices on the 250 were breathier, more sibilant, less fleshed-out. A slight fuzziness in the top of the 250’s audible range simply was not a factor with the 300S. The latter was simply at ease with everything—a powerful presence, yet at the same time subtle, refined, and self-effacing.

Again, Rickie Lee Jones’s “On the Boardwalk” clearly displayed the differences between the two amplifiers. As the music began, quietly and slowly, the 250 initially appeared airier and more open. As it progressed, the 300S’s smoother, more grain-free sound took over, the 250 now seeming a bit lean and etched in comparison. The 300S had more punch and weight, especially through the mid-bass, and a more fluid, coherent sound overall. Both amplifiers impressed equally in the deep bass. The 250’s relative leaniness gave it a more superficially open quality, but at the cost of richness and a fully developed sense of weight and drive. The KSA-250 is still a very fine unit. But it has more than met its match in the 300S.

**Sound: Krell**

Sam was about to change to another recording when he was interrupted by the doorbell. He froze in his tracks.

“It’s him,” he moaned. “The party’s over.”

Forcing himself to answer it, Sam confronted Krell-man Jim as he swung open the front door.

“Well, how’s she working out?” Jim asked.

“What?” Sam responded. “Oh, you mean the new amp. I might’ve known it was you.”

For the moment, Sam ignored his curiosity as to how Jim had gotten into his house earlier.

“It’s unbelievable.”

“Thought so. I brought along a little something else.”

Jim waved a new Krell KRC preamp in Sam’s face, nothing if not eager to snag a potential buyer. Sam had heard of Midnight Madness sales, but this was ridiculous. Grabbing the new preamp and making a beeline for the equipment rack, he didn’t see Jim flashing his victory grin.

After getting a good handle on the performance of the KSA-300S in my reference system, I now moved the KRC into the preamp position. I used the low gain setting for all my listening—it proved more than adequate to the task at hand, in balanced or unbalanced mode. The balanced outputs were used, however, unless otherwise noted.

**Striking. That’s the only way I can describe the combined performance of the KRC and KSA-300S. Listening to Mokave, Volume 2 (AudioQuest AQ-CD1007), I noted immediately that it had never sounded better in my system, with an outstanding combination of instrumental weight and body combined with clarity and openness. The timbral weight of instruments was fully developed, without lapsing into heaviness. The bowed double bass, in particular, had a realistically gutsy quality, combined with an airy, rosin sheen. The top end was pristine clean and detailed yet grainy.**

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4 Egad! I seem to have gone Country here. However, I own exactly four recordings on CD (out of 700+) by Country performers. I’ve just named two of them, each of which is very useful for listening evaluations, although for very different reasons.

5 Soundtrack recordings are, in general, artificial constructs. Yet when produced with care and intelligence, they can be very effective. JP’s music-scoring mixer was Shawn Murphy, whom I have mentioned previously. His name on any sound credit’s list is a solid assurance of an intelligent music mix, frequently distinguishable by an effective use of depth and space.
less, sounding in no way etched or electronic. *Christmas Time with the Judds* was delicate, open, airy, and in some ways a new experience: to rip off Gertrude Stein (by way of Sam Tellig), there was more “there” there. I was troubled by neither brightness nor excessive warmth. Particularly impressive was the way I could follow the backup vocal line better than ever. Focus was particularly fine throughout.

The reproduction was perhaps a bit more analytical than with the Rowland preamp in the system. There was an improvement in overall precision, but with a sacrifice in “bloom.” Certainly the sound here would not be mistaken for classic tube sound. But I don’t think that’s bad. There was no superfluous warmth or richness, but neither was the sound hard, edgy, electronic, or cold in any way. It was fast, airy, and transparent, images properly sized within a soundstage that was tight, wide, and deep.

I referred above to the KRC’s reproduction as “gutsy,” a word which cropped up more than once in my listening notes. “Gutsy,” the antithesis of “muddy,” implies a natural resonance which belies the muddle plaguing far too many components’ midbass–through-lower-midrange region. The Flying Bulgarian Klezmer Band (Dorian Discovery DIS-80106) is a superb recording and a lot of fun. Here, again, the Krell combination reproduced the gutsy, even lusty quality of cooing double bass and blaring alto horn. All this with a natural edge—a difficult feat. Surprisingly, on this and other recordings, there was less of what I’d always considered to be excess room (and loudspeaker) warmth than I have ever noted before. While no conventional electronics can cure room modes (DSP is another story—complex, controversial, and still very much in its infancy), clearly something right was happening. While the recording itself gets a bit congested on peaks, the sound here was otherwise beautifully transparent, the solo instruments and voice lively (in the positive sense) and involving.

When I brought the Rowland Component back into the mix for a direct comparison, my initial impressions were confirmed. The Rowland sounded more soft and sweet. The KRC’s viselike grip was replaced by a more relaxed, rounded presentation. It had its own charms, to be sure—sweet without ever being quite tubey, laid-back without soundings recessed. This seems to be typical of Rowland—it certainly was characteristic of their Model 1 amplifier which capitivated me a few years back. But the Krell KRC had a tighter, more detailed, dynamic, and—that word again—*gutsy* sound. This was not an easy conclusion to reach—I own the Component—but the KRC lifted another veil from the sound.

The slight softness I noted in my earlier evaluation of the KSA-300S power amplifier was, apparently, not inherent in the amplifier itself. It largely disappeared when the 300S was paired with the KRC, replaced not by any degree of hardness or brightness, but simply by a more alive, open quality. To be fair to the Component (it remains a superb preamp, and I intend to continue using it in situations in which precise, repeatable control of listening level is required), it was not able to benefit here from the undeniable synergy which exists between the new Krell KSA-300S and the KRC.

**Further Thoughts**

To get another perspective on the sound of the KRC and the KSA-300S together, I auditioned both products in another system, this one consisting of Apogee Stages at the pointy end and a Krell Reference 64 D/A processor and DT-10 transport at the source. This was in my new listening room, which has nearly twice the volume of Stereophile’s. (I’ll have more to say about this room, in which I will now do most of my critical listening, in a later issue.)

The sound here was also superb, though certainly displaying a different set of strengths and weaknesses due largely to the change in room and loudspeakers. It was a big sound, less intimate but more open and expansive than that in the smaller room. The KRC and KSA-300S used here were different samples from those discussed above, but despite all the system and room differences, nothing in the sound persuaded me to change my opinions of the Krell amplification. Somehow I had never quite been comfortable with the KSA-250 driving the Stages, though the results were certainly more than acceptable. The KSA-300S with the Stages, however, was a different, and more pleasing, proposition altogether.

Nearly all of my listening to this point was done with an unbalanced input to the KRC and a balanced output. To get a feeling for the sound of the KRC/KSA-300S with balanced vs unbalanced connections, I briefly compared both modes. This time, to do a straight, fully balanced vs fully unbalanced comparison, I rounded up matched sets of interconnects of both types. Well, *almost* matched. I had two pairs of long Cardas Hexlink interconnects—20′ unbalanced and 25′ balanced—for the preamp–to–power amp link. Also available were two sets of Music Metre silver interconnects, both 1.5m—one balanced, one not—to connect processor and preamp. The only difference, then, was the extra 5′ of Cardas balanced.

I found that I marginally preferred the balanced connection; its sound was a shade more full-bodied and dimensional. The unbalanced mode was a bit washed-out in comparison. But these differences hardly made my jaw drop. I’ve never been a big fan of balanced connections—they’ve never made an irresistible difference in the sound, and they do make life difficult for the reviewer who’s forever mixing and matching things. But in this case I did find some sonic benefit in their use, and no down-side other than the cost of new cables.7

**Measurements: KSA-300S**

Following the 1/6-power, one-hour preconditioning test, the KSA-300S’s heatsinks were hot, though not too hot to touch. Interestingly, though it was driving only 100W into 8 ohms during this test, the bias level 3 lights came on. This was somewhat surprising, since the owner’s manual indicates approximately 75% rated power for this bias level (225W into 8 ohms). Checking the precise point at which the bias-level lights illuminated, I obtained approximately 100mW for level 1 (113mW left, 97mW right), 17W for level 2, 84W for level 3, and 253W for level 4. (There were some interchannel differences, but these were only worth noting at level 1.) This is considerably different from the levels referenced in the owner’s manual. Practically speaking, it means that, into a hypothetically ideal 8 ohm load, the second bias level, for example, will operate from 17W to 84W, the third from 84W to 254W, and the fourth above 254W.

The KSA-300S’s input impedance measured 47k ohms unbalanced, and just under 91k ohms balanced. The amplifier’s output impedance measured 0.13–0.14 ohms at 1kHz, 20Hz, and 20kHz. Voltage gain into 8 ohms measured

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6 Klezmer is traditional Yiddish dancefolk/party music that will probably be recognized by most readers, even if they can’t recall exactly where or when they heard it. Here it’s re-created by six instrumentalists plus a solo vocalist. How can you resist numbers like “Araber Tanz,” “Fischelke in Vassar,” and “Der Yudlisher Soldat in Die Trenches”? Well, maybe you can.

7 There’ll probably be a noise of silver-stranded Litz wire waiting for me at the next CES for saying this, but most balanced and unbalanced high-end cables are of the same construction except for the terminations. If you already own a set of unbalanced cables you’re happy with, I see no reason why you couldn’t get them re-terminated by the manufacturer for balanced use. Don’t expect this to be free, but it’ll probably cost a lot less than a new set of cables.
25.6dB. DC offset, though fluctuating slowly with time, was a maximum of about 3.5mV (L) and 1.9mV (R). Signal/noise (unweighted ref. 1W into 8 ohms) measured 95.8dB in the balanced mode. The KSA-300S is noninverting, unbalanced; balanced, pin 2 is configured as the positive leg, pin 3 the negative.

Fig. 1 shows the frequency response of the 300S driven from its balanced inputs at 1W into 8 ohms. The response into 4 ohms, and from the unbalanced inputs, is not shown, but was virtually the same. The waveform of a 10kHz squarewave in the balanced mode (fig.2) shows only a small rounding of the leading edge. The 1kHz squarewave (not shown) was virtually textbook-perfect.

The crosstalk shown in fig.3 indicates nearly identical performance in either balanced or unbalanced configurations. The balanced right-to-left crosstalk is marginally better across most of the range than any of the other readings, and the unbalanced crosstalk trace rises at the second harmonic of the power-line frequency, indicating the presence of very-low-level 120Hz hum. But in general, either mode offers very good separation.

The THD + noise vs frequency for the balanced mode—the unbalanced mode, not shown, is a virtual overlay of these graphs—is plotted in fig.4. While the results are not exceptionally low, and rise at high frequencies (fairly common), low frequencies (less common with solid-state amplifiers), and lower impedances, they are nonetheless good, and consistent with a high-end amplifier designed for more than just eye-popping test-bench performance.

The 1kHz distortion waveform (2W into 4 ohms) in fig.5 shows a large second-harmonic component combined with some higher-order harmonics and noise. These higher-order harmonics are increasingly evident to 2 ohms (at 4W), resulting in an increasingly triangular waveform (fig.6). The largely second-order nature of the distortion, however, remains.

The KSA-300S’s output spectrum, driving a 50Hz tone at 400W into 4 ohms (% rated power at that load) is shown in fig.7. While not as low as in some amplifiers measured recently, the distortion components here are still all at or below 0.1% (-60dB). At this high level, the third harmonic has risen to the same level as the second. Fig.8 shows the output spectrum of a combined 19 + 20kHz signal—the intermodulation products resulting from an input signal consisting of an equal combination of these two frequencies—at 331W into 4 ohms. The largest artifacts here are at 18kHz and 21kHz (-55dB, or 0.17%), with the next largest at 1kHz (-59.6dB, or just over 0.1%). The 19+20kHz artifacts at 170W into 8 ohms (not shown) were very similar but just slightly lower. In both cases, the specified output power was the power just prior to visible waveform clipping with this signal.

Fig.1 Krell KSA-300S, balanced mode, frequency response at 1W into 8 ohms (right channel dashed, 0.5dB/vertical div.).

Fig.2 Krell KSA-300S, 10kHz squarewave at 1W into 8 ohms.

Fig.3 Krell KSA-300S, crosstalk (from top to bottom at 50kHz): R-L, balanced (bottom at 1kHz); L-R balanced; R-L, unbalanced (top). 100-400Hz; L-R unbalanced (10dB/vertical div.).

Fig.4 Krell KSA-300S, THD-noise vs frequency at (from top to bottom): 4W into 2 ohms, 2W into 4 ohms, and 1W into 8 ohms (right channel dashed).

Fig.5 Krell KSA-300S, 1kHz waveform at 2W into 4 ohms (top); distortion and noise waveform with fundamental notched out (bottom).

Fig.6 Krell KSA-300S, 1kHz waveform at 4W into 2 ohms (top); distortion and noise waveform with fundamental notched out (bottom).

Fig.7 Krell KSA-300S, spectrum of 50Hz sinewave, DC-1kHz, at 400W into 4 ohms (linear frequency scale). Note that the second and third harmonics, at 100Hz and 150Hz, are the highest in level, 60dB below the level of the 50Hz fundamental (0.1%).

Fig.8 Krell KSA-300S, HF intermodulation spectrum, DC-22kHz, 19x20kHz at 331W into 4 ohms (linear frequency scale).

Fig.9 Krell KSA-300S, distortion vs output power into (from bottom to top): 8 ohms, 4 ohms, and 2 ohms.

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The 1kHz, THD+noise vs level curves for the KSA-300S are shown in fig.9. These plots are a little unusual in that the distortion rises to a moderate value somewhere below 10W, then remains at that value until reaching the knee of the curve, just prior to clipping. The KSA-300S’s discrete clipping levels (at 1% THD+noise) are shown in Table 1.

The slightly low line voltage may explain the marginally lower-than-spec power output into a 2 ohm load, as well as the slightly higher-than-spec THD+noise at rated power visible in fig.9. We do not use Variacs or other devices to control the line voltage in our bench tests, preferring to let the equipment operate from the line in the way it routinely will in normal use.

These are very fine bench-test results. While not the absolute best we have ever measured, there is nothing here which would compromise the KSA-300S’s audible performance in any way.

**Measurements: KRC**

The KRC’s balanced output impedance at its line outputs measured just over 3 ohms (just over 2 ohms unbalanced). Its (line) input impedance measured just over 104k ohms (L) and just under 100k ohms (R), balanced, and just under 47k ohms unbalanced. The output impedance at the tape output was just under 45 ohms, regardless of the source impedance, indicating a buffered tape output.

The DC offset at the KRC’s outputs measured under 0.3mV either channel, balanced or unbalanced. The preamp was noninverting from its inputs to its main outputs, and in the balanced mode, pin 2 is positive, pin 3 negative. Line-stage gain (aux input to line output) measured 11.2dB balanced and 5.2dB unbalanced at the low gain setting, 11dB unbalanced and 17dB balanced at the high gain setting.

The KRC’s flat balanced-mode frequency response is shown in fig.10. Both high- and low-gain responses are shown; there is little difference between them. The unbalanced frequency response (not shown) is virtually identical. Volume-control tracking is very good, with a maximum channel difference of 0.4dB (at the 12:00 setting).

**Conclusions**

Sam knew he was in trouble as he watched Jim disappear down the front walk, stuffing a down-payment check into his pocket. How would he explain this to Mary when she returned from visiting her mother? Oh, well, maybe she wouldn’t notice the change.

That new amplifier does look a bit like the old one, though its black, front-panel trim pieces and less-art-deco-ish heatsinks sort of give it away. But how will he explain the less-toasty listening room? A mod, that’s it! He’d had the old amp modified! Explaining the preamp would be more of a challenge...

My Curmudgeon Club membership has taken a real beating during this review. I should say something negative. Okay, the amplifier is too heavy to be practical. Forget rearranging your system without help. And the front “handles” on the amp, though stylish, have uncomfortably sharp edges. Tube-o-philics will still be hard sells. It’s too expensive for most of the rest of us. In normal-sized rooms with normal-sensitivity loudspeakers, those of us with normal-sized listening-level tastes will rarely or never use its full power (or, for that matter, its extreme low-impedance drive capabilities). The less expensive and less powerful KSA-200S or 100S, which use the same technology (but which we have not yet auditioned) might better fit our needs and budgets.

As for the preamp, tubiacs will still be tough to convince. You can’t see its level-control-knob indicator LED from angles well off center. And I do miss a numerical readout of the level setting à la Rowland’s Consummate. On the other hand, a super–high-end Krell preamp with just such a capability is said to be in the works. But it will be muy mucho mas expensivo, and its availability is still a good ways down the road.

This review will not please those readers who complain that we review too much expensive stuff. (An equal number seem to complain that we review too much inexpensive stuff.) This Krell tandem costs more than I care to think about, and certainly there’s plenty of solid-performing, less-budget-busting equipment out there capable of giving a great deal of pleasure. I am as bothered as any reader by the perceived growth in prices at the high end—the growth heavily fueled by demand for such products in certain overseas markets.

But what can I say? Costly or not, there’s no denying the bottom line: These Krells are the best-sounding preamplifier and power amplifier I have heard in my system.
Pure Tube = Pure Music?

Jack English auditions the MFA MC Reference preamplifier

MFA was founded by Bruce Moore and Scott Frankland, neither of whom is still with the company. Moore has gone on to form his own company, Bruce Moore Audio Design, which manufactures a line of tube electronics, while Frankland has formed Wavesheet Kinetics and is currently offering the $22,000 V-8 8 tube power amplifier whose looks match its name. Though both Moore and Frankland were major contributors to the design of the MC (Moving Coil) Reference, responsibility for the final design belongs to former pipe-organ builder John Nunes, who has become MFA's primary circuit designer and "sonic tuner." Arn Roatcap was the chief mechanical designer, and significant contributions were made by John Curl of Vendetta Research and Paradiso fame.

My fear was that there might have been too many chefs, too many changes, too many conflicting priorities, and too long a gestation period for the MC to be a success. Fortunately for MFA, company president Peter Evans managed to hold everything together throughout this state of flux. An ardent audiophile, Evans's desire for a tubed phono preamp to assault the state of the art in this digital age became the driving force necessary to see the project to completion. That the MC Reference is now a viable commercial reality is to his credit.

Description

Surprisingly, the MC is not a true dual-monaural design, as became immediately apparent when I unpacked the 56-lb preamp. The power supply uses a single Gold Aero CV378 rectifier tube. The power supply has extensive filament regulation, truly slow turn-on circuitry (four minutes), eight independent MOSFET buffers, and an operate/standby mode with LED status indicators. The power supply alone weighs 27 lbs, a large part of this weight being the shielded and potted toroidal transformer. A massive polarized umbilical cable connects the power supply to the audio unit.

Further indications of the attention which has been paid to this design are evident in the audio section's tube complement: six Sovtek 6922s (the industrial version of the 6DJ8) and two Golden Dragon 12AX7s. Tubes have been carefully selected from various suppliers to optimize the performance of the preamp. The "virtually dual-monaural" printed circuit board is suspended and damped within the 20-lb audio chassis.

One of the more fascinating elements of the MC is its looks. Instead of a simple power-status LED, an orange-backlit MFA logo is proudly placed on the black-anodized faceplate of the audio unit. When the preamp is in standby, the logo is dimmed. If the unit is in warm-up or user-selected mute mode, the logo pulses. I found these useful displays to be a pleasant alternative to the ubiquitous on/off red LED.

The perforated tops of the power supply and audio units look like metal cheesecloth, and provided all of the benefits of plexiglass with none of the drawbacks. Coupled with the large Mod Squad feet, the open tops facilitate convection cooling for both units, are strong enough to provide protection for the valuable innards, and permit visual access to the two LED status indicators located inside the audio unit.

Functionally, the MCR includes a number of valuable features: a stereo/mono switch, separate source and tape source selection, full mute, six source inputs (five line plus phono), balance, and a single volume control. The tape source switch has an Off position whichdisconnects the tape outputs. The four large controls (source, tape source, balance, and volume) are lovely to look at, with a raised center section on each round knob that points to the desired position. It was somewhat difficult to interpret the settings with these controls, however, especially in low or poor light.

The rear of the unit is mirror-imaged for all inputs and outputs. (These are single-ended only.) I found this far easier to use, since it was always clear where the left and right channels were (as opposed to stacked inputs/outputs). A grounding post and female RCA's for cartridge loading are located just above the phono...
inputs in the center of the back plate. The preamp is internally wired for a standard 47k ohm load. RCA plugs and resistors are provided for alternate loadings.

The MC Reference includes three other valuable options. The first is active or buffered passive operation. (Only one mode is possible at a time, although there are separate outputs on the rear of the unit for each mode.) The mode is changed by moving two jumpers on the pcb. In the passive mode, the overall gain is less than unity, at -2.5dB attenuation.

A second option, which requires soldering, bypasses the stereomono relay contacts. This option is advisable if the unit is to be used only for stereo operation.

The third option makes the MCR potentially the most useful. The phono stage has 62.5dB of gain, which is extremely high. In the standard factory-set mode, the active line stage offers an additional 16.5dB of gain, yielding a total of 79dB. This combination should provide adequate gain for moving-coils with outputs ranging from 0.15mV to 0.5mV.

The low end of this range should allow the MCR to work with very low output cartridges such as the Benz-Micro Ruby, the original Transfiguration, and even some of the Ortofonos. If that wasn’t enough, the line-stage gain can be adjusted upward (again requiring soldering) to 21 or 30dB, allowing a total maximum gain of 92.5dB. The line-section gain can also be adjusted downward to either 6 or 11.5dB. The flexibility of both phono and line-level gain makes the MCR a unique choice, and a potentially ideal match for many cartridges that are simply emasculated by many otherwise excellent preamps on the market.

SYSTEM

For most of my listening sessions I used the MCR with all NBS Signature cables, ARC Classic 150 monoblock amps, Mark Levinson No.30 and No.31 digital gear, Audio Power 114 Power Wedges and PE-1 Enhancers, Solidsteel equipment stands, and ProAc Response Four loudspeakers. Analog front-ends alternated between a Koetsu Pro IV mounted on a Versa Dynamics Model 1.2, and a revised (higher-output) Transfiguration with an SME 405 Vt onearm on an SME Model 20 ‘table sitting on an Arcici Lead Balloon stand. Comparison preamps included the SME CAT SL-1 Signature and Melody 333 Gold with phone. Because the MCR inverts output from all inputs, I compensated by reversing my speaker cables at the speakers.

INITIAL IMPRESSIONS

One of the dilemmas facing each reviewer is that of exactly when one should unpack a new, just-arrived component. The inner audiophile yells, “Now! Do it now!” The levelheaded, task-oriented reviewer counters with: “Not yet, I have to finish up my reviews of things I’ve started on, or that I’ve had sitting around too long already.”

Such was my plight with the MC Reference. It sat in its box for nearly two months while I finished up a number of other reviews. After all, my CAT Signature was in its customary place of honor throughout these other reviews; I felt no real urgency to move on to another preamp.

Finally, I got the MCR in the system. I opted for convenience and started out with Gustav Leonhardt’s Authentic Organ: Netherlands (RCA GD-71965), with my venerable Levinson No.30/31 combination. Within seconds, I was awestruck by the performance of this preamplifier. The sense of spaciousness was uncanny. Everything was expanded, with long, decaying reverberations just as you would hear in a cathedral. To top it off, the resolution of low-level detail was superb. The mechanical workings of many of the instruments let me feel I was sitting alongside Mr. Leonhardt turning the pages of the scores. The wind through the pipes seemed as real as the breeze through an open window.

On went John Eargle’s awesome King of Instruments CD (Dolos D/CD 3503), which opens with Bach’s ubiquitous Toccata and Fugue in d. The result was again captivating—the deep, powerful BBBBBBBBBBB of the organ’s big pipes was stunning. The first-rate transient performance and utter lack of confusion or muddling quickly and cleanly revealed this gorgeous music’s contrapuntal structure. As before, the back wall of my listening room evaporated into an open, airy, spacious cavern filled with sound.

But I couldn’t let myself fall in love so easily. After all, the MCR’s raison d’être was its phono stage. With a slight nod to my audiophile sensibilities and a growing desire to hear if this baby could rock, I cued up Joan Armatrading’s The Shouting Stage (A&M SP 5211) on the Versa and watched in eager anticipation as the Koetsu Pro IV slowly descended toward the grooves. As Little Richard might have said, “Great Uga Muga!” Slam and punch took to the floor. There were gobs of gain and far less noise than any tube preamp I had ever spent time with. This baby could rock.

Still playing hard to get, I reasoned that the Koetsu test was far too easy. After all, the Pro IV has tons of output. It can drive any moving-coil phono stage. How about a tougher test—the Transfiguration from Sumiko (which has been replaced by a higher-output, better-performing version which I am currently reviewing)? The old Transfig simply didn’t come alive with the CAT. Like the Benz-Micro Ruby, it desperately needed an additional step-up device, such as the Benz or the Klyne. Now this would be a test. To make it even more difficult, I decided to put on some soft music with no orchestral bombast, no heavy-metal, and no big organ to provide the omph. I wanted the preamp to sweat.

On went the softly whispered “Comin’ Back to You,” from Rickie Lee Jones’s Pop Pop (Geffen 24426). I succumbed. Why fight it? The sounds coming out of my system floored me. The MC Reference sounded superlative in every regard. For all practical purposes, I simply ignored my responsibilities as a reviewer and spent weeks mining my record collection for unending hours of sheer delight. My wife and my friends shared in this orgy of non-reviewing, music-loving hedonism.

LONGER-TERM IMPRESSIONS

I ended up spending an immense amount of time with the MC Reference. I wanted to be certain I hadn’t been overwhelmed by my extremely favorable initial impressions. Months of listening did confirm those impressions, but also helped me to clarify just what this sensational preamp did and didn’t do. While I think it was/is captivating, it may not be the preamp for every (wealthy) audiophile.

The MCR consistently presented a somewhat distant perspective equivalent to a mid–hall seat, or one even slightly farther back. No matter the recording, performers were always located behind the loudspeakers; the music was never thrust out into the listening room. (My bias in this area admittedly favors the MCR’s presentation.) The somewhat distant perspective was especially natural on orchestral works such as Stravinsky’s The Rite of Spring (Clarity CDD 1005–G, gold Zeonex CD). The mid–hall presentation was virtually identical using either CD or LP as source. My seat moved a bit closer with Musorgsky’s A Night on Bald Mountain (The Power of the Orchestra, Chesky RC30) on LP—the recording itself has a slightly closer perspective, but the sensation remained essentially the same as with the Stravinsky.

The SBM version of Dave Brubeck’s Time Out (Columbia CK 52860) provided a precise example of the MFA’s hall-seat presentation. With other preamps I tried, this performance was in-
the-room, sitting along the plane of the speakers. With the MC Reference, the performers remained in the room but moved back behind the speakers, closer to the rear wall. I was ready to conclude that the MCR had a mildly recessed midrange, but too many vocal recordings changed my mind. For example, the voices of Eric Clapton (on "Tears In Heaven," Unplugged, Reprise 45024-1) and Anita Baker (on "Sweet Love," Rapture, Elektra E1-60444) were more prominent than with other preamps.

With other equipment I have reviewed, distant perspectives have often been accompanied by narrow stages, reduced layers of depth, and broadly attenuated midranges. The MCR suffered none of these ills. Peter Gabriel's Passion (the soundtrack from The Last Temptation of Christ, Geffen 24206-2) provided an excellent illustration of the preamp's ability to reproduce even electronically created depth gradations. This CD's opening track begins deep in a narrow center stage with an eerie Middle-Eastern aura. After the introduction of the percussion, the stage opens up in width and depth, various sounds coming from locations all over the now wide, deep stage. The MCR got all of these effects right.

The same strengths were obvious with the Stravinsky, in which the acoustical space was large and open; and with the Mussorgsky, in which the performers were located with precision upon a very wide, deep stage. An even more fascinating example was Brian Eno's Ambient 1: Music for Airports (Editions EG EGS 201). Through the MFA, this wonderfully hypnotic music could have easily been retitled "Music for Spacesports." However, while the presentation was consistently spacious and stable in placement, there was a modest lack of air around and between individual performers that fell a bit short of the state of the art.

A second area in which the MC Reference had a somewhat unusual characteristic was the bass in general, and the midbass in particular. Most tube preamps have wonderfully rich tonalities. Unfortunately, the deepest bass is often attenuated, coupled with an overly ripe midbass and a lack of articulation. Once again, the MCR chose a different path. Deep bass extension was excellent, going flat in my problematic room to below 50Hz and remaining usable well below that. While I've gotten slightly better extension from some solid-state preamps, the differences have been marginal.

There was no exaggeration of the midbass, which was consistently powerful and well-controlled. Many popular recordings pump up the midbass region. Through tube preamps, this midbass hump is often throbbing and ill-defined. Not so with the MCR. Two great examples were the electric bass lines from many of the tracks off Chris Isaak's Wicked Game (German WEA International 26513-1) and Suzanne Vega's 99 999F (A&M CDB 005). With the MC Reference, the deliberate elevation of midbass levels on both the LP and CD was obvious, but the music always remained clear and tuneful, providing wonderful rhythmic underpinnings to the music. A much better example was the acoustic bass line from "Detour Ahead," from Bill Evans's Waltz for Debby (Riverside 9399). It was strong, tight, and clean, propelling the music.

While the resolution of detail in the bass and, especially, midbass regions was at the cutting edge, this wasn't the case throughout the frequency spectrum. In some of the lower treble areas, the MCR failed to re-create every nuance of the music. For example, on the live version of Richard Thompson's "Al Bowly's In Heaven" (Watching the Dark, Hannibal HNCD 5030), Thompson's evocative string bending and harder/softer picking wasn't as obvious as he worked over his guitar's higher register. On Vega's "Rock in this Pocket" or Brubeck's "Blue Rondo à la Turk," percussive cymbal strokes lacked some sparkle and crash. On John Handy's Excursion in Blue (Quartet Q-1005CD), the mechanical workings of Handy's sax weren't as noticeable. On Clapton's "Tears in Heaven," the triangle was slightly obscured in both level and clarity. However, retrieval of low-level information was generally excellent in the bass and midrange regions. Even in the treble range, the shimmering decay of cymbals was often very realistic.

On Chesky's reissue of Night on Bald Mountain are numerous panned stereo effects—the simulated sound of wind, for example. I have always found these terribly distracting—enough so as to knock this otherwise splendid recording out of contention for my "Records To Die For" nominations. Oddly, these effects were less obvious, although certainly audible, with the MC Reference. This was typical of low-level detail resolution. Nothing was lost entirely, but many subtle sounds were slightly less audible.

Another captivating area of performance was dynamics, especially through the phono section. Because the noise floor was vanishingly low for a tube product and the gain so unusually high, the MFA effortlessly re-created wide dynamic swings. Excellent illustrations were equally abundant with digital or analog: the waves of sound emanating
from Clannad’s “Theme from Harry’s Game” (Past Present, RCA 9912-2, CD); the surprising energy of Telemann’s Oboe Concerto in e (Heinz Holliger, Philips 412 879-2, CD); the punchy wallop of Chris Isaak’s “Blue Hotel” (LP); or the emotive volume contrasts of “Chromatique” (Vangelis, Opera Sawnage, Polydor 829 663-1, LP). But the greatest examples came from large-scale works such as the Mussorgsky, or Eargle’s organ recordings, as well as Rachmaninoff’s explosively dynamic Symphonic Dances (Athena ALSW-10001). In every instance, the music remained tonal true and crystal-clear as it simply grew louder or dropped to a whisper, heightening the emotional contrasts created by sheer manipulation of level.

Of course, all would be for naught if the MC Reference didn’t have that oft-praised midrange magic. Fear not—the midrange was the most glorious aspect of all. With the MFA, Isaak’s voice had enough texture to touch; Vega’s often frail instrument remained staunch and dominant no matter how raucous the sounds around it; Mussorgsky’s often whimsical tonal combinations were lovely and terrifying at once; Eno’s music decayed slowly into otherworldly places; Handy’s sax was lush, rich, and ready for anyone’s favorite smoky club; and Eargle’s recordings of pipe organs defended the “King of Instruments” title with nary a moment of doubt.

MEASUREMENTS FROM TJN

The MC Reference’s output impedance at its line output measured about 170 ohms and varied only slightly with changes in the level control (about 165 ohms at unity gain, or a setting of approximately 2.30 on the control). The line-level input impedance measured just over 13k ohms at the control’s maximum setting, but it increased rapidly at lower settings, ranging between a bit below 46k ohms and just over 50k ohms at level settings between 10:00 and 2:30. Phono input impedance measured 47.2k ohms (L) and 46.8k ohms (R). The output impedance at the tape output was just under 2k ohms with a 25 ohm source impedance and just under 2.5k ohms with a 600 ohm source impedance, thus indicating no active buffering at the tape outputs. The DC offset at the MC Reference’s outputs measured a low 0.1mV on both channels.

The preamp inverts from its line inputs to its main outputs (the phono stage by itself—measured at the tape outputs—does not invert).

Line-stage gain (Aux input to line output) measured 16.6dB. Phono-stage gain measured 60.9dB, more than adequate for typical low-output moving-coil cartridges. (As JE mentions in his review, other settings are available through hardwire changes inside the unit.) Through most of its central range, the level control’s individual steps ranged between 1.5dB and 2.0dB, and its channel-to-channel tracking was excellent.

The MC Reference’s line-input frequency response is shown in the top curves in fig.1. The level control has a small, insignificant effect on the frequency response above 20kHz. Two such conditions are shown in these uppermost curves: at the top for a 9:00 setting of the level control (best case), and at the bottom for a 2:30 setting (worst case). The third curve shown, displaced down by 0.5dB for clarity, is the RIAA error of the MC Reference’s phono input. This is reasonably flat, though it had some rolloff at the frequency extremes. This is more significant at the bottom end than at the top.

The MC Reference’s crosstalk is shown in fig.2. Interestingly, the line crosstalk increases with frequency in the expected manner, while the phono crosstalk—though higher than the line crosstalk across much of the band—is unusually consistent with frequency, suggesting that it might be dominated by noise. The phono-stage separation is superb, the line-stage separation good.

The manner in which THD+noise changes with frequency is shown in fig.3. A 350mV input level was used for the line measurement, a 15mV input level for the phono. (These levels were also used for the crosstalk measurement, and indicate that noise dominates the THD+noise reading below 1kHz.) These are very good results, especially in light of the phono input’s high gain setting. Finally, the MC Reference would accept a signal level of 6.3V at its Aux input before reaching 1% THD+noise (with an output of 42.1V). The MC Reference’s phono overload margin was also good: 1% THD+noise was reached at an input of 37mV at 1kHz, 500mV at 20kHz, and 2.3mV at 20Hz. The input for the latter measurements was unequalized, and the variation of overload margin with frequency is due to the RIAA curve’s characteristics. This is excellent performance, giving an overload margin referenced to a typical MC input voltage of 0.5mV (5cm/s) of between 33.25dB at 20Hz and 40dB at 20kHz!

There were no surprises in the MC Reference’s test-bench results, its excellent performance straightforward and unambiguous for a tube preamp. I noted only one quirk: The preamp would not accept input levels above a certain value below 15Hz in frequency before it automatically switched back into the standby-warm-up mode. This is why fig.3 terminates at 20Hz. I discovered this glitch while trying to do a THD+noise vs frequency sweep down to 10Hz. Since JE does not remark on this in his review, it is clearly a problem that is unlikely to occur in normal use. —Thomas J. Norton

CONCLUSIONS

In almost every sonic regard, the MFA MC Reference is outstanding. Though it is outrageously expensive—something which has become business as usual in the High End—sonically I found the MC Reference joyously musical and tirelessly entertaining. Such startling performance mandates that it be considered by anyone who insists on owning the very best. The MFA MC Reference is one of those extremely rare products that lets you immerse yourself totally in the beauty and wonder of music—any type of music. —Jack English
Lee de Forest filed for a US patent on his "Audion"—the first triode—on October 25, 1906, but never could explain why it worked.1 It was up to Armstrong and Langmuir, in their pioneering work, to place the hard-vacuum triode on firm scientific ground. When the US entered World War I in April 1917, the Army had to rely on French tubes. Six months later, Western Electric was mass-producing the VT-1 receiving tube and the VT-2 transmitting tube. However, it was only in the decade following World War I, as designers became conversant with the triode amplifier, that many of the crucial elements of tube amplification were nailed down. Technical issues such as coupling two gain stages and selection of optimal coupling impedance were already resolved by the mid-'20s. The triode ruled supreme until the tetrode came along in 1926, followed in 1929 by the pentode from Philips's research laboratories in Holland.

Roarin' '20s amp circuits naturally tended toward simplicity. A single power triode was allowed to handle the entire signal; i.e., both negative and positive portions of the waveform. These amplifiers perform in purest class-A: the signal was not shared between two tubes, as it is in a push–pull output stage. These minimalist designs typically used no global negative feedback, feedback not being widely used until the late '30s. This is one of the major reasons why a single-ended design recovers so gracefully from overload. In this age of 84 dB—sensitivity loudspeakers, power amps clip routinely. "Redlining" an amp may push it into momentary gross distortion, or oscillatory behavior which persists for many milliseconds. That literally sounds bad. The single-ended amp, on the other hand, clips so smoothly and recovers so quickly that it's difficult to tell that it has clipped at all.

In the '20s, a UX-171 triode reliably delivered a clean 0.7 W, while a UX-210 power triode with a plate voltage of 425 V could deliver 1540 mW of undistorted power—a whopping 1.54 W! Such power is actually adequate for home radio applications. Come to think of it, my daughter's new Sony boombox sports a specification of 1.5 W at 5% THD. That's progress! In the '30s, Western Electric pushed the single-ended power amplifier to around 9 W output using the 300A output tube. These 9 W beasts were used extensively to power large horn-loaded speaker systems in movie theaters across the country. Later, RF transmitting tubes such as the 211 and the 845 were used to generate over 20 W in single-ended fashion.

What caused the near demise of the single-ended power amp in the '40s and '50s? The switch to push–pull was fueled in the '30s by the growing popularity of the pentode, which offered better load dumping, and even greater efficiency in push–pull. The proliferation of relatively inefficient direct–radiator loudspeakers demanded more amp power. The inefficient single-ended output stage finally gave way to push–pull designs that were more efficient by factors of two and three (less wasted plate dissipation).

Ironically, the push–pull stage was already known in the '20s. Such a connection was recognized to balance out even harmonics—assuming tube-like characteristics—and therefore offered a possible means of reducing triode harmonic distortion, which is primarily even in nature. Unfortunately, the trend toward using power pentodes in a push–pull connection tends to emphasize their harsh odd–order harmonic distortion signature, which is canceled by balanced operation.2 Odd–order harmonics (third, fifth, etc.) are not consonant with the music's harmonic envelope and are therefore not easily masked, even at very low levels.

Whether or not the distortion–reduction argument holds much water, undeniably the biggest practical advantage of push–pull operation is that direct currents in both halves of the output transformer's primary winding balance each other magnetically, minimizing the problem of core saturation and making a lighter, more compact, and wider-bandwidth design possible.

Another factor behind the single-ended amplifier's demise had to do with the misguided drive for lower and lower harmonic distortion. The invention of the moving-coil dynamic loudspeaker in the '20s generated much excitement and a common perception that there was

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1 Lee de Forest insisted that the triode's behavior was due to the presence of gas in the primitive audion's soft vacuum. It was left mainly to Armstrong to provide a strong theoretical footing for the triode's behavior and to develop circuits that made use of its properties. Those interested in the early days of sound reproduction and broadcasting should read Tom Lewis's Empire of the Air: the Men Who Made Radio (Harper/Perennial Books, 1991). Written in conjunction with an excellent PBS program (which is also available as a videocassette), this is the best account I have yet read on the legal disputes between de Forest and Armstrong and between Armstrong and Sarono.

2 The necessary phase splitter or inter–stage transformer was thought, even 70 years ago, to introduce some distortion itself, thus negating at least some of the push–pull stage's inherent distortion neutralization.
now a speaker that had no distortion detectable by the human ear. The next logical step in the development of perfect radio reception was to perfect a distortion-free amplifier; hence, the birth of the simplistic notion that lower distortion, at whatever cost, is hi-fi's ultimate goal. This idea has stuck with us through the years and was used to legitimize the supposed "superiority" of early solid-state gear. Tons of transistorized crap have been sold under the conceptual umbrella of "Less than 0.01% Total Harmonic Distortion!" Joe Public could sleep blissfully at night, secure in the comforting illusion that his receiver was true hi-fi.

Over the years, the legacy of the single-ended triode amp and horn loudspeakers continued to find a receptive audience in Japan where, in the '70s, audiophiles discovered "Western Electric gear." Japan is apparently one country where the dry, sterile sound of modern gear is frowned upon. Audiomart's Walt Bender tells the story of how he laughed at Japanese collectors who paid him big bucks for these audio antiques. He stopped laughing when he actually heard the stuff for himself. Like Walt, audiofiles whose sole exposure to tube gear has been via class-AB push-pull amps heavy on feedback go into shock the first time they hear single-ended magic; the sound's purity and musical intensity are that dramatic. The Japanese have combed the countryside for years for this classic sound; by now, practically all the available vintage gear has migrated East.

The good news is that the growing underground interest in single-ended tube gear has translated into a commercial rebirth of this class-A King. Cary Audio Design is the first modern US-based manufacturer to offer several single-ended amp designs. CAD's designer, Dennis Had, says he's excited by and devoted to single-ended triode amplifiers: "It never ceases to amaze me how some of the golden classical designs of the 1930s were actually more advanced in their sonic presentation than some of the more current Hi-Fi designs," he says in Cary's promotional brochure. "Maybe we really don't even have a clue to what Hi-Fi of today is all about until we listen to some of the more simplistic, in terms of component count, audio circuits from brilliant minds of years ago in comparison to a live performance." In other words, unless we understand our audio roots, we will never find the path to musical fidelity.

CARY'S 805 (AT LAST)
With its ornate knobs and gold-on-black finish, the beautifully crafted Cary Audio Design 805 looks like a '30s period piece. A delightful feature is the "tuning eye" on the front panel. The eye, which monitors the AC output voltage, closes completely at the 50W output level. The open chassis is dominated by the large—almost 8" from head to toe—211 output tube. This true three-element tube has been heavily used over the years in RF amplifiers. The filament, a directly heated thoriated-tungsten type, requires a current of 3.25 amps at 10VAC. The 211's plate dissipation in the 805's circuit is 94W (100mA at 940VDC), which means that, when you add the filament dissipation to that of the plate, the tube heats up like a 120W light bulb. This is a power triode!

There was a time when General Electric built 211s, as they did just about everything; the Chinese are now the major supplier. (Although the 805's 211 is stamped "Philips," it is, in fact, Chinese.) I'm told that this is a tube they've been producing for over 20 years, so quality should be very good.

The first question anyone is likely to ask is: "Why is this thing so darn heavy?" The main reason is the size of the 805's output transformer. Because the bias current for the output tube flows through the primary winding of the transformer, core saturation becomes a serious problem. An air-gap transformer has to be used, with its core laminations typically spaced 2–16 mils apart, in a precise manner. The air-gapped design gives more inductance for the same number of turns, but its inductance becomes proportional to the core cross-section. Maintaining a large primary inductive reactance relative to the load at very low frequencies therefore mandates the use of a very large, heavy core and lots of wire. A primary inductance of over 60 Henrys may also be required.

Practically speaking, it's rare to see a single-ended transformer with a full-power bass response lower than 20Hz. Additionally, all that wire generates both ohmic losses and significant winding capacitance, which limits the HF bandwidth. Unless interleaved primary/secondary winding techniques are used to control winding capacitance, HF extension beyond 15kHz is not possible.

The 805's output transformer uses an E-1 core with large air gaps between laminations. Output taps are provided for 4, 8, and 16 ohm loads. Note that these taps are designed for efficient power transfer to the load. The actual output impedance of a single-ended amplifier is typically around 2 ohms, which gives rise to a poor damping fac-

tor. Defined as the ratio of the loudspeaker impedance to that of the amplifier output impedance, the damping factor is intended as a figure-of-merit to describe the amp's control or braking action over a loudspeaker cone. A solid-state design with high negative feedback may have an output impedance below a tenth of an ohm, generating a damping factor of well over 100. In contrast, a single-ended design can only muster single-digit damping factors, even into a 16 ohm load. However, there's some controversy over the need for, or significance of, higher (ie, greater than 10) damping factors.

The following circuit description is based on information provided by Dennis Had. The input signal is DC-coupled to the grid of a 6SL7 dual-triode operated in parallel as a single voltage-gain amplifier. The 6SL7's plate is AC-coupled to the control grid of an EL34 pentode wired as a triode! The EL34 dissipates about 19W of class-A power and produces 4W of audio power to drive the grid of the 211 through an inter-stage transformer of air-gap design. The 211 is cathode-biased, and the output stage is operated in class-A (no grid current) up to 25W output. As the drive to the 211's grid is further increased, operation shifts to class-A2. The 211's grid goes positive (and starts to draw current) while the output power with increased efficiency reaches about 50W. The ability to drive a 211's grid positive is made possible by the use of the inter-stage transformer coupling between the EL34 and 211. Unfortunately, substantial class-A power entails significant harmonic distortion, as the tube is eventually pushed into non-linear operation.

The 805's power supply features a full-wave bridge rectifier using avalanche-protected diodes. The smoothing filter is a pi network using a series choke of air-gap design. Variable global feedback from 0–10dB (from the secondary of the output transformer back to the input stage) is offered via a pot and an impedance selector switch. The owner is thus given the chance to experiment with the amount of feedback—from none to moderate—within his or her own system. The On/Off switch powers up everything but the 211 tube. The Standby/Operate switch controls the filament current to the 211. The proper turn-on sequence is to power up the amplifier in Standby. After waiting a few minutes to give the input and driver stages a chance

3 As this review went to press, we were informed that the EL34 driver tube was going to be replaced by a 300B triode. DO will comment on the change this makes to the CAD-805's sound in a future issue.

—JA
to stabilize, the 211 may be powered up by switching from Standby to Operate. (I mention this because there's no formal good manual for the 805.) The amp sounds good right out of the box, but reaches prime time after about 25 hours' break-in.

The chassis runs very hot to the touch because both the rectifier bridge and the 211's cathode resistors are heatsinked to the chassis.

**TUBE TERRITORY**

With about 20 clean watts at my disposal, the choice of partnering loudspeaker became a crucial issue. The two factors paramount to the selection process are sensitivity and impedance magnitude. I say "sensitivity" rather than "efficiency" because the former properly describes a speaker's bottom line in terms of how loudly it will play for a nominal watt input. Efficiency has to do with conversion of electrical into acoustical energy: how much of an electrical watt at the input terminals is converted into acoustical power. But if, for example, I were to use ten inefficient drivers instead of a single efficient one, I might find that the sensitivity of the multiple-driver speaker was higher. In a typically sized listening room with only a moderate amount of damping, a sensitivity of 90dB/W/m would allow a stereo pair of loudspeakers to reach 100dB peak sound pressure level at the listening seat with about 10 electrical watts. This represents an acceptable dynamic range for many listeners.

Unfortunately, the great majority of audiophile loudspeakers are direct-radiator types with sensitivities of 88dB or lower, which makes them either marginal or simply unacceptable for use with single-ended amps. Ideally, the partnering loudspeaker should be blessed with a sensitivity of at least 95dB/W/m to make life easier for the amp... but that's horn-loaded speaker territory. Dennis Had reports good results with such average-sensitivity speakers as the Monitor Audio Studio Six and the ProAc Response One and Two. The key to using speakers with sensitivities of less than 90dB is a compatible (benign) impedance magnitude.

The impedance magnitude should be fairly flat for efficient power delivery. The nominal impedance should be 8 ohms or higher, and ideally there should be no dips below 4 ohms—at least below 500Hz. Any tube amp is limited in its current delivery, and the lower the load impedance, the greater the current demand. As a simple example, compare two loudspeakers: one with an 8 ohm impedance vs one with a 4 ohm impedance. Assuming purely resistive loads, the current demand of the 4 ohm load is twice that of the 8 ohm load. I'm appalled at the recent trend toward vanishing-impedance loudspeakers. An impedance of 2 ohms or lower below 500Hz—the power-hungry musical range—is Krell country, not tube territory. There was a time when a 16 ohm nominal-impedance speaker was commonplace. More speaker designers should be considerate of the special needs of tube amplifiers.

**PRELIMINARIES**

If I told you that some of this galaxy's purest, most musical sound comes in a 10W or 20W package, would you (as some have done) shrug your shoulders and say, "What's it good for?" Or would you scramble around for a compatible load? Okay, so I can't use the Sound-Lab A-1 with the Cary 805. But if the ticket to Nirvana says "single-ended," I'd most definitely search Speakerland for a suitable mate.

So I gathered several loaner speakers which (at least on paper) had a good chance of partnering the 805. These included the Audio Note 3/SPX-SE, the Reel-to-Reel Design Legacy Protege, the Solo Electronics H500, and the Audio Artistry Mozart.

Speaker cable was primarily TARA Labs RSC. The front-end consisted of the Jadis JP 80MC preamp or the Air Tight ATC-2 line-level preamp used with Air Tight's matching ATE-1 phono preamp and the Ikeda step-up transformer, the Ovation turntable outfitted with a Graham 1.5t arm and an Audio-Technica ART-1 cartridge, and the Theta DS Pre Generation III used with both Micro-mega and California Audio Labs Delta CD transports. Interconnects were mostly Mapleshade's Omega Mikro and Hovland/Sonic Purity.

**SONIC IMPRESSIONS**

**Audio Note 3/SPX-SE:** Because Audio Note UK distributes the fabulous single-ended amps of Audio Note Japan, you might have guessed that their speakers would be eminently compatible with 10W amps. And indeed that seemed to be the case—on paper. The Model 3-SE ($2995/pair) is said to possess a 6 ohm nominal impedance and is rated at 95.5dB at 1W at 3m. That's one hell of a sensitivity for a direct-radiator two-way design with a 7.5" woofer. While I believe the 6 ohm nominal impedance rating is reasonable, the sensitivity figure is straight out of the Twilight Zone. My measurements show a figure of 90dB/W/m to be much more appropriate.

The 3 was stand-mounted using the MAF stands provided by Sounds Like Music, Audio Note's US distributor. I would describe the 3's low end as gelatinous, lacking definition and rhythmic strength. Nor is there much deep-bass extension. This may be due to the 3's enclosure construction: For its volume, the cabinet is distressingly lightweight. Although the lower treble is a bit too polite and laid-back, there's plenty of upper treble. But it's quite excitable in nature, which means that the sound is often raspy and raucous. (A time-domain measurement of the tweeter would probably not be a pretty sight.) The Model 3's only sonic virtue is its reproduction of the midrange's core with admirable tonality and decent soundstage transparency.

Ironically, a single-ended amp's weaknesses at the frequency extremes are blessings with this sort of speaker. The 805's inherent loss of bass extension wasn't noticeable, and with vinyl playback was actually welcome: it "filtered" out subsonic garbace which can overdrive a bass-reflex-loaded woofer. At the other extreme, the amp's closed-in presentation tended to tame treble nasties.

The 805s thus catered to the needs of the Audio Note 3s. I found them to be much more listenable with these speakers than the Jadis JA 200s, even though the Jades sounded faster and more transparent. The 805s highlighted the real glory of the mids with a suave, direct presentation that caressed a human voice as much as divine intervention can. It wasn't so much that Marlene Dietrich (Myths Marlene Dietrich, German EMI-Electrola 791287 1) sounded so good, but that her expressiveness was so well facilitated. In this, the 805s' role as communicators became rapidly clear as they recast harmonic textures in a more believable fashion. Whether this was a coloration or the gospel truth wasn't clear to me at this early stage, but I didn't really care—the music was just more enjoyable.

**Reel-to-Reel Legacy:** My sample of the Legacy was a high-sensitivity version of the standard Protege, made expressly for use with Coda Technologies' 25W model 2.5. Though I didn't measure it, I estimated the Legacy's sensitivity to be in the low 90s. The bad news was that the impedance magnitude dips as low as 2 to 3 ohms below 70Hz. The Legacy possesses undeniable flair, and, from my experience with the Coda 2.5, it certainly can boogie, even with only a few watts. Its inherent character is on the bright side of reality, with a lean mid-bass region. The soundstage, program material permitting, is quite panoramic, with excellent dimensionality. Bass extension is decent, with tight bass definition and a nice rhythmic drive. The midrange
sounds sweet and cohesive. The treble balance, however, forced me to listen to the tweeters off-axis, with the speakers toed-in to the point where the tweeter axes crossed in front of the listening seat. The Legacy was stand-mounted using factory-supplied stands.

The lively nature of the Legacy's aluminum-dome tweeter was laid bare by Classé Audio's 700 monoblocks. When the tweeter was hit pretty hard, it started imitating a fire-breathing dragon: scorching heat cloaked with a thick metallic accent. This tendency to spit fire was subdued enough with the Coda 2.5 that my ears were no longer badly singed. It was, therefore, amazing to witness the degree to which the 805 tamed the Legacy's highs—a night-and-day difference. The extreme treble actually sounded closed-in, while the lower-treble brightness was almost totally tempered, with greatly reduced sibilance.

The midrange was infused with a romantic blush. Harmonic textures were more liquid and flowing. A tropical warmth permeated the core of the music, like an electric blanket on a cold winter's night. Tommy Flanagan's graceful touch on the piano blends well with George Mraz's strong bass technique and Al Foster's dynamic drumming on Nights at the Vanguard (Uptown UP27.29). Rudy Van Gelder's live recording perfectly captures the mood and the feeling of being there, and the Vanguard's good vibes were superbly reproduced by the 805.

Again, wonderful things were happening to human voice with the Cary. Rich and almost palpable, the individual voices of a chorus floated in space with remarkable resolution. The sensation of being able to pinpoint isolated singers in an ensemble was very believable. There was something about the 805 that made human voices sing more soulfully. The ability to convey human emotions transcended the realm of mere reproduction.

Even off the 4-ohm taps, the bass lacked impact and a convincing foundation. Taj Mahal's "John Henry's Fiddle" (string bass) on "Texas Woman Blues" (from Recycling the Blues & Other Related Stuff, Columbia 31605), while sounding full enough through the upper bass, sounded murky, lacking definition in the midbass. That impedance magnitude below 70Hz is a killer for a single-ended amp. The Legacy's current-drive demands proved too much for the 805.

I did experiment with the feedback control, which turned out to be rather instructive. Increasing feedback improved the resolution of transient detail, which I felt was being obscured, as if a thick glaze was overlaying the soundstage. The sense of speed and directness also improved, at the cost of some lushness. About 5dB proved right to my ears.

Both the magnitude of harmonic distortion and the output impedance are reduced with increased feedback. If you desire a softer, less distinct presentation, then no feedback is what the doctor ordered. On the other hand, increased purity and directness with a small level of feedback appeals to me as a more realistic balance between music's hard and soft textural qualities.

Driving the Legacy with the much more expensive and higher-powered Jadis JA 200 monoblocks drove home the 805's limitations. The Legacy's upper octaves opened up significantly, while treble transients sounded faster. Bass control improved dramatically; bass lines were tighter and much easier to resolve. Soundstage transparency also improved, all the hall's recesses lighting up. What was missing, however, was that beguiling lushness, that romantic touch that allowed the 805 to speak more effectively to the heart.

It's a given that any small power amp will be routinely driven into clipping. The 805's ability to dip gracefully and recover quickly, without harshness, was very evident with this speaker. There was none of the pronounced ringing and oscillation that often plague push-pull designs. The 805's ability to move from soft to loud was quite impressive. Only when attempting to scale the dynamic range from loud to very loud did it run out of steam, especially with speakers whose sensitivities were at the lower range of acceptability. After all, there's a limit to what 25W can do. Compression was subtle, not gross and harsh like a rubber band stretched beyond its elastic limit.

Solo Electronics H500: This high-sensitivity (96dB/W/m), $2480/pair loudspeaker features a 2" titanium-diaphragm compression driver loaded by a wooden exponential horn. The horn driver is crossed over at 1kHz to a pair of 8" polyconed woofers. A titanium metal-dome tweeter is used to fill in the extreme treble above 12kHz. This visually attractive three-way caught my attention at the 1993 Winter CES, when it sounded very listenable indeed. The nominal impedance is 6 ohms, which, together with its sensitivity spec, makes the Solo H500 quite attractive for single-ended applications. Matching Sound Anchors stands, which elevate the enclosure to the proper listening height, are available.

Critical listening in the reference room showed the H500 to be grossly colored in the midrange. (I experienced a similar frustration with the PAS Studio Monitor that I reviewed a year ago.) Considering that the speaker was designed by audiophiles, I'd hoped for more. My measurements noted problems in the integration of the horn and woofers. The horn's cutoff frequency simply isn't low enough, resulting in a discontinuity at the crossover point. The upper mids feature far too many resonances to make this loudspeaker a serious tool for evaluating associated equipment. Dynamic headroom was great, but the voicing was far off-base for me to pursue the Solo experience.

Audio Artistry Mozart: This $2495/pair two-way design features three Vifa drivers: two woofers flanking an aluminum-dome tweeter, à la Joe d'Appolito. A product of computer-aided design, the Mozart lived up to its nameake in the sense of evincing a classic tonal balance. Although bass extension is flat to only about 50Hz in-room, the lower mids and upper bass are full, and the midbass is well-defined, lending a convincing foundation to jazz and classical music. The Mozart's ability to preserve the rhythmic drive and pacing of live music is outstanding. The treble is equalized to be flat on-axis—a refreshing change from the rising high end of which so many designers are enamored. I took an instant liking to this speaker.

The Mozart also measures very well, which implies that its drivers integrate smoothly. Designer Marshall Kay took a calculated risk by crossing the tweeter over at 1.8kHz—rather low by metal-dome standards. His tests have shown that this particular tweeter can handle a lot of power around the crossover point with little distortion. As a result, the Mozart is blessed with excellent dispersion through the critical midrange. Its ability to suspend a wide, spacious soundstage in the front third of my Reference Room is quite remarkable. The sensitivity is about 91dB/W/m and the nominal impedance is around 6 ohms, without any impedance dips below 4 ohms. I'm told that CAD's single-ended amps were used as part of the design process to refine the speaker's voicing. This I could readily believe after my first listen to the Mozart with the 805.

The Mozart and the 805 formed a synergistic duo. Objectively, the Mozart's upper registers are lively, with a notable metallic flavor characteristic of all the Scandinavian aluminum-dome tweeters I've heard. With the Classé M-700 solid-state monoblock, the metallic aroma had no place to hide. The 805, on the other

4 Vol.16 No.1, January 1993, p.183. —JA
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The Mozart simply brought out the 805’s best, resulting in a fully 3-D illu-
sion of space. Not only were instrumental outlines fully fleshed out, but the space
around each instrument was convincingly resolved. There was a wonderful trans-
parency to the soundstage; the sensation of being able to reach out and touch
someone was strong. The extreme treble sounded rolled off and shut in, while
the lower treble’s bite was somewhat reduced so as to emphasize the midrange. This,
together with the delectable lushness and tonal texture added by the 805, served
to change the “stage lighting” from sunny to patently yellow. This duo’s harmonic
compass, while at times softer and less bright than the real thing, could conjure
up a whole new spectrum of soulful moods.

Violinist Arturo Delmoni’s Music for Violin and Guitar (with David Burgess,
Sonora SACD-102) features about as sweet a violin tone as you’re likely to hear
anywhere. I’ve heard this disc through a variety of push-pull tube amps, but in this
instance the 805’s clarity of expression and palpable imagery clearly surpassed those
of the push-pull crowd. Harmonic nuances were fleshed out with startling
vividness. Gene Ammons’s tenor sax (on The Gene Ammons Story: Gentle Jug, Pres-
tige 24079–2) never sounded sexier, the slow, elastic tempo serving to accentu-
ate the mood. The pacing sounded oh-
so-right.

Fig. 1 Cary CD-$805$, 5dB negative feedback, frequency response at (from top to
bottom at 30kHz): 1W into 8 ohms
(8 ohm tap), 2W into 4 ohms (8 ohms tap).

While the deep bass was typically
indistinct, the mid- and upper bass
regions were well defined and tonally
authoritative. Nor was double bass
slighted—Gary Karr’s instrument
sang out with believable body and heft on
Adagio d’Albinoni (King K33Y 236).

Table 1 Output Impedance

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\begin{array}{|c|c|c|c|c|}
\hline
\text{Output Tap} & \text{Feedback dB} & \text{Output Impedance ohms} \\
\hline 4 & 5 & 0.51 & 0.63 & 0.62 \\
8 & 5 & 0.74 & 0.92 & 0.86 \\
16 & 5 & 1.14 & 1.38 & 1.14 \\
8 & 10 & 1.18 & 1.14 \\
8 & 10 & 0.49 & \\
\hline
\end{array}
\]

JA once pointed out to me that it
seemed as if I listened to nothing but Bel-
shazzar’s Feast (EMI SAN-324). Well,
hardly a week goes by without my tak-
ing Walton’s epic work out for a spin.
The large chorus and orchestra work
well together to present any audio system
with certain basic problems. First is that
of adequate dynamic range. The Mozart/
805 duo ran out of steam only on very
loud passages, when the 805 clipped but
seemed to recover instantly. The stage
came alive, every rhythmic nuance nicely
resolved. The surging imagery of a large
chorus was allowed to bloom nicely,
with full emotional impact and out-
standing spatial resolution. As far as
fleshing out an orchestral foundation, the
deep bass lacked full extension and
impact. But the lower mids and upper
bass regions were quite convincing.

Again, female voice was superbly
expressive. Whether it was Jennifer
Wichers, Joni Mitchell, or my wife Lesley
on ViTAL, the brilliance of the upper
registers was slightly subdued, though
the music’s drive and energy came
through in spades. The emphasis was
typically on the middle registers, which
were reproduced with plenty of heart.

MEASUREMENTS FROM T.JN
Because the Cary CAD-$805$, like any
tube amplifier, has multiple output taps
(further complicated in the case of the
805 by the presence of a choice of feed-
back settings), I chose to perform a cross-
section of diagnostic tests. Most of the
measurements were made with 5dB of
feedback—the setting chosen by DO for
most of his listening evaluations—with
selected additional measurements pre-
sented at 0dB and 10dB of feedback.
In the case of the latter two, the 8 ohm
tap was used with an 8 ohm load. Also, only
a few select measurements were made
into a 16 ohm load—a load that a search
of the October 1993 Audio equipment
directory shows to be very rare among
modern loudspeakers. If it’s not other-
wise stated in the discussion below, the
measurements should be assumed to be
from the 8 ohm tap with 5dB of feed-
back.

Following its 1-hour, ½-power pre-
conditioning test, the Cary CAD-$805$
was no hotter than you might expect in
normal operation. (This test was devised
by the IHF primarily with solid-state
class-B amplifiers in mind—in which
case ½ power roughly corresponds to a
worst-case heating situation. It is less
applicable to tube amplifiers, but we per-
form it in the latter case primarily to
maintain consistency and to warm-up
and stabilize the amplifier.) Gain
averaged 23.2dB at 5dB feedback (into an 8
ohm load, slightly less into a 4 ohm load,
slightly more into a 16 ohm load). With
0dB of feedback, the gain increased to
25.2dB; with 10dB of feedback it
dropped to 18.2dB (all into an 8 ohm
load). The input impedance measured
just under 104 ohms, DC offset 0.1mV
(largely noise). The CAD-805 was non-
inverting, a positive-going input emerging
positive at the output. The wideband
S/N ratio, unweighted (at 1W into 8
ohms), was an excellent 108.1dB.

The CAD-$805$’s output impedance is
shown in Table 1 for several different
conditions of operation. (The figures
shown are averages; there was a small
variation of the calculated value with
load impedance, but this was not partic-
ularly significant.) The values are reason-
ably low for a tube amplifier, and while
some sensitivity to loudspeaker load may
be expected—the higher the output impedance of an amplifier, the more such
sensitivity increases—I would expect it
to be less here than with many tube amps
having higher output impedances (see
"Questions of Impedance Interaction").

Fig. 2 Cary CD-$805$, frequency response at 1W
into 8 ohms (8 ohm tap) with (from top to
bottom at 30kHz): 10dB, 5dB, and 0dB
negative feedback (1dB/vertical div.).
QUESTIONS OF IMPEDANCE INTERACTION

On a number of occasions we have commented on the effects of an amplifier's output impedance on a system's performance. A high output impedance—such as is found in many tube amplifiers—will interact with the loudspeaker's impedance in a way which directly affects the combination's frequency response. The Cary CAD-805 has a lower output impedance than most tube amplifiers, and should be less prone to such interaction. Some months back—before the CAD-805 arrived—I investigated this phenomenon in conjunction with measurements for a forthcoming review of the Melos 400 monoblock amplifier.1 Since the Melos 400 also had a relatively low output impedance for a tube amplifier (at 0.43 ohms at low and mid frequencies, rising to 1.2 ohms at 20kHz, from its 8 ohm tap), I took that opportunity to run some frequency-response measurements using an actual loudspeaker as the load for the amplifier. Figs.1–3 show the results, all measured at the loudspeaker's input terminals. All of the loudspeakers were connected with an 8' run of Symo cable; shorter lengths of ordinary cable didn't significantly change the results. A very low power output—about 10mW—was used to prevent possible damage to the loudspeakers, especially at high frequencies. I tested three popular audiophile loudspeakers: the Vandersteen 2Ce, the Spica Angelus, and the Martin-Logan Aerius.

Fig.1 shows the response of the Melos 400 when driving the Aerius from its 1, 2, 4, and 8 ohm taps, respectively. There are no significant differences below 10kHz (note the ± 5dB scale on figs.1–4). Figs.2–4 show the results of four different amplifiers driving each of the loudspeakers—one at a time, of course. Note that the two solid-state amplifiers—the Hafler 9500 and the Aragon 4004 Mk II—produce the flattest responses. The Melos is also relatively flat (tapped from the 4 ohm tap for all of these curves). Note, however, the results with the Sonic Frontiers SFS-80, an amplifier with a high (above 3 ohms) output impedance. As expected, this high output impedance results in clear deviations in the frequency response into real loudspeaker loads. This is not to say that the Sonic Frontiers cannot provide excellent performance, but any amplifier with a high output impedance will be prone to this matching sensitivity. Figs.5–7 show the measured impedances of the 2Ce, Angelus, and Aerius. Note that the Sonic Frontiers' frequency-response deviations when driving these loudspeakers show the same general trends as the impedance magnitudes of each respective loudspeaker. That is, the peaks and dips in the responses correspond closely to the peaks and dips in the impedance plots. The impedance plot therefore gives a general indication as to just how a given loudspeaker's response will change when used with an amplifier having a high output impedance.

—Thomas J. Norton

1 Our review of the Melos 400 was ready for print when the manufacturer informed us that they'd updated the amplifier. We returned our samples for updating, but Melos had yet to return them. —FJN

Fig.5 Vandersteen 2Ce, electrical impedance (solid) and phase (dashed) (2 ohms/vertical div).

Fig.6 Spica Angelus, electrical impedance (solid) and phase (dashed) (2 ohms/vertical div).

Fig.7 Martin-Logan Aerius, electrical impedance (solid) and phase (dashed) (2 ohms/vertical div).
audible range. The low-frequency dip, however, probably will be audible on a system having good low-end extension.

Fig. 2 shows the frequency response again, this time as the negative feedback is varied. Here, increasing the feedback reduces the bass dip, decreasing feedback aggravates it. At the top end, increasing feedback increases the magnitude of the peak but pushes it slightly higher in frequency. The results from the 16 ohm tap are not shown; they are similar from 100Hz to 20kHz, but with a greater rise above 20kHz and a lesser dip below 100Hz.

The CAD-805's output, in response to a 1kHz squarewave, is shown in fig.3. Note the small leading-edge overshoot (which actually becomes slightly more pronounced as the feedback is increased to 10dB—not shown). At 10kHz (fig.4) the overshoot and damped oscillations are more apparent—reflecting the ultrasonic peak in the amplitude response.

Fig.5 shows the THD+noise at 1W into 8 ohms from all three taps; fig.6 shows the same, except at 2W into 4 ohms. Note that in both cases the 4 ohm tap gives the lowest distortion through the midband, though it crosses over to become marginally the highest at 20kHz. Though you might conclude from this that the 4 ohm tap is optimum for either 4 or 8 ohm loads, you would be wrong in the case of an 8 ohm load—as the THD+noise vs level curves, presented below, will confirm. The levels here are moderately high, though not unexpect-

dly so for a single-ended, low-feedback design. The THD+noise vs frequency curves for a 2 ohm load (4W) are not shown; they show a reading of under 0.7% from 100Hz to 3kHz from the 4 ohm tap, remaining below 1.3% at 10Hz but rising to just under 2.5% at 20kHz. From the 8 ohm and 16 ohm taps, the midband THD+noise rises to just over 1% and 2% respectively for 4W into 2 ohms. These results, together with the THD+noise figures below, indicate that DO was correct to restrict his search for a loudspeaker to use with the CAD-805 to those whose load impedance remains both high and relatively uniform.

Fig.7 shows how the low-level THD+noise vs frequency changes with varying levels of feedback. As expected, the change tracks the amount of feedback—higher THD+noise with less feedback—but the differences with the small amount of feedback used here are not dramatic.

The 1kHz THD+noise waveform at low power into both 8 ohms and 4 ohms, not shown, is almost pure second harmonic with some noise. Fig.8 shows the THD+noise waveform for 4W into 2 ohms (from the 4 ohm tap). The result is still heavily second-harmonic, though with an interesting notch on the downside of every other cycle in the distortion wave. This corresponds to the negative-going portion of the signal itself and may relate to the circuit's intrinsic performance, possibly the single-ended output tube in this circumstance. The THD+noise here is actually fairly low in level: under 0.3% (see fig.6).Though the CAD-805's THD+noise levels are higher than those usually seen with competitive high-end amplifiers, their heavily second-harmonic nature should be musically consonant with the input. [The individual distortion harmonic tracks on Stereophile's Test CD 2 show quite convincingly that even 1% of second harmonic is completely inaudible.—Ed.]

At low frequencies and higher powers, the amplifier's distortion signature is less benign. The distortion spectrum resulting from a 50Hz input at 24W into 4 ohms (4 ohm tap) (approximately 3% of the power output at 3% THD+noise, 5dB feedback) is shown in fig.9. The distortion levels are relatively high: -33dB (about 2.5%) at 100Hz (second harmonic), -38.2dB (about 1.2%) at 150Hz. The distortion level does not drop below 0.1% until we reach the ninth harmonic.
At a much lower power output (4W, not shown), the distortion levels are lower: about 0.6% at 100Hz, dropping below 0.1% above 250Hz. Fig. 10 shows the output resulting from an input of a combined 19 + 20kHz into 8 ohms at the 8 ohm tap. The output level here is 6.5W—just below the level at which clipping is observed in the output waveform with this input signal. Incidentally, clipping onset is quite gentle with the CAD-805, initially visible only as a slight rounding of the waveform's lower half (the bottom of the waveform shows signs of clipping before the top). The 1kHz intermodulation artifact lies at -29.3dB or about 3.5%—a very high level. The 2kHz and 3kHz IM products drop to just below 0.5%. The higher-frequency products are again high, reaching a maximum of -29dB (35%) at 18kHz. The corresponding results for a 4 ohm load, also into 6.5W, from the 4 ohm tap (not shown) were quite similar, with marginally higher—but not significantly so—distortion artifacts.

Table 2: Power Output

<table>
<thead>
<tr>
<th>Load</th>
<th>Tap</th>
<th>Feedback</th>
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<td>4</td>
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</table>

The CAD-805's THD+noise vs level curves, with all three output taps driving an 8 ohm load, is shown in Fig. 11. Fig. 12 shows the output into 2, 4, and 8 ohm loads from the 8 ohm tap, and Fig. 13 shows the effect of varying the amount of feedback into an 8 ohm load at the 8 ohm tap. The important data from all three of these curves, plus data for other taps and other loads which are not presented in graphical form for reasons of space, are shown in Table 2. The values shown in this Table were read directly from the appropriate graphs. The “knee” referred to here is the first point at which a major positive change in the distortion slope occurs. The main observation to be made from this table is, as might be expected, that the maximum output is available from the CAD-805 when the output tap selected matches the load impedance. While this is not necessarily true at the 1% THD+noise level, it's certainly the case at higher output. Note also that, whatever the pros and cons of negative feedback, the only configuration which produces more than 10W output at the 1% THD+noise point is the one having 10dB of feedback.

The Cary's actual discrete clipping points (for the purposes of discussion, defined here as 3% THD+noise at 1kHz) for the 8 ohm tap, 5dB feedback, were 38.2W (15.8dBW) into 8 ohms, 28.9W (11.6dBW) into 4 ohms, and 14.4W (5.6dBW) into 2 ohms. From the 4 ohm tap, the corresponding values were 20.2W (13.1dBW) into 8 ohms,
35.9W (12.5dBW) into 4 ohms, and 28W (8.5dBW) into 2 ohms. And from the 16 ohm tap, 28.9W (14.6dBW) into 8 ohms, 14.4W (8.6dBW) into 4 ohms, and 6.4W (2.1dBW) into 2 ohms. All line voltages for these measurements were between 118V and 119V.

In classical terms, the CAD-805's test bench results cannot be categorized as anything other than mediocre, at best, even for a tube amplifier. As I stated in my measurement conclusions to the Jadis JA 200 review last November (Vol.16 No.11, p.153), such a set of measurements raises a question: Does the amplifier sound the way it does, in whole or in part, because or in spite of its objective performance? The former is not acceptable in a high-fidelity device, and certainly at least a number of the measured results on the CAD-805 fall within the boundaries of what we know to be audible deviations. And its power output, as DO states, restricts the user's choice of loudspeakers.

The CAD-805's somewhat nostalgic-inducing design is reinforced by its measured performance—an updated nostalgia, to be sure, but updating can only bring us so far in what is basically a half-century-old design concept, one long since abandoned for what would appear to be very good objective reasons. There is more to the story than measurements, of course; if you listen to the CAD-805s, fall in love with their sound, and can afford the price and loudspeaker restrictions, by all means buy them. But go into the purchase with open ears.

—Thomas J. Norton

FINAL THOUGHTS FROM DO

It may seem incredible that 1930s audio technology is viable in the '90s, that 25W single-ended amplifiers are actually saleable in this age of the 200W solid-state juggernaut, and that music lovers worldwide are embracing the notion of pure class-A as the ultimate means of connecting with the music's emotional value. But that's exactly what appears to be happening. This return to audio roots is gaining momentum as sales of single-ended amplifiers have grown dramatically in the last several years, both in Europe and the Far East. Kudos is due CAD's Dennis Had for his vision and perseverance in promoting the single-ended passion Stateside.

In the context of a compatible load, the 805 will redefine the meaning of a tube amplifier. Admittedly, this 211-based, single-ended amplifier is not a stellar test-bench performer. Yet, equipped only with a sophisticated integrated test and evaluation system (ie, two ears), any audiophile worth his or her salt should have no problem discerning the 805's magic. True, it's flawed at the frequency extremes; but in the midrange, the CAD 805 offers a glimpse of heavenly bliss—and a highly addictive one at that. It's intensely romantic and expressive, to the extent that I find its musical qualities impossible to walk away from. It's a great communicator of the musical message. There's a feeling of realism about harmonic textures that easily draws the listener into the music.

It would be doing the 805 an injustice to brand it as merely euphonic and walk away from it. It doesn't so much give the music a cosmetic "face-lift" as act as a lens through which the music's intensity is focused. This is a product for, first and foremost, the music lover. It preaches its own brand of Super-Fi: the surreal universe that awaits those burned out on the bland and sterile landscape of mere hi-fi. Most of us, at least subconsciously, want to feel good about reproduced music; issues of accuracy are secondary. This amplifier will allow you to connect with the music as never before.

Lately, Toob Man has felt good only when those colossal 211s light up. Only once or twice in a lifetime does one come to such a fork in the audio road. I've taken Route 805.

—Dick Olsher

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Close your eyes and see the difference between Arcam's all new Alpha 5 system of hi-fi components and anything else in its price range.

Ignore the fact that the Alpha 5 amplifier is our best 'budget audiophile' amplifier ever. Don't be tempted by its attractive styling or price tag. Just listen and discover a quality sound that can only be described as exceptional. Next, try the Alpha 5 tuner. Listen to broadcast sound that is natural, clear and dynamic, without annoying sibilance or harshness.

Finally, feast your ears on the Alpha 5 CD player - quite simply, the best value high performance CD player ever produced by a UK manufacturer. September's What Hi-Fi? agreed, calling it "the player to beat" and giving it a class leading 5 star rating. They concluded, "It's one remarkable transparent player, seeming to be at home with all genres of music, and equally enjoyable with all.

Just listen. Just close your eyes, open your mind, and see the light.

For further information contact:

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Stereophile, January 1994
“My car is supercharged, not turbocharged, so you see there’s no throttle lag,” explained Yves-Bernard André as he reversed at what seemed like 80mph up a narrow cobbled Paris street. “D’accord,” I mumbled, afraid to loosen the white-knuckled grip I had on the passenger grab handles. Yves-Bernard’s car may have been pointing the right way down the one-way street, but it was not actually traveling in that direction. Okay, so it was 2am and the good residents of the Dix-septième Arrondissement were busy stacking Zs (en français, “emplir les ronflements”). But I still didn’t think we would’ve been able to explain the logic of the situation to the gendarmes (les flics, en français).

Yves-Bernard André goes his own way in amplifier design too. He’s a pillar of the French engineering establishment as a full-time electronics lecturer and researcher at l’École Polytechnique, a technical university near his suburban Paris home. He also has strong ideas about how amplifiers should be designed. These ideas are embodied in the YBA products, which are distributed by his wife, Ariane’s, company, Phlox Electronique. His basic ideas for power amplifiers are: short signal paths; a fully symmetrical, complementary circuit topology with as little global negative feedback as possible; as few series passive components as possible in the signal path (especially no output inductor); transformer cores aside, an absence of magnetic materials; meticulously selected parts; and careful attention paid to microphony and working temperature.

“Over-engineering!” snorts the traditional electronics community, whose collective mind is repelled by the idea of spending $5 for a worry-free, tight-tolerance premium resistor where a $5 carbon-film, sloppy-tolerance resistor might give some of the performance to some of the people some of the time. But such attention to detail, such concern to what less conscientious designers appear to regard as irrelevant components, seems as natural to Yves-Bernard as choosing to sip a properly aged, carefully decanted premiers crus St. Emilion rather than chugging a gallon jug of Carlo Rossi. “En bier, how is that it could not be that way, mon ami?” Yves-Bernard asks as he slams his Volkswagen on opposite lock ’round the Porte Maillot exit off the Boulevard Périphérique, white tire-smoke heralding our entry into the mother of cities (Paris, en français).

**YBA 2 HC**

YBA amplifiers range from an $1850 integrated amp—L’Intégré—to the ultra-expensive Signature remote-controlled preamplifier and power amplifier. This middle model in YBA’s range is available in two versions: the YBA 2 HC (high current) at $3750, reviewed here, and the basic YBA 2 at $3100. From what I could glean from the YBA literature, the difference is primarily the use of one mains transformer in the less expensive model, and two (one for each channel) in the high-current version.

The small but very heavy chassis is attractively finished in blue-gray anodized aluminum, with black heatsinks running the length of its sides. The front panel features two handles, an On/Off switch, and a red LED. The rear panel has a vertical pair of 4mm sockets at each end, with a gold-plated and Teflon-insulated RCA jack next to it. In the center, an IEC AC socket carries a 10A fuse.

The 2 HC’s interior holds two C-core AC transformers mounted on Sorbothane washers just behind the front panel, and a printed circuit board with each channel’s diode bridge, four 4700μF reservoir capacitors, and circuitry kept physically separate. Don’t let the single pcb fool you: this is a true dual-mono amplifier.

The circuit for each channel is simple, with a direct, logical layout that minimizes pcb track length. The input is taken from the RCA jack on a short twisted-pair cable to the board, where DC is blocked with a capacitor. It then feeds the bases of two complementary long-tailed pairs of bipolar transistors, each with a constant-current emitter load. The inverting collector outputs are taken to a complementary pair of pre-driver transistors, these followed by hefty flat-pack driver transistors. The two complementary pairs of TO-3 output
devices are mounted very close to the reservoir capacitors, which are bedded in at +46.5V. Each power transistor sits on a 0.22 ohm emitter resistor, with the common points taken to the positive output socket via a 5A slow-blow fuse in parallel with a 10k resistor.

*Naturellement,* there's no output inductor to define the ultimate high-frequency rolloff with highly capacitive loads, so that Yves-Bernard has either designed a circuit with plenty of ultrasonic phase margin, or he just likes living dangerously. (Optional air-cored coils are available for those with problem loudspeakers; the coil is placed between the output terminal and the positive speaker lead.) Negative feedback (said to be less than 20dB) is taken from the emitter resistors' common junction—the fuse therefore doesn't appear to be in the feedback path—and fed to the non-inverting pair of the input differential pairs' bases. A small transistor glued to one of the output devices ensures efficient thermal bias tracking—the amplifier runs quite hot. The circuit's HF rolloff seems to be defined by a shunt capacitor on the input, shunting TIM-inducing signals safely to ground.

A closer look at the 2 HC reveals signs of lateral thinking. Each pair of reservoir caps is shunted by a high-power resistor to give a constant 50mA drain, said to stabilize the power supply's loading. The input caps are wedged between blocks of felt to minimize microphony. The two differential pairs and their associated resistors are damped with felt and covered with a copper-foil shield. Rather than conventional mica washers insulating the power transistors from the heat sinks, these are *copper-plated* and connected to the positive supply rail. The idea, explains Yves-Bernard, is to eliminate the parasitic capacitances that usually exist between the transistor collectors and the grounded heatsink. Such capacitances are highly non-linear and, he feels, contribute heavily to "transistor" sound.

The 2 HC comprises high-quality parts: the resistors look like Holcos; the circuit capacitors are polycrylylene, polycarbonate, and polystyrene; and a long-crystal copper conductor developed by Yves-Bernard is used for all internal wiring. If this is overengineering, then you can call me Alain Prost (le Professeur, *en français*).

**SYSTEM**

Due to both mid-life confusion and a change in distributor during this review's preparation, I used the YBA 2 HC and its matching preamplifier, the YBA 2!

for an uncommonly long period of time—over two years! Thus it was also used with all the loudspeakers I've reviewed in that period. However, I fondly remember the Epson ES11s, Magneplan MG2.6/Rs, Spendor S100s, Acoustic Energy AE1s, Thiel CS2.2s, Vandersteen 3s, PSB Status Minis, Minion Cyrus 753s, Martin-Logan Aeriuses, and Harbeth HL-P3s. The comments are an amalgam of the listening notes I took with all of the speakers used.

Front-end components were either a Linn Sondek LP12 (Cirkus/Trampolin/Lingo)/Ekos setup sitting on an Archi-Dee table and fitted first with a Troika, then two Arkiv cartridges for LP playback; or a VTL Reference, Theta DS Pro Generation III, Counterpoint DA-10 with Ultra Analog DAC module, Mark Levinson No.35, Krell Reference 64, or the new Sonic Frontiers SFD-2, all recently driven by a Mark Levinson No.31 transport via AudioQuest Pro 2 ST-optical for silver disc. Other components included Aiwa HD-S1 and Panasonic 5000 DAT recorders and a Revox PR99 open-reel recorder. The preamplifier was either the Melos SHA-1 headphone amp used as a line-stage coupled with a Mod Squad Phono Drive EPS, or the YBA 2 with its MC module. Interconnects were primarily AudioQuest Lapis, while speaker cable was mainly a 5' bi-wired set of AudioQuest Sterling. All source components and preamps were plugged into a Power Wedge 116—recently fitted with the Power Enhancer option—plugged into one of my listening room's two specially installed AC circuits.

YBA marks one pin of the IEC AC socket with red paint. They recommend that this be connected to the wall supply's "hot" side, and provide a neon tester so the user can determine which side this is.

**LISTENING**

I find tubes seductive. There's a recognizable "rightness" to the sound of a big tube amplifier that, once heard, is hard to forget. The Jadis JA 200 monoblocks that DO reviewed last November come to mind. I had my most recent experience with them in Jonathan Scull's room— instrumental images sounded tangibly real; the music was projected at me with robust vigor. The Audio Research Classic 150s that Jack England uses to drive his ProAc Fours had a similar effortlessly powerful presentation, while the smaller Audio Research Classic 120s have provided the most consistently enjoyable sounds in my system.

But a big tube amplifier requires more of a relationship with the hardware than I—and perhaps many other audiophiles—am prepared for. (Men aren't over-rewarded for commitment anyhow.) I want the virtues of solid-state. I don't want expensive output devices that wear out as fast as I do, even if they can be replaced. I don't want an amplifier that forces me to choose between leaving it on all the time because turn-on transients with cold cathodes reduce tube life, and turning it on and off because leaving it on all the time wears out the tubes faster. I may have been brought up a Catholic, but I can't handle that much vacuum-packaged guilt.

I also want foot-stomping, funky-butt, shake-a-tail-feather, solid-state lows. I want the bass line on Michael Jackson's "Billy Jean" to fall from the speaker cones, shiny across the floor, and lift me to my dancin'-foot feel. Tubes just don't do enough of that, no matter how real they make Mr. Jackson seem as he lays into the song's "the chair is not my son" refrain. (Those who logically insist the lyric proclaims that the *kid or child* is not the fruit of the ex-Pepsi promoter's loins need either more system transparency or more imagination.)

The YBA 2 HC therefore faced a tough challenge. Its bass was a little soft-sounding compared with that of the expensive, fully regulated Mark Levinson No.206cs, and lacked a little extension and weight. But hey, what doesn't? The YBA did score in its low frequencies' articulate character. Whether it was Willie Weeks's big ol' fatback Fender bass on the live Donny Hathaway album (Chad Kassem's Acoustic Sounds might still have stocks of European vinyl, if you're interested), Mark King's finger n'thumb ultrafunk on Level 42's *World Machine*, or Nathan East's tight-fingered triplets in his "Old Love" solo on Eric Clapton's 24 Nights, there was not a bit of boom, no hint of overhang, no trace of treacle. I could clearly characterize every note of that famous bass on Paul Simon's "You Can Call Me Al!"

Overall dynamics were punchy. Mahlerian climaxes were not ruined; Eddie Van Halen's essential guitar lines on Latoya's slightly-more-famous brother's "Beat It" raggedly ripped around the room. Even at high levels, the amplifier's sound didn't harden or become fatiguing. This amplifier has more power (*la puissance, *en français*) than you'd expect from its modest physical size.

1 To be reviewed next month.

2 I commend YBA for not changing its products once the designs have been stabilized. When I expressed my concern to Yves-Bernard that the '91 samples I had were no longer representative, he laughed. "If it's good, then it needn't be changed, n'est-ce pas?"
The YBA's midrange was more laid-back than the Audio Research Classic 120's, though the Mark Levinson No.206 monoblock softened the mid-treble further. The YBA wasn't reticent in the high treble, though, once warmed up, it could never be called bright. And its soundstaging was wide and deep, with excellent ambience retrieval. The traces of Columbia's old 30th Street studio surrounding Paul Chambers's bass on the Super-Bit-Mapped reissue of Miles's *Kind of Blue* were easily discernible, yet were well integrated with the direct sound of the instrument—just as they would be in real life. (Some writers have promoted the idea that increased image depth is an amplifier artifact and doesn't, therefore, always equate with greater accuracy. If that's true, Gordon, you can call me Albert! See our March issue.)

Though I found the YBA's performance good, it faces stiff competition from domestic solid-state stereo amplifiers that offer much of its performance at a lower price. The Aragon 4004 Mk.II ($1850), Bryston 4B NR ($2095), Hafler TransNova 9500 ($1900), and McCormack DNA-1 ($1995) all have received rave reviews from *Sterophile* writers in the last year or so—why should someone spring another $1750 for the YBA?

Personal preference, that's why. All the above amplifiers, in the limited amount of listening I've done to them, seem to offer exceptional clarity and dynamics. However, to a greater or lesser degree, this is coupled with a somewhat vivid overall presentation. It seems difficult for a solid-state amplifier designer to obtain clarity without vividness, and this is where Yves-Bernard André's YBA 2 HC scores in spades: it offers a superbly transparent view into the soundstage, yet nothing is thrust unnaturally at the listener. This is how you hear things in real life. This is how I heard things via the YBA 2 HC.

Cool! (C'est ultra fidèle, en français!)

MEASUREMENTS

All measurements were made after the YBA 2 had been preconditioned by running it at one-third full power into 8 ohms for an hour, which thermally stresses the amplifier to the maximum. Its heatsinks were very hot at the end of this period. Interesting, however, those who say that solid-state components need no warmup should note that the amplifier's THD+noise, initially 0.09% for 1W into 8 ohms, dropped by a factor of more than five—to 0.016%—by the end of this preconditioning period.

The YBA 2 HC's voltage gain measured 27.6dB into an 8 ohm load; its input impedance was pretty much to spec at 28.5k ohms. Despite the circuit's low amount of overall negative feedback, the YBA's output impedance, without the optional series output inductor, was low at 0.06 ohms across the audio band. Its noise level was very low, the SN ratio measuring 83.2dB (left channel) and 92.8dB (right), both figures unweighted with a 22Hz–22kHz bandwidth and ref. 1W into 8 ohms. DC offset was negligible in both channels.

The YBA's small-signal frequency response (fig.1) was well matched between channels and flat in the audio band, rolling off above 10kHz to reach −1dB just above 50kHz. The low frequencies were flat down to the generator's 10Hz limit. A 1kHz squarewave was correspondingly reproduced with flat tops, while a 10kHz squarewave (fig.2) revealed no overshoot or ringing, just a slightly lengthened risetime because of the ultrasonic bandwidth limiting. The optional series output inductor didn't affect the squarewave's risetime significantly. Channel separation was very high, though somewhat asymmetric between channels (fig.3). The amplifier was non-inverting.

The manner in which the YBA 2 HC's distortion changed with frequency (fig.4) indicates the basic circuit must have good linearity, as, even with the modest amount of feedback employed, the overall level of THD+N into 8 ohms hovers between 0.02% and 0.03% below 2kHz. Note, however, the rise in THD in the mid-treble and above. I suspect that this illustrates the circuit's limited open-loop gain–bandwidth product. When the loop is closed with negative feedback, that feedback can work its distortion-reducing trick only as long as there's a significant difference between the closed- and open-loop gains. With falling open-loop gain at ultrasonic frequencies, less distortion reduction occurs. Note also the approximate doubling of the distortion level as the load impedance is reduced from 8 to 4 ohms, and the even greater increase into 2 ohms (though this is still sufficiently low, provided the harmonic products are sonically benign second- and third-harmonic rather than the much more audible seventh-, ninth-, etc.).

Fig.5 shows both a low-level signal waveform (2W into 4 ohms) and the waveform of the distortion and noise residue once the fundamental 1kHz signal has been notched out by the analyzer. The distortion is clearly mainly second harmonic, though dropping the load to 2 ohms does somewhat raise the level of higher harmonics. This phenomenon can also be seen in figs.6 and 7, which show...
the output spectrum with the YBA reproducing a 50Hz tone at 1W into 8 ohms and 100W into 4 ohms, respectively. At low levels and higher impedances, the only harmonic worth mentioning is the second at 100Hz, which lies nearly 80dB down from the fundamental. At much higher levels into lower impedances, the second harmonic rises in level to -54.5dB (0.2%) and is joined by the third harmonic at nearly the same level (-56.7dB). The fourth through seventh harmonics can also now be clearly resolved above the FFT plots' floor of "grass," as can a splattering of higher harmonics, though these are all still very much below the levels of the dominant second and third harmonics. Note, however, that the 60Hz power-line frequency appears in fig.7, as do the 120Hz and 180Hz harmonics. Though these are all low in level, they do indicate that the 2 HC's power supply is a little undersized in absolute terms. I suppose this is why YBA makes the physically larger but nominally not much more powerful YBA 1.

Given the YBA's rising distortion at high frequencies, I was concerned that it would generate intermodulation products when asked to put out high levels of high frequencies. This didn't turn out to be an issue into higher-impedance loads, as revealed by fig.8, which shows the audio-band spectrum of the amplifier's output when reproducing a 1:1 mix of 19 and 20kHz sinewaves at 40W into 8 ohms. Though the 18 and 21kHz sidebands lie at -57dB and -53dB, respectively, the audible 1kHz IM product (the difference tone) is 66dB down from the level of either fundamental. At high powers into 4 ohms (fig.9), these IM products rise in level by 10dB and are joined by higher-order spurious, but the overall level is still not bad.

The YBA 2 HC's maximum power delivery (fig.10) indicates that the amplifier will deliver a fair amount of power, more than its specification would suggest: 110W into 8 ohms (20.4dBW) and 190W into 4 ohms (19.8dBW) at the 1% THD point. Into 2 ohms, the SA fuse in series with the YBA's output blew at 201.7W (17dBW), a power level with a THD+noise content of 0.77%. Getting there.

I wanted to examine some aspects of the YBA 2 HC's measured performance in more detail, but at this point in the testing, after replacing the 5A output fuse, I inadvertently destroyed one of the amplifier's channels. I reloaded the Audio Precision's IM test procedure but unfortunately forgot that the test load was still set to 2 ohms. In the 30 seconds it took me to realize that I was driving the amplifier's channel A into clipping into 2 ohms with a combination of 19 and 20kHz tones, the AC fuse in the rear-panel IEC connector blew, accompanied by the unforgettable smell of torched electronic components. When I replaced the fuse, it blew again; a quick check with a multimeter revealed that at least one of the channel A output devices was now behaving like a straight piece of wire without gain.

Other than to curse Murphy's Law for ensuring that the transistors had given their lives for the survival of the output fuse, there wasn't a lot I could do. The amplifier was not at fault—the combination of high frequencies, high levels, and a 2 ohm load isn't something that occurs in the wild. Luckily I had finished all my auditioning, but the mishap reminded me that this is why high-power amplifier testing is always best left to the very end of the loan period.

**CONCLUSION**

"L'être dont l'être est de n'être pas," wrote Simone de Beauvoir about humanity: we're essentially beings whose essence lies in having no essence. The French writer could have been describing amplifiers: the perfect amplifier would leave no evidence of its existence other than the fact that the varying voltage representing the music signal has been made larger, resulting in truly musical sound from your speakers.

While the YBA 2HC doesn't reach that paradigm, it does less damage to the signal than most solid-state amplifiers I've heard. Recommended.

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3 The reference for Stereophile's dBW ratings is the voltage that gives rise to 1W into 8 ohms power. This is equivalent to 2W into 4 ohms and 4W into 2 ohms. A perfect amplifier would therefore have the same dBW rating into any load—an easy paradigm to grasp. Note that we don't hold the wall voltage constant in our measurements, because we believe this is more accurately reflective of the situation in our readers' homes.
Krell dt-10 CD Transport

Robert Harley

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So many things in this world are designed for convenience, not for excellence. That's all right if you have a choice, but it becomes a problem when products designed for convenience become universal standards and are thus foisted on everyone—including enthusiasts, who must then live with a product aimed at the lowest common denominator.

The digital interface between CD transports and digital processors is a perfect example of this dilemma. The Sony/Philips Digital Interface Format (S/PDIF) standard was designed so that connecting two digital products required only one cable. This single cable carries left and right audio channels as well as the timing clock essential to making the system work.

The problem lies in embedding the clock with the audio data. As described in the October and November '93 issues of Stereophile, transmitting the clock in the same data stream as the audio data causes jitter to appear in the digital processor's clock. The result is degraded musical performance from digital audio.

The simple solution is to have separate cables for the audio and the clock. In this scheme, the audio would be transmitted through one cable and the clock through the other. Interface jitter would be eliminated as a source of sonic degradation.

Someone apparently thought that asking consumers to connect two cables instead of one between digital audio products was asking too much of them. Consequently, audio purists and serious music lovers are stuck with a flawed standard created for the Walkman generation.

But there's a simple solution to this problem: provide the clock signal on a separate output from the transport, and make a processor that will accept the clock input and ignore the clock embedded in the audio data. This technique eliminates the interface as a sonic variable—and ends the debate over which interfaces and cables sound the best. Unfortunately, such a system works only between transports and processors made by the same manufacturer; no standards exist for separate clock transmission.

Fortunately, we can enjoy the benefits of separate clock transmission in the gorgeous new Krell DT-10 CD transport. The DT-10 provides what Krell calls a "Time Sync" output that directly drives the clock input on their processors. Hearing what the Time Sync function could do inspired my opening railings against the established S/PDIF standard. In fact, if you want to hear how bad S/PDIF can sound, connect a TosLink cable between a DT-10 and the Krell Reference 64 processor. Listen first with the Time Sync function disengaged (a front-panel button), then with the separate clock line activated.

If only all transports and processors had a separate clock link...

**Technical Description**

The DT-10 transport is a cosmetic and electrical match for Krell's Reference 64 processor (reviewed elsewhere in this issue). The two units share identical cosmetics, making them an attractive combination. The DT-10 is finished in brushed gray metal, with black side panels and a black, front-loading drawer. Because the DT-10 is a front-loader, it can be placed inside an equipment rack rather than requiring top-shelf placement.

The usual features are provided, both on the front panel and on the remote control. There's a numeric keypad on the front panel, as well as a display that shows track time and number. The display can be switched between elapsed time and remaining time, or shut off completely. The DT-10 also features a form of Favorite Track Selection (FTS) that automatically remembers track programming for each disc and repeats that program every time the disc is inserted.

The remote, beautifully made from machined aluminum, incorporates some of the control functions of Krell's KRC preamp and KSA-series power amplifiers, allowing you to control an all-Krell system with one handset.

All four digital outputs (coax, AES/EBU, AT&T ST-type optical, TosLink) are included as standard. An additional ST-type optical jack marked "Time Sync" sends a separate clock signal to Krell processors to reduce jitter. Specifically, the Time Sync carries an 11MHz clock from the transport to the processor directly, bypassing the interface and input receiver. This technique eliminates the interface and input receiver as sources of jitter in the processor. Note that the Time Sync works only with Krell processors with a Time Sync input.

Inside, the DT-10's left side is all power supply, with the transport mechanism in the middle and the decoding and control electronics on the right. The power supply features a large toroidal transformer and four regulation stages, some of which use heavy-duty TO-3 devices. Most of the decoding electronics are Philips chips, with transport control and the user interface handled by Krell's custom software. To reduce vibration in the unit, the chassis is mounted on four large compliant feet.

The transport mechanism is a Philips CDM 4 Pro mounted in Krell's custom housing, clamp assembly, and drawer.
The CDM 4 Pro is radically different from the CDM 9 Pro used in many other transports. The laser diode assembly, swing arm, and motor are all unique to the CDM 4 Pro, and the CDM 4 Pro mechanism is mounted in a large, heavy-duty cast assembly (instead of a stamped frame as in the CDM 9 Pro).

The laser pickup is encased in a Krell-designed machined-aluminum housing attached to two rods running on either side of the housing. These rods form a linear bearing on which the transport mechanism moves in and out for disc loading, driven by a large motor at the rear of the chassis. When the drawer is closed, a sturdy-looking clamp mechanism above the disc descends to lock the disc in place. This is by far the most elaborate and beefy drawer-loading mechanism I've seen.

The DT-10 is both gorgeous to look at and built like a tank. Internal layout and build quality are first-rate. The only problem I had was an occasional failure to play a track when it was selected from the direct-access number panel.

**Ancillary Equipment**

While in my listening room, the DT-10 drove the Krell Reference 64, Sonic Frontiers SFD-2, and Mark Levinson No.30 digital processors. The Reference 64 was an ideal match for the DT-10; this combination, connected with the separate Time Sync clock, allowed both products to achieve their optimum levels of performance. Other transports on hand for comparison were the similarly priced Mark Levinson No.30 ($8500) and the much less expensive PS Audio Lambda ($1695).

Loudspeakers were Thiel CS3.6es, driven by a Krell KSA-300S power amplifier via 8' runs of AudioQuest Sterling. Preamps were either the Audio Research LS5 or Krell KRC. Interconnects included Expressive Technologies IC-1, AudioQuest Lapis and Diamond, and the recently received TARA Labs balanced RSC. Digital cables were Aural Symphonics Digital Standard (coax), Madrigal's AES/EBU link, and AudioQuest Optical Pro II ST-type. A Krell-supplied ST-type cable was used for the Time Sync connection.

The primary point of reference for the DT-10 was the similarly priced Levinson No.31 transport. I compared the DT-10 to the No.31 driving both the Reference 64 processor and the No.30. My overall impressions of the DT-10 were consistent with both processors.

**Music**

The DT-10 quickly established itself as a topflight transport, particularly when driving the Krell Reference 64 processor. Its sonic characteristics were well suited to the Krell processor, forming a synergistic match. The Reference 64's strengths—pace and rhythm in particular—were enhanced when mated with the DT-10.

The DT-10's bottom end was full, deep, and warm. Extension was excellent, giving the music solid tonal and rhythmic foundations. The midbass tended to be a little warm rather than lean and tight. Although the presentation was weighty and just a bit on the fat side, the DT-10 was articulate, fast, and conveyed detail in the lower registers. A particularly revealing test of LF detail is the bass on Bela Fleck and the Flecktones (Warner Bros. 26124-2), especially the bass guitar solo on track 5. With some digital products you can hear every nuance of the fingers on the bass strings, the dynamic envelope of the string being plucked, and lots of inner detail in the instrument. Other products lose so much of this information that the bass sounds generic, the playing less than extraordinary? The DT-10 was superb at conveying all the nuance and detail that made the bass guitar a palpable and tangible presence between the loudspeakers.

Compared with the No.31, the DT-10's bass was warmer and a little fatter. The Levinson transport was leaner, tighter, more analytical, and had slightly better extension at the extreme bottom end. When listening to the DT-10, however, I found myself more rhythmically involved with the music. I wasn't aware of this impression at first, but found myself tapping my foot and enjoying the music's drive more with the DT-10. When connected to the Reference 64 with the Time Sync function engaged, the enhanced sense of rhythm and power was extraordinary.

The DT-10's overall perspective was a little on the dry and forward side compared to the No.31. The Krell transport had a more immediate, incisive, and present rendering, rather than a laid-back sense of case. Similarly, the DT-10 didn't present as much space and air on naturally miked acoustic recordings. The soundstage was less deep and spacious through the DT-10, although the Krell threw very tight and well-defined images. The sax on Kci Akagi's CD Playroom (Bluenoon/Moo R2 79342) moved forward in the soundstage when played back on the DT-10, and had less air and space surrounding it. This gave the music more immediacy, but at the expense of ease and soundstage depth. If the No.31 put me in Row P of the concert hall, the DT-10 put me in row H.

One hallmark of a great transport is its ability to resolve recorded detail. The transport should present lots of musical information to the listener, yet not sound aggressive, etched, or analytical. In this area, the DT-10 and the No.31 stand alone. Both can extract the finest nuances of the musical performance—nuances that often convey so much musical expression. When you listen to familiar music and hear previously unnoticed shades of expression, you know the component is revealing more of the recording's details. This happened to me with the DT-10; subtle vocal inflections suddenly became obvious, and added to the music's meaning.

Although the DT-10 revealed a lot of information, it was of a different kind than that revealed by the No.31. The latter presented more fine detail, particularly in the treble. There was more action through the No.31's top end, but in a delicate and understated way. This detail I'm describing is the music's very fine structure at the lowest levels, something that was better conveyed by the No.31. The DT-10's presentation of this detail tended to be more immediate and salient than the No.31's greater sense of subtlety and ease. Nonetheless, the DT-10 excelled at resolving the kind of low-frequency detail described earlier.

The DT-10's portrayal of instrumental timbres was less liquid compared to the No.31's. In fact, this is my biggest criticism of the DT-10: it tended to make textures a little hard and brittle. Cymbals took on a more metallic character, and there was a trace of extra edge to saxophone. The DT-10's character was nearly the opposite of that of the C.E.C. TL 1 I reviewed in Vol.16 No.7, p.91. The TL 1 was lush, soft, smooth, soft and slow in the bass, very spacious, and lacked the last measure of resolution. The DT-10 was immediate, powerful and well defined in the bass, more highly resolving of information, a little hard in the mids and treble, and with a somewhat dry perspective.

It was interesting to have the No.30/No.31 and the Reference 64/DT-10—two superb but different digital front-ends—for an extended period. Without realizing it, I tended to listen more to certain music with one digital source, and to an overlapping—but slightly different—mix of music with the other. I found myself enjoying rock, electric blues, and fusion with the DT-10, and jazz, classical,
and acoustic music more through the No.31. These impressions held even with the Time Sync function engaged between the DT-10 and the Reference 64—an advantage not possible with the No.31 driving the Reference 64.

MEASUREMENTS
This is the first CD-transport review to include a measurements section: We can now measure how much jitter appears in a transport's digital output using the UltraAnalog jitter analyzer described in the October and November 1993 issues of Stereophile. For comparison measurements on other products, see the November '93 feature story.

Fig.1 shows the DT-10's jitter (from the AES/EBU output) with three test signals: digital silence (solid trace), a -90dB, 1kHz sinewave (heavy dashed trace), and a full-scale, 1kHz sinewave (lightly dotted trace). The RMS levels, measured over a 30kHz bandwidth, were 34picoseconds (silence), 127ps (-90dB sinewave), and 39ps (full-scale 1kHz sinewave).

Using the same high- and low-level music signals described in last November's jitter article, I plotted the DT-10's jitter, shown in fig.2. The RMS levels were 67ps (low-level music, solid trace) and 43ps (high-level music, dotted trace). Incidentally, the DT-10's jitter levels were about twice as high from the coaxial output as from the AES/EBU output. (The test results presented here were all measured at the AES/EBU output.)

Although these RMS levels are moderate, note that the traces are smooth rather than spiky. (The peak between 7 and 8kHz in fig.1's digital silence jitter trace is due to the subcode signal. The peaks at 1kHz and its harmonics in fig.1 are signal-correlated, due to the format of the AES/EBU data stream.) This indicates that the DT-10's jitter is the more sonically benign random jitter instead of the more musically degrading periodic jitter. Note also the complete absence of jitter at the power-line frequency of 60Hz.

I must again caution readers not to jump to conclusions about a transport's sound quality based on the jitter measurements. The RMS levels and curves shown here represent the transport's jitter performance into the UltraAnalog jitter analyzer's input circuit, and may not reflect the transport's performance into different D/A converters. Moreover, the technique is so new—last November's article was the first published presentation of transport jitter measurements anywhere—that we don't yet understand the correlation between sound quality and transport jitter.

Finally, the DT-10's jitter performance is theoretically a moot issue when the DT-10 is used with Krell processors having the Time Sync input. If the Time Sync clock output is jitter-free (a much easier task than achieving low-jitter in the interface), the jitter seen in the measurements won't appear at the DAC's word clock and thus cannot corrupt the sound. Nevertheless, the DT-10's sonic character remained identifiable even with the Time Sync engaged.

I also tested the DT-10's tracking ability by playing the data dropout test encoded on the Pierre Verany two-CD test set. Each track in the series has a longer dropout: the higher the track number the transport will play without skipping, the better its tracking ability. Most players and transports begin skipping at about track 34, with good players reaching track 38. To my surprise, the DT-10 played through every track, without skipping, to track 50—the highest in the series. When searching the higher track numbers, the DT-10 took a few seconds to settle down, but then played through the track without a hitch. This is the best tracking performance I've seen, by a wide margin.

CONCLUSION
The Krell DT-10 transport is unquestionably a superb transport. I was, however, less enthusiastic about it than I was about Krell's Reference 64 processor (reviewed elsewhere in this issue). On the plus side, the DT-10 has a warm, rich tonal balance coupled with excellent resolution of low-frequency detail. Its pace, rhythm, and drive were superb by any measure. In addition, the DT-10 is beautiful to look at, and built to survive World War III.

On the minus side, the DT-10 sounded a little dry and forward—characteristics that may suit some systems better than others. The transport also tended to impart a trace of harshness to instrumental and vocal textures. I should add that my very revealing playback system is not very forgiving of these characteristics. Through another system, the DT-10's shortcomings may be less of a liability.

The inescapable point of comparison for the DT-10 is the $600-more-expensive Mark Levinson No.31, a product that established a new level of performance for CD transports. They're both superb products, but very different in character: the DT-10 was visceral and immediate, the No.31 more subtle and refined. In my system, I preferred the No.31's sense of case, more liquid rendering of timbre, and greater sense of space. These qualities more than made up for the DT-10's more exciting, more rhythmically involving presentation. I also found the No.31 easier to operate, despite its additional disc damper and top-loading design.

Nevertheless the DT-10 is among the best transports I've heard. However, its distinct sonic signature requires careful matching to the playback system. A careful audition in one's system is, as always, mandatory.

If your system needs a little more life, drive, and immediacy, the Krell DT-10 CD transport will probably be just the ticket.

Stereophile, January 1994
Krell reference 64 digital processor

Robert Harley

Digital/analog converter with 64x oversampling digital filter. Frequency response: 4Hz-20kHz, -0.1dB. SNR ratio: 108dB (A-weighted). Linearity: ±0.3% at -90dB. THD+N: 0.001%. Channel separation: ≥110dB at 1kHz. Inputs: two coaxial on RCA jacks, one AES/EBU on XLR jack, one TosLink optical, one AT&T ST-type optical, separate "Time Sync" clock input (two additional digital inputs are provided for tape monitoring, one coaxial, one ST-type optical). Digital output: one coaxial on RCA jack. Analog outputs: unbalanced on RCA jacks, balanced on XLR jacks. Analog output voltage: 2.4V (unbalanced), 4.8V (balanced) at full-scale. Conversion: custom Krell DAC modules. Digital filtering: DSP-based 64x oversampling filter running custom Krell software. Dimensions: 19" W by 5.63" H by 14" D. Shipping weight: 54 lbs. Warranty: 5 years parts and labor. Price: $14,000. Approximate number of dealers: 55. Manufacturer: Krell Digital, 35 Higgins Drive, Milford, CT 06460. Tel: (203) 874-3139. Fax: (203) 878-8373.

Remember the early days of CD, when some players were touted as having the revolutionary new "2x-oversampling" digital filters?

Those early oversampling players were the first to replace the analog output filter with one that operated in the digital domain, thereby avoiding the problems of steep analog filters. In fact, those analog filters were a significant source of unmusical sound in first-generation CD players, introducing severe phase shift, ringing, passband ripple, and often upper-treble attenuation. They were necessary, however, to remove the spurious images that appeared at multiples of the sampling frequency, and to smooth the stairstep waveform created by the reconstruction process.

Digital filters changed all that. Instead of putting a steep analog "brick-wall" filter after the DAC, the digital filter carried out the same function by performing mathematical operations on the digital signal within a chip. With filtering being performed before the digital/analog conversion process, designers could get rid of steep analog output filters, and their sonic problems.

Digital filtering had other advantages. The filter can generate new sample points between the original audio samples, thus multiplying the sampling frequency. This process, called oversampling, shifts the effective sampling rate from 44.1kHz to a multiple of 44.1kHz. A 4x-oversampling digital filter, for example, would interpolate three new sample points (generally set to zero amplitude) for each input sample, bringing the sampling frequency to 176.4kHz (4 x 44.1kHz). The spurious images at multiples of the sampling frequency still appear, but they are now shifted away from the audio band, where they can be easily filtered (even by one with a gentle 6dB/octave slope that won't interfere with the audio signal). Today, virtually all CD players use digital filtering.

This brings us to the current state of digital audio reproduction. Most filtering today is performed by the 8x-oversampling NPC SM5803 or SM5813 filter chip or the equivalent from Burroughs, the DF-1700, a device found in about 90% of the high-end digital processors currently on the market. Designers have very few options when selecting a digital filter.

There's another way of implementing a digital filter: build your own. Custom filters are made with Digital Signal Processing (DSP) chips controlled by instructions telling the chips what to do to the audio samples. These instructions are the filters' "software," or filtering "algorithms," that determine the filters' characteristics. Changing the filter is as simple as changing the chip containing the software (or firmware).

This is exactly what Krell has done with the Reference 64 processor—but with a twist. Instead of oversampling at 8x, the Reference 64's filter operates at an astonishing sixty-four times sampling frequency, or 2.8224MHz. In fact, the Reference 64 has the highest sampling rate of any digital filter in a digital processor. This route is expensive, exacting, and requires a high level of engineering expertise to accomplish.

How much better is this elaborate approach than using an off-the-shelf chip? Do digital filters have a large effect on a processor's sound? And are DSP-based converters worth the attendant high cost?

These questions were on my mind as I took a look inside this remarkable piece of engineering and warmed it up for some critical listening.

TECHNICAL DESCRIPTION

The Reference 64 sports the entire Krell line's new styling. Dark gray-anodized aluminum panels are flanked by black aluminum sides, with a wide black panel running down the middle. The 64's appearance is serious and businesslike. (Incidentally, the Reference 64 replaces Krell's earlier SBP-64X processor.)

The 64 comprises two chassis stacked atop one another. The lower chassis is the power supply and the top chassis contains the processor. Large heatsinks running down the power supply's sides provide a good visual match for the processor's black side panels. Two blue LEDs on the power supply indicate if the analog and digital supplies are working, and red LEDs on the processor show that the analog and digital supplies are present inside the processor. Two rows of five buttons each run down the processor's front panel, providing input selection, polarity reversal, digital tape monitor, and selection of Krell's "Time Sync," a circuit that accepts a clock from a Krell transport on a separate line (more on this later). Each button is accompanied by a red LED to show that the function is engaged. Three additional LEDs indicate when the unit is locked to one of three sampling rates. All but one LED
can be turned off with a front-panel button.

The rear panel has an unusual connection method between the power supply and processor. Instead of by cables, the connection is made by a metal panel with four D-connectors mounted to it. These D-connectors fit into D-connectors on the power supply and DAC, electrically joining the power supply to the processor. This arrangement also mechanically joins the two chassis at the rear. The processor's front feet fit into "shoes" on the power supply that lock the two chassis together at the front.

Five digital inputs are provided: two on RCA jacks, one TosLink, one AES/EBU, and one ST-type optical. A digital in/out tape loop on RCA jacks (with an additional tape input on an ST-type jack) is included for driving a digital recorder. A sixth input on an ST-type jack, marked "Time Sync," allows the Reference 64 to lock to an external clock from Krell's transports. When the Time Sync connection is made between the Reference 64 and a Krell transport, the clock is sent separately instead of being recovered from the SPDIF or AES/EBU datastream.

This technique can theoretically eliminate transport- and interface-induced jitter in the processor's clock—provided the separately transmitted clock is jitter-free. Of course, any jitter in the separate clock, or jitter-inducing mechanisms between the clock source and the DAC (the transmission path, ICs, pcb traces, etc.), will produce jitter at the DAC's word clock. Note that the transport sends the clock signal to the processor on a separate line—the transport is still the master and the processor the slave. (In Linn's Karik/Numierik CD player, the processor generates a master clock which is sent back to the transport, forcing the transport to lock to the processor.) To use the Reference 64's Time Sync function, you must drive it with a Krell transport; no standards exist for defining the separate clock line between processors and transports.

Analog output is provided on a pair of RCA jacks (unbalanced) and XLR jacks (balanced). An IEC AC jack finishes off the rear panel.

The power supply is massive, using three very large custom-made toroidal transformers, five bridge rectifiers, and 11 regulation stages. The analog, digital, and DAC supplies are sourced from separate transformers. All power-supply voltages are doubly regulated (one regulation stage feeding another regulation stage). The regulation stages are unusual in that they use a TO-220—type regulator (the ubiquitous three-pin devices) only to set the voltage, with a pass transistor (in a TO-3 package) supplying the current. This arrangement is repeated in both stages of the cascaded regulation. The large TO-3 pass-transistors are mounted to the heatsinking side panels. The TO-3 package is the large metal can most often used in power transistors. They're more expensive and generate more heat than TO-220s, but can handle much more current and are far more robust. The cascaded regulation is used on the digital +5V supply, the analog output stage rails, and the DAC module supplies. Power-supply filtering is provided by three 4700μF and six 1000μF electrolytic caps.

All these power-supply circuits are housed in the Reference 64's lower chassis, isolated from the digital processor circuitry located in the upper chassis. The lower chassis runs very hot—too hot to leave your hand against for more than a few seconds. In fact, the Reference 64's power supply runs hotter than the big Krell KSA-300S power amplifier!

The Reference 64's processor section is quite a piece of engineering. At its heart is the elaborate 64x-oversampling digital filter, which consumes nearly half the processor's real estate. The Reference 64's digital filter section—a single chip in most processors—runs on four Motorola DSP56001 Digital Signal Processing (DSP) chips with lots of support ICs. The filter takes in 16-bit audio data at 44.1kHz and outputs low-pass filtered 18-bit data (24-bit is the internal word length) at 2.8224MHz, or 64x the input sampling frequency. This makes the Reference 64's filter the highest-oversampling digital filter extant.1 For comparison, the popular NPC filter chips convert 16-bit audio data at 44.1kHz to low-pass filtered 20-bit data at 352.8kHz (86fs).

The DSP chips are arranged in left- and right-channel pairs. The first DSP brings the signal up to 4x-oversampling, and the second DSP is two 4x-oversampling filters cascaded. Although the second DSP seems to do a disproportionate amount of the work, the second- and third-stage filters require fewer taps and thus less processing horsepower. Erasable Programmable Read-Only Memory (EPROM) chips contain the filtering instructions for the DSP chips. The filter's output—2.8 million 18-bit audio samples every second per channel—is written to a FIFO (first-in, first-out) buffer that acts as an interface between the filter and the D/A converter section.

1 The 64x-oversampling Wadia processor runs at 16x-oversampling in the digital domain, then uses four time-staggered D/A chips in parallel to get to a 64x rate.

The audio samples are then clocked out of the buffer to the DAC. The timing supplied to the filter, FIFO, and DAC is critical.

The DAC chips and associated circuitry are housed in machined-aluminum modules and mounted to the two PCBs by hand—on connectors. The DAC modules can be removed by loosening two nuts and pulling up on the housing. A small machined-aluminum cover is bolted to the DAC housing, covering a slot that provides access to the DAC's MSB trimmers. The aluminum housing reportedly provides a more stable thermal environment for the DAC.

The DAC itself is the Burr-Brown PCM64, a device I haven't seen in any other digital processor. Although the PCM64 is an 18-bit device that needs MSB trimming (compared to the PCM63, which is a 20-bit part and needs no trimming), it was chosen because it could handle the very fast operating speeds generated by the 64x-oversampling digital filter. Unlike DACs that use the More Significant Bit (MSB) to be internally trimmed at the factory for best linearity, the PCM64 has the provision for adjusting the four MSBs. In the Reference 64, four trim pots inside the aluminum housing are adjusted by hand before the unit leaves the factory. A fifth trim pot sets the gain, which is matched between channels.

The PCM64 has a fairly high level of glitch in its output. DAC glitch is a spike of energy in the output signal when the converter changes state—as it does at every sample. To remove the PCM64's glitch, Krell designed a de-glitch circuit based on an AD841 op-amp. This is followed by another Analog Devices part, the AD846 op-amp used as a current-to-voltage (I/V) converter. The voltage output is then buffered by a PMI SSM2131 device. The de-emphasis circuit is built around the PMI output buffer. All this circuitry resides inside the aluminum DAC housing.

The analog signal from the DAC module is input to a discrete, direct-coupled (with a DC servo) output stage. The signal is first converted from single-ended to balanced with a phase splitter, with each polarity amplified independently. The single-ended output on the RCA jacks is taken from pin 2 (the non-inverting, or "hot") pin of the XLR jack.

Note that the signal is balanced in the analog domain after the DAC, not in the digital domain before the DAC (as is done in Theta, Meitner, Mark Levinson, Sonic Frontiers, Kinergetics, and some Meridian processors). Converting a digital signal to balanced before the DAC

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Stereophile, January 1994

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Nov. 1990 - Model PC 8.5
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requires four DACs, four I/V converters, and four analog output stages (for two channels), but has advantages over analog-domain balancing. First, digital-domain balancing doesn't require a phase splitter in the analog signal path. Second, any DAC artifacts common to both channels will cancel with true digital-domain balancing. Frankly, I was disappointed that the Reference 64 wasn't balanced in the digital domain, considering its $14,000 price tag. This is, however, an expensive feature, and one that may not have been possible considering the cost of implementing a custom 64x-over-sampling digital filter. One could also argue that a $14,000 processor shouldn't use an off-the-shelf NPC filter chip.

The input receiver—a large, potted module made from machined aluminum—looks custom-designed. It contains only a Crystal CS8412 input receiver chip and a custom programmable device (PAL). The potting reportedly allows the CS8412 to operate in a more stable thermal environment. Krell says this technique improves the processor's sound.

Finally, I must comment on the Reference 64's extraordinary build quality. Its gorgeous metalwork, rock-solid build, beefy power supply, and bulletproof appearance contribute to the impression of an all-out effort. Moreover, the inside, with its beautifully machined and finished DAC housings and input receiver block, looks just as finished as the outside.

OTHER EQUIPMENT
I auditioned the Krell Reference 64 as part of my usual system, and also in the context of an all-Krell system comprising the KRC preamplifier, KSA-300S power amplifier, and DT-10 CD transport (with the Time Sync connection). Most of the auditioning was through an Audio Research LS5 preamp driving the KSA-300S via the Reference 64's balanced outputs. CD transports driving the Reference 64 included Krell's top-of-the-line DT-10 (reviewed elsewhere in this issue) and the Mark Levinson No.31. Digital interconnects included a Madrigal AES/EBU cable, Aural Synthomices Digital Standard coaxial, and AudioQuest Optical Pro II (ST-type). I listened to the Reference 64 on its own and in direct, matched-level comparisons with the Mark Levinson No.30 and the Sonic Frontiers SFD-2 ($4695, reviewed last issue). Loudspeakers were the Thiel CS3.6es, connected with 8' runs of AudioQuest Sterling.

I also had a unique opportunity to evaluate the Reference 64 when driven by an original 20-bit master recording played back on the new $26,500 Nagra D open-reel digital recorder. While the Reference 64 was under review, JA and I recorded pianist Robert Silverman performing Liszt with the 20-bit Nagra (and, of course, on our modified ½" Ampex ATR-100 analog machine) for future release in the Fall as a Stereophile CD and LP. After the sessions, I brought the Nagra and the master tapes home to drive the Reference 64, with the memory of the live microphone feed (and the piano in the hall) fresh in my mind. I'll report on this evaluation later.

MUSIC
After sufficient warmup, my impressions of the Reference 64 were largely favorable. The 64's overall perspective was midway between the No.30's laid-back ease and the Sonic Frontiers SFD-2's forwardness. On some music, the No.30's lack of incisiveness was a liability; on other music, the SFD-2's overly immediate perspective detracted from the musical experience. I found the Reference 64's incisive, yet not aggressive, portrayal a good match for a wide range of music. The Reference 64 sounded immediate, detailed, and "tight" without going over the top and sounding etched or analytical.

On the plus side, the Reference 64 had some spatial qualities I haven't heard from digital before. The processor excelled at presenting a cohesive, focused, and clearly delineated soundstage. The ability to hear exactly where an instrument was located in space was uncanny. Instruments that sounded somewhat amorphous through other processors— the acoustic bass on "Moonshine #2" from the first Robert Lucas CD (AudioQuest AQ-CD101)—were perfectly focused and tangible through the Reference 64. Moreover, there was terrific front-to-rear depth, with layers of distance separated by space. The depth had many gradations of distance, rather than just a few layers. Soundstage transparency was similarly impressive, with a hear-through quality such that I could hear all the way back into the hall's farthest recesses. The Reference 64 maintained its superb soundstaging when the music got loud and complex. The soundstage stayed focused, deep, and transparent even when the processor was pushed with complex, full-scale signals.

The Reference 64 also kept individual instrumental threads separate from the whole. The music was never thick, homogenized, or blurred. Just as the soundstage stayed coherent and focused when the music got loud, the Reference 64 maintained its ability to differentiate individual images from the whole at high signal levels. During the exceedingly complex passages of the Liszt Piano Sonata in B-minor played by Robert Silverman (which just reached digital full-scale, 0dBFS, on the peaks), the Reference 64 kept the left- and right-hand lines perfectly delineated, rather than allowing them to degenerate into a roar.

Although the Reference 64's soundstaging was first-rate, the No.30 threw a broader, more enveloping feeling of width. The Reference 64 was tighter, narrower, and more focused. The Krell's soundstage, however, had a pinpoint precision not heard from the No.30. In addition, the Reference 64 had a unique quality that I greatly enjoyed: a feeling of palpability and immediacy from instrumental images, yet a sense of space and bloom. Many processors with good space and depth lack visceral immediacy. Others that are forward and incisive tend to be dry and lacking in air and space. The Reference 64 was stunning in its ability to throw a present, tangible image surrounded by air. This was particularly noticeable on the Robert Silverman recording: the Steinway was right there in the listening room, with the sound of the hall enveloping the image like a halo.

The Reference 64's bass balance was leaner than that from the somewhat fat SFD-2, but fuller than the No.30's tight rendering. Overall, the Reference 64's bass was excellent, with exceptional dynamics and drive. In particular, I was impressed by the feeling of transient attack in the lower registers. Roscoe Beck's bass on the Robben Ford CD Robben Ford and the Blue Line (Stretch Records STD 1102) had a terrific feeling of bounce and rhythm, created in part by the Reference 64's rendering of bass dynamics. I also had this impression listening to the magnificent Steinway on the original 20-bit Nagra master tapes of Robert Silverman. The left-hand lines of the Liszt Sonata were reproduced with tremendous impact, power, and suddenness. Throughout the auditioning, I kept noticing this quality as well as the forceful, visceral immediacy the Reference 64 imparted to the music. In terms of LF pitch resolution, the Reference 64 was good, but not quite up to the standards set by the Sonic Frontiers SFD-2. For example, the SFD-2 was slightly better at revealing the way the Steinway's low
notes changed harmonically as they decayed during the rests. This dynamic quality heard in the bass extended to the rest of the spectrum. The Reference 64 was particularly adept at portraying microdynamics—the small-scale transient aspect of music such as percussion, and the quickness of a drumstick hitting the drum head. The sound was the antithesis of slow, blurred, or fat. Macrodynamics—the sheer sense of slam and power—were also superb through the Reference 64. Orchestral climaxes were startling in their impact, a quality attributable to both the Reference 64's tremendous dynamics and lack of strain or congestion on peaks.

The Reference 64 had a terrific sense of pace and rhythm, in part because of the characteristics described above. The music had a power and drive heard only from a handful of products. Moreover, the tempo seemed faster and more upbeat through the Reference 64, further adding to the sense of the music's forward propulsion. I greatly enjoyed this aspect of the Reference 64.

The Reference 64's treble purity wasn't up to the standards set by the No.30 and SFD-2, tending to have a slightly grainy and untidy upper treble. This was manifested as an increase in sibilance and a slight "whitening" of sax and other brass instruments. The vocals on Michael Ruff's "Speaking in Melodies" (Sheffield Lab CD-35) and the previously mentioned Robben Ford discs were good examples of how sibilance became more noticeable through the Reference 64. Similarly, violins had a bit of edge and bite rather than a liquid texture. Use of the AES/EBU connection and the Time Sync function tended to ameliorate this characteristic. Nevertheless, in comparison with the SFD-2 and No.30, cymbals had a slightly metallic character and a fine layer of grain overlaying them. The No.30 had a more delicate, subtle, and filigreed presentation of treble detail. Similarly, instrumental textures were slightly hard rather than lush and liquid. This didn't affect all instruments, only those with significant energy in the upper registers. I don't suppose to imply the Reference 64 was hard or glassy; the Steinway on the Robert Silverman recording was never edgy or brittle. Instead, instruments such as saxophones took on slightly harder timbres. I stress that this characteristic—and thus my criticism—are minor. I enjoyed music to the fullest extent through the Reference 64.

In three-way comparisons between the Reference 64, No.30, and SFD-2, I had the unusual experience of liking the Reference 64 best on some music, the No.30 best on other selections, and the SFD-2 best on yet other discs. For example, on the very upbeat and rhythmically driving Michael Ruff disc, the SFD-2 was the clear winner. Its clean treble, immediacy, and driving bass best suited this music. The Reference 64 came in third with this disc; although it had the best sense of pace, the slightly untidy treble emphasized sibilance (especially on the background vocals). With the Robert Lucas CD Usin' Man Blues, I liked the No.30, followed by the Reference 64, with the SFD-2 finishing third. The SFD-2's forwardness made the harmonics too aggressive and in-your-face, while the No.30 had a sense of ease and a lack of hardness that made it the first choice on this music.

Finally, the Reference 64 clearly excelled in reproducing full-scale orchestral music such as Trinito (Reference Recordings RR-52CD). The Krell processor had more immediacy, palpability, and bite than the No.30, yet didn't go over the edge to becoming aggressive. Moreover, the Reference 64's precise image focus, depth, and finely resolved spatial perspective provided the most satisfying perspective on the orchestra. I also greatly enjoyed the Reference 64 on rock and electric blues—the terrific Robben Ford disc is a good example—for its outstanding sense of pace and rhythm.

In short, the Krell Reference 64 processor is among the best in digital processors. It had some qualities—rhythmic drive and soundstaging, for example—that set it apart from the competition. It didn't, however, have the treble smoothness or purity of the No.30 or SFD-2. Although these impressions were primarily from listening to the balanced outputs, the Reference 64 had all the qualities described from the single-ended outputs.

**Measurements**

The Reference 64 had a maximum output level of 2.4 V from the unbalanced outputs and 4.8 V from the balanced jacks—exactly the 6dB increase expected. Channel balance—a measure of how closely matched the left- and right-channel output levels are to each other—was virtually perfect, with the right channel measuring just 0.03dB higher than the left. This excellent performance is no doubt due to the manual gain-trimming at the factory.

Output impedance was a low 16 ohms from the unbalanced outputs and 32 ohms from the balanced outputs, measured at any audio frequency. This low output impedance suggests that the Reference 64 won't interact with the input impedance of preamplifiers, and will drive passive level controls adequately. DC levels at the output were low to moderate, measuring 3.9mV (left channel) and 10.4mV (right) from both the balanced and unbalanced outputs. I heard no pops or ticks through the loudspeakers when I switched between inputs or activated other front-panel functions.

The Reference 64 had no problem locking to 32kHz, 44.1kHz, or 48kHz sampling frequencies. The unit does not invert absolute polarity (a positive-going impulse at the input is positive-going at the output) unless the front-panel "180°" button is pushed. The XLR is wired with pin 2 "hot," meaning the Reference 64 is non-inverting when used with other "pin 2 hot" equipment.

The following measurements were taken from the Reference 64's balanced outputs. If the unbalanced performance was different, it is noted in the text.

First, the Reference 64 had the flattest frequency response of any processor I've measured, being down just 0.04dB at 20kHz (fig.1). This is the result of the custom digital filter—the designers can control the point where the passband ends and the transition band starts. The transition band is the frequency span between where the filter begins rolling off and the point where the attenuation
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is complete. Most processors are down a few tenths of a dB (0.3dB is typical) at 20kHz. Some software-based processors have much greater treble rolloffs—3dB at 20kHz in one unit. Note in fig.1 how tightly the traces overlap, revealing the perfect level matching between channels.

Also included in fig.1 is the Reference 64's de-emphasis error. There's a slight rise above 7kHz, reaching a maximum error of +0.25dB at 20kHz. This may be barely audible as an increase in upper treble and "air" when playing pre-emphasis discs (of which there are very few). Krell chose to use an analog de-emphasis circuit rather than the DSP chips to perform de-emphasis in the digital domain; the latter would have consumed precious computing cycles.

Fig.2 shows the Reference 64's inter-channel crosstalk. It measured -112dB at 1kHz, decreasing to -101dB at 20kHz. (Krell specifies 111dB channel separation at 1kHz.) This is better-than-average performance, but short of the 130dB (at 1kHz) channel separation seen in the best-measuring processors. Unbalanced crosstalk was identical.

A spectral analysis of the Reference 64's output when decoding a -90dB, dithered 1kHz sinewave is shown in fig.3. There's a moderate level of noise visible below 500Hz, particularly at the powerline frequency of 60Hz. We can also see some negative linearity error, revealed by the peaks at 1kHz not quite reaching the -90dB horizontal division.

Fig.4 is the same type of spectral analysis, but is made with an input signal of all zeros (no signal) and a 200kHz measurement bandwidth. The noise rises gently and inconsequentially above the audio band, with no peaks in the trace that would indicate DAC artifacts.

The Reference 64's linearity, shown in fig.5, was moderately good, with a slight negative error below -75dB that peaked at about -95dB. Interestingly, the linearity improved when I measured the single-ended outputs about an hour after measuring the balanced outputs. Remeasuring the balanced outputs confirmed that the linearity error decreases as the unit warms up. The plot in fig.5 was the best I could get, made after the Reference 64 had been on the bench about 2½ hours. Even after this warmup time, the Reference 64 didn't get as hot as it normally does when left on continuously. Obvi-

ously, the MSB trimmers are adjusted when the unit is at its maximum temperature, and it will perform its best when fully warm. Note that the review sample didn't meet Krell's specification of ±0.3dB linearity error at -90dB. It's possible—though unlikely—that the 2dB and 3.7dB linearity errors at -90dB would be reduced to less than 0.3dB with additional warmup. Incidentally, the Reference 64 takes a very long time to sound its best—it should be left on for at least two days before performing any critical auditioning. Its sound keeps on improving, even after a week!

Fig.6 is the Reference 64's reproduction of a 1kHz, undithered sinewave at -90dB. The staircase waveform is moderately good, but overlaid with audio-band noise. Note that the horizontal scale is offset (0V to 1mV, rather than the usual ±500µV) because of some DC present.

Much has been made of the square-

Fig.1 Krell Reference 64, frequency response and de-emphasis error (bottom) (right channel dashed, 0.5dB/vertical div.).

Fig.2 Krell Reference 64, balanced crosstalk (right-left dashed, 10dB/vertical div.).

Fig.3 Krell Reference 64, spectrum of dithered 1kHz tone at -90.31dBFS, with noise and spurious (1/2-octave analysis, right channel dashed).

Fig.4 Krell Reference 64, spectrum of silent track, 20Hz-200kHz, with noise and spurious (1/2-octave analysis, right channel dashed).

Fig.5 Krell Reference 64, departure from linearity (right channel dashed, 2dB/vertical div.).

Fig.6 Krell Reference 64, waveform of undithered 1kHz sinewave at -90.31dBFS.
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wave response of custom DSP-based digital filters. Some of them—the Meitner and the Wadia—have minimal overshoot and/or ringing typical of conventional filters. The Reference 64’s squarewave response, shown in fig.7, has some overshoot and ringing, but the peaks aren’t clipped as they are with the NPC filter chip.

The Reference 64’s noise-modulation performance is shown in fig.8. Each trace is the Reference 64’s noise floor with a different input level (from −60dB to −100dB; the 41Hz stimulus tone is removed by a high-pass filter). Ideally, the noise floor shouldn’t shift as a function of input level—you should see five perfectly overlapping traces. We can see that the Reference 64 has a low noise level, but there is also some divergence of the traces, which indicates that the noise floor increases slightly at low signal levels. The traces, however, remain fairly straight, suggesting that the noise floor’s spectral balance doesn’t change with input level.

Fig.9 is an FFT of the Reference 64’s output when decoding a full-scale mix of 19kHz and 20kHz sinewaves. (Each component is at −6dBFS, the combined waveform therefore peaks at 0dBFS.) The 1kHz difference component is relatively low in level (−92dB), as are the sidebands around the test-signal frequencies. There is, however, some spurious energy apparent at 3kHz.

I was unable to measure the Reference 64’s word-clock jitter: the DACs are housed in aluminum cases that make them inaccessible unless they’re unplugged from the mother board. This is unfortunate, because it would have been possible to measure the effects of the Time Sync function on word-clock jitter. Although I couldn’t measure its effect, it was certainly audible.

CONCLUSION
The Krell Reference 64 digital processor is among a handful of processors that can truly be called state of the art. The 64x-oversampling digital filter, in particular, is an impressive technical achievement. Many of the Reference 64’s unique musical qualities are perhaps the result of this sophisticated custom filter. Moreover, the Reference 64’s cosmetics, build quality, and features (lots of inputs and outputs, and the Time Sync port) establish it as a real contender for the top echelon of digital processors.

Musically, the Reference 64’s performance was clearly Class A. Its sonic strengths and weaknesses, however, lay in different areas of musical reproduction in relation to the other Class A processors. The Reference 64 was unequalled in its soundstage focus and ability to reveal a recording’s spatial information. I also found its bass dynamics, sense of power, and rhythmic drive extraordinarily compelling musically. Potential purchasers should be warned, however, that the Reference 64’s upper midrange and treble are less clean than those of the Mark Levinson No.30 and Sonic Frontiers SFD-2. Careful system matching is therefore essential in order to minimize the Reference 64’s few shortcomings.

If forced to choose between the identically priced Reference 64 and the No.30, I would choose the No.30 for my particular system and tastes. In another system, or with a different listener, the comparison could go the other way. We all value different things in music reproduction; choosing one product over another is a matter of weighing the musical significance of each product’s sonic strengths and weaknesses. The Reference 64 was clearly better at soundstaging and pace; the No.30 had a greater sense of ease and a more refined midrange and treble. It’s best for you to decide which presentation you prefer. But if you’re looking for the best digital playback money can buy, the Krell Reference 64 digital processor should be on your short list of products to audition.

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MACH 1 Acoustics? Cute name. Mach 1 is, of course, the speed of sound—the speed at which a loudspeaker's acoustic output is forever constrained to travel. Quite a fitting choice for Marc McCalmont, Marine and jet pilot turned speaker designer. Marc retired to Wilton, NH together with Melissa. (Oops, that should be MLLSA, the well-known acoustic analysis system—not Marc's girlfriend.)

MACH 1 started off by selling their DM-10 loudspeaker direct to the public with a 30-day return policy, but has now set up a small network of specialist retailers. The company has kept up its profile in the audio press for the past few years, advertising the DM-10 and, more recently, the DM-10 Signature. It was through one of these ads that I learned about the latter.

MACH 1's philosophy of using the best parts they can find is both laudable and reassuring. What caught my attention was MACH 1's use of the Accuton tweeter and midrange. These drivers feature concave "ceramic" domes, the product of vapor-deposition technology developed by Ceratec-Thiel in Germany. The Accuton drivers display smooth frequency response and excellent time-domain behavior, with almost textbook-perfect impulse responses. Naturally, they're very expensive, and as a consequence have seen little commercial application in the US. But no matter how cleverly any designer synthesizes a given driver complement, the resultant sound quality is ultimately dependent on each driver's in-band resonances and colorations. If you start with a lemon, no matter how hard you squeeze, you'll only get lemon juice. It's imperative that one start with the best drivers obtainable at a given price point.

DO'S Law of Speaker Design states that the degree of design difficulty increases as the square of the number of drivers. Thus, a three-way is more than twice as difficult to engineer than a two-way. The preponderance of two-way designs in the market is a practical consequence of this law. Computer-aided design techniques are essential tools for synthesizing complex crossover networks for a three-way loudspeaker. Such software eliminates a lot of guesswork, allowing a variety of design options to be investigated before the first plank is sawn. Not only were DM-10's the bass alignment and crossover network computer-generated and -optimized, but McCalmont went one step further, optimizing the enclosure's internal bracing using finite-element structural analysis.

It would be misleading to describe the DM-10 Signature as simply a refined version of the standard DM-10. For one thing, the driver complement is different. While the 1" Accuton tweeter is still used, the Accuton midrange has been replaced by a high-performance Peerless 5.5" polypropylene-cone driver with an inherently very flat (+1dB) response over the 300Hz-3kHz range. The midrange driver has been modified by MACH 1, particularly with regard to damping reflections from the rear chamber. The 10" woofer, also from Peerless, is slightly larger than that in the standard DM-10. However, a similar bass alignment is used: a near critically damped sealed box. On the whole, the Signature qualifies as a new design; similarities with the original have mainly to do with looks and design philosophy.

TECHNICAL DETAILS

The cabinets, made by a New Hampshire custom furniture craftsman, are beautiful to behold and incredibly well built. The walls are a laminate of 1.25" MDF and a 1/4" A-grade veneer. A loudspeaker's front baffle should be the strongest and best-damped enclosure wall because it acts as a sounding board for the woofer basket: the DM-10's baffle is 2" thick with constrained layer damping. Enclosure rigidity is further enhanced by internal bracing.

The enclosure is "de-coupled" from the floor via rubber isolation feet. McCalmont points out that suspended wood floors are the largest vibrating surfaces in a listening room, and says that the rubber feet improve midrange imaging and bass definition. In my present environment of carpet and ¾" foam over a concrete slab, I've always found spiked feet desirable for improving stability and enhancing lower-octave clarity. MACH 1 offers an optional, spiked, nonresonant platform for their speakers. The platform is intended to slip under the speaker cabinet, thus indirectly allowing you to spike the enclosures to the floor. These large, 17.5" by 19" platforms accommodate a variety of speaker footprints and facilitate tweaking the final speaker position and toe-in angle by allowing you to simply slide the speaker along the top of the platform. This eliminates the frustration of having to move a heavy, spiked enclosure across a carpet. These plat-
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forms worked so well for me that they became an integral part of the setup. The woofer is located close to the floor to minimize frequency-response errors due to floor reflections. It's refreshing to see a sealed-box alignment among the recent horde of bass-reflex designs. This is no accident; driver manufacturers offer few woofers suitable for sealed-box loading, basically because floppy suspensions are very difficult to control in production. Why a closed-box design? Well, for one thing, MACH's computer simulations showed significantly less distortion in the 45-80Hz range, where a lot of bass energy resides. Sealed boxes are also much less susceptible to cone pumping due to subsonics—the sub-20Hz garbage analog systems are capable of generating. [The second-order high-pass rolloff of a sealed box also gives much better in-room bass extension than an equivalent ported design—Ed.]

The crossover features computer-generated fourth-order filters, with a Linkwitz-Riley response as an initial target. The lower crossover point is at a rather low 250Hz to prevent acoustic interference resulting from the considerable distance between the midrange and bass drivers. The upper crossover frequency of 3kHz was chosen to ensure good polar response with minimal lobing. Air-core coils are used for the mid and treble networks, while ferrite-cored coils are used for the bass network to minimize DC resistance losses. Only premium capacitors are used; there are no electrolytics anywhere in the DM-10. Solen caps are used in noncritical positions, while proprietary caps are used in all critical circuit positions. All parts are matched to within 1%.

A separate enclosure is provided for the crossover network to isolate the circuitry from the vibrational hell found inside a speaker cabinet. My crossover boxes had three pairs of flying leads for connecting the networks to their respective drivers. Current-production Signatures have binding posts at both inputs and outputs to accommodate a complete run of your favorite speaker cable. The DM-10 is bi-wire-ready, and that's how I used it. TARA Labs RSC speaker cable worked very well with Holvand/Sonic Purity and Mapleshade Electronics' Omega Micro interconnects.

SONIC IMPRESSIONS

I had the DM-10 Signatures for several months, during which time I had the opportunity to audition them with a flock of power amps, both solid-state and tube. I believe a great speaker should perform well with either transisors or tubes. A speaker's deficiencies at the frequency extremes are either laid bare or exacerbated by a solid-state amp, while a tube amp tends to be more forgiving. For a speaker to sound much better with tubes than with a good solid-state design implies that there's something wrong with the speaker. The modern trend toward excessive treble energy is hardly well served by bright-sounding amps. For example, a potentially deadly combination is a metal-dome tweeter driven by pure solid-state amplification. Mind you, I'm not anti-metal-dome—in fact, I like their inherent speed and detail. But solid-state typically etches their resonant metallic flavor to the point of sizzle, in my opinion.

The DM-10 sounded good with tubes or transistors. Sonic differences between amps were easily revealed: bad-sounding amps came across sounding bad. However, good tubes and transistors excelled equally in driving the MACH 1. Either way, the treble remained sweet and refined.

Enter the Classé M-700 monoblocks. These solid-state juggernauts in no way clouded the DM-10's sunny, natural top-end disposition. Female voice retained its harmonic sweetness and natural tonality. Even Joni Mitchell's Blue (Reprise MS-2038), whose sound exemplifies early solid-state recording, was well under control. The overall presentation was fast and detailed, with excellent dynamic bloom and a transparent soundstage. Midrange textures, while not as liquid as with tubes, were plenty smooth.

Tommy Flanagan, George Mraz, and Al Foster were fleshed out in a believable space on Nights at the Vanguard (Uptown UP 27.29). Bass was so defined and detailed that I could hear bassist Mraz's fingers sliding along his fingerboard. Transient attack and decay were pristine, almost electrostatic in flavor. This enhanced the feel of the original space, as the decay of transients into the hall's background was nurtured with a motherly touch.

Neither was imaging excellence restricted to tube drive. The M-700 was able to portray a large chorus and orchestra with panoramic majesty and convincing spatial resolution. It was left to tubes, however, to flesh out this speaker's full imaging potential. The Jadis JA 200 monoblocks succeeded in erecting a 3D soundstage you could drive a truck through—the front third of my listening room was flooded with sound. Far from being tethered to the speakers, the soundstage appeared to have a life of its own. A "palpable" image focus, together with a transparent view, allowed me to explore the hall's inner recesses.

Too often a three-way design manages to distract my attention from the music by speaking in several voices, this "Tower of Babel" effect occurring in the frequency ranges where two drivers overlap. For a two-way, the overlap occurs once. A three-way has two regions where drivers are asked to join hands, and thus has more opportunity for problems. As the drivers that share the load in the transition band usually have different sonic signatures, and since the crossover networks add their own sounds, there is often some confusion and lack of blending through these regions. The result is typically a split personality that detracts from the presentation's cohesiveness. The organic unity of the DM-10's tightly knit drivers allowed me to focus more clearly on the music.

I was constantly aware of low-level detail surfacing above the noise floor of the recording. With some speakers, such a resonant signature etches detail and exaggerates sonic information. Such analytical transducers hit the listener over the head, shouting, "Notice me! I'm better 'cause you hear me!" This wasn't the case with the DM-10. Detail seemed to flow naturally from the music's fabric, as if I were peering through a microscope and had slowly increased the magnification. There was absolutely nothing mechanical, electronic, or edgy about the sound. This clarity of presentation allowed me to unravel the harmonic envelope and sample nuances I had missed with lesser speakers.

Tonaly, the DM-10's harmonic compass swung only minimally from True Neutral North, thus interfering very little with the music's mood. Harmonic colors were vividly portrayed, with only a slight dulling of soprano voice through the upper midrange. I wished for a tad more weight through the lower midrange, but my taste in reproduced music runs toward a fuller, warmer sound than that of the DM-10. Harmonic textures were smooth, with a softness or hardness dictated by the choice of partnering amp. The lack of grain and glare through the mids and lower treble did wonders for violin overtones and female voice. This whole range could be made to sing with the greatest of ease.

The DM-10s were very low in the "Technicolor" (ie, euphonic coloration) department. Some speakers are capable of "enhancing" musical reproduction with artificial excitement usually attributable to response aberrations in the upper mids or presence regions. A case in point is Western Electric's 755A—a full-range, 1940s-vintage PA driver. The
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Stereophile (Dick Olsher), Vol. 16, No. 1, Jan. '93
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The Inner Ear Report, Sept. '93
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The Sensible Sound, Summer '91
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The Absolute Sound, Vol. 17, Issue 81, July/Aug. '92
The complete review is available on request.

Hi-Fi Heretic, Spring '91
"...the SL26C easily qualifies for 'Best Buy' status."

WorldRadioHistory
755A is highly sought after, especially by the Japanese, because of the startling vividness with which it projects voice and harmonic overtones onto the soundstage. Its frequency-response curve clearly indicates that the response from 3–8kHz is boosted relative to the midrange's core. This is nothing more than an implementation of the Academy curve, which prescribes a similar boost or EQ to film soundtracks. The intent is to make dialog not only more intelligible but more exciting—it seems to jump right off the screen into your lap. The same effect can be achieved with an equalizer like the Cello Palette. It seems that colored speakers often generate strong cult followings, while natural-sounding speakers are often passed over by the audiophile as "not exciting enough."

The DM-10 had plenty of dynamic flair, most evident in its resolution of the music's microdynamics. Harmonic textures bloomed from soft to loud with great conviction. When called upon to soar from loud to very loud, the speaker's dynamic headroom was quite impressive. Complex musical passages did not congest as the DM-10 scaled the dynamic spectrum. There were limits: When driven very hard, compression set in, most notably through the midrange. Although the DM-10 could safely sink a lot of power, its dynamic range was limited, primarily by the midrange driver—perhaps a reflection of its low crossover point to the woofer.

The sensitivity spec is quite decent; even the 50W Air Tight ATM-2 (outfitted with Gold Aero KT99As) made the DM-10 boogie. There was something magical about this combination, which treated the mids to a fresh coat of paint and set my foot tapping along with the beat. Additionally, the lower mids sounded fuller and warmer, the way I like them; a romantic tube amp should nicely complement the DM-10.

Bass lines were consistently quick, tightly defined, and rhythmically precise—this was no doubt a function of the DM-10's critically damped sealed-box alignment and well-damped enclosure. The midbass was tonally convincing, but, as evidenced with cello and double bass, I felt the upper bass to be a bit lean. Still, the definition in the bass octaves was quite remarkable. However, as a tradeoff perhaps to the type of bass alignment used, both deep bass extension and impact were a bit weak. Timpani and bass drum lacked the stentorian response and punch I've come to expect from speakers in this price range. I had a hard time generating much response below 40Hz in my room. The DM-10 Signature doesn't appear to be the ideal speaker for organ-music aficionados.

**Measurements from JA**

The DM-10 Signature generally doesn't make too many demands on the amplifier. Its calculated B-weighted sensitivity was a little below specification but still highish at 87dB/W/m, while its impedance plot (fig.1), measured with the Audio Precision System One, didn't drop below 4 ohms, and with only minor-magnitude changes above the upper bass. This means that, sound won't change significantly with amplifiers featuring high output impedances. Phase-angle values, too, are generally small. Note, however, that in the midbass, a lowish magnitude is combined with a moderate phase angle, which will demand a fair amount of drive current from the amplifier. The sealed-box tuning is revealed by the 16.3 ohm peak at 24Hz, which implies good bass output down to below 30Hz—if not to the 20Hz Dick Olsher feels to be appropriate, in theory at least, for a speaker in this price class.

The crossover's open architecture made it easy to look at the signals supplied to the individual drive-units (fig.2). The lower electrical crossover frequency was 250Hz, though the upper one was a little lower than the specified 3kHz. The ultimate rolloff slopes are, indeed, very steep at 24dB/octave. (Note the expanded scale on this graph, which exaggerates the filters' pass-band effects.)

Fig.3 shows the actual quasi-anechoic outputs of the three drive-units, measured with DRA Labs' MLSSA system and a calibrated B&K 4006 microphone. Bass and midrange units seem generally well-behaved, though the latter is a bit peaky at the top of its passband. The midrange unit's cumulative spectral-decay, or waterfall, plot (not shown), however, revealed that any cone breakup modes were way down in level, meaning that the acoustic peak is possibly due to the residual electrical drive-signal peak seen in fig.2.

The tweeter appears to have a slight mid-treble hump in its output; this can also be seen in the overall response averaged across a 30° horizontal window on the tweeter axis. I suspect that the shelved-down nature of the high treble that this gives rise to is the reason for DO finding the DM-10 to be very slightly dull in its balance. The 2kHz peak in the midrange unit's output can also be seen in this graph, slightly accentuated by a small suckout in the region where the two upper-frequency units overlap. Nevertheless, DO heard nothing amiss in the treble, so I assume that this response behavior is inconsequential.

However, the speaker's lower-frequency behavior in this graph implies a rather overdamped alignment coupled with a slight rising trend through the reobserver side. This probably led to Dick's finding the DM-10 Signature's balance to err on the lean side. The bass extension is only moderate, with a ~6dB point of 38Hz rather than the 24Hz implied by the impedance measurement.

The speaker offers well-controlled lateral dispersion, as can be seen from...
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TEREOPHILE, JANUARY 1994
top octave increasingly rolling off for more extreme off-axis angles. A small excess of energy in the crossover region develops between 45° and 90° off-axis, but unless the DM-10 is used very close to a hard reflecting sidewall—not a good idea with any speaker—this shouldn’t color its in-room balance. As might be expected from the high-order crossover filters, there’s very little change in the DM-10 Signature’s balance with changes in vertical listening axis (fig.6). Only when you stand so that you can see the top of the enclosure does a suckout develop in the upper crossover region. As long as you sit so your ears are somewhere between the Signature’s midrange axis and the top of its enclosure, you’ll perceive pretty much the same balance. In the time domain, the DM-10’s step response (fig.7) reveals a not very time-coherent nature. The sharp negative-going spike is the tweeter output, followed half a millisecond later by the positive-going output of the midrange unit, which in turn is followed by the slow, positive-going output of the woofer. The waterfall plot (fig.8) shows a very clean initial decay throughout the midrange and treble, correlating with Dick’s finding that the speaker sounded very clean overall. The cursor in this graph is positioned at the top of the midrange unit’s passband, where there are some low-level stored-energy problems. But as noted earlier, these are very likely inconsequential in their effects on the Signature’s sound quality.

As DO reported above, much research was done on the DM-10’s cabinet. It did seem very dead to the knuckle-rap test, and calculating waterfall plots from the output of an accelerometer placed at various positions on the cabinet walls confirmed its general inertianness. Fig.9, plotted with our standardized -30dB floor so that it can be compared with other such plots published in Stereophile, shows the highest mode (on the front baffle) to lie at 285Hz. It’s so far down in level, however, that for all intents and purposes it doesn’t exist. Only the “Matrix” cabinets of the B&W speakers and the Aerolam cabinets of the Celestion SL600 and SL700 are in the same league as the MACH 1 when it comes to absence of cabinet vibrations.

Coupled with Dick’s enthusiastic auditioning of the DM-10 Signature, these impressive measurements indicate an auspicious debut from designer Marc McCalmont. I look forward to hearing his efforts in the cutthroat arena of more affordable designs.

—John Atkinson

**FINAL THOUGHTS FROM DO**

The MACH 1 DM-10 Signature is a great dynamic speaker, distinguished first of all by its use of the most natural- and musical-sounding tweeter I’ve heard to date. That wonderful Accuton unit affords a welcome relief from the monotonous procession of metal-domes presently flooding the market.

The DM-10 Signature’s most amiable trait is probably its organic whole-ness—a sense of total driver integration which makes it easy to leap forward and embrace the music. This, together with its knack for revealing rhythmic nuances, empowers the DM-10 to touch the soul as only a handful of speakers can.

The MACH 1 excels in preserving the flavor of live music. At the asking price, it becomes sensible to look seriously at a large planar speaker. But if your room and tastes gravitate toward dynamic speakers, be sure to audition the DM-10. It’s a breath of sonic fresh air. The DM-10 Signature was a joy to have around; I’ll miss its company in my listening room.

—Dick Olsher
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What makes someone a good hi-fi reviewer? A fine critical sensibility? A good technical background? Ears? Eyes? Nose? Throat? So many different people are reviewing audio gear these days that it's downright impossible to characterize a good reviewer. But I do know that Beavis and Butt-head would make killer hi-fi reviewers!

I know this because I just spent a whole weekend watching the Beavis and Butt-head Marathon on MTV—two full days of the clearest, most incisive social commentary since Charles Kuralt stuffed himself into a souped-up Winnebago and hit the road searching for the naked soul of this strange and dangerous country.

As everyone now knows, Beavis and Butt-head are two 13-year-old, brain-damaged, dysfunctional cartoon snottnoses who sit on a couch and critique rock videos when they're not out playing baseball with live frogs and shooting down Boeing 747s with shotguns.

Naturally, Beavis and Butt-head have become my Supreme Gurus.

See, Beavis and Butt-head are Real People. I know because I was Beavis and Butt-head. Maybe I still am. I hope I still am, because Beavis and Butt-head know what's really important. When they watch rock videos, they don't lament the lack of plot focus or plausibility—they want babes in tight shorts, fire, babes in tight shorts, ugly, longhaired, devil-looking guys hunched over electric guitars, and babes in tight shorts.

Beavis and Butt-head are God.

Man, I'd love to see Beavis and Butt-head start reviewing affordable loudspeakers! I just know they'd have the right hierarchy when it comes to the things that Real People want from their hi-fi: Batta-head: Listen to these "$1000 high-

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All three: Approximate number of dealers: 250. Manufacturer: New H., Inc., 537 Stone Road, Suite E, Benicia, CA 94510. Tel: (800) NHT-9993. Fax: (707) 747-0669.

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_Stereophile, January 1994_
Too often, solid-state audio components sound harsh, edgy, grainy, and dimensionless. This is so common among solid-state designs that audiophiles readily identify this unmusical sonic signature as "transistor sound". At Conrad-Johnson, we have long believed that these audible distortions are not inherent in solid-state devices. Instead, they are a consequence of circuit design and implementation. Through innovative circuit design and the use of highest quality parts, we have developed a range of Conrad-Johnson solid-state products that prove the point. They do not sound like solid-state. They just sound like music.

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end minimonitors... like, where's the bass, dude? They suck. Huh-huh, huh-huh.

BEAVIS: Yeah... huh-huh... they suck! Expensive speakers that can't kick ass suck! Huh-huh, huh-huh.

BUTT-HEAD: I bet they were made by somebody who's old. And a wuss. Huh-huh, huh-huh.

BEAVIS: Do these speakers come in Morning Wood finish? Huh-huh, huh-huh.

BUTT-HEAD: Huh-huh, huh-huh.

BEAVIS: Huh-huh, huh-huh.

When I picture a speaker that would win the approval of even Beavis and Butt-head, I see a speaker that really kicks ass—one that offers true high-end, full-range sound, all for under $1000. A speaker that'll not only play your music as loud as you want, but remain clean and clear under the most trying conditions. Not surprisingly, there isn't a single speaker that offers the entire High End that can fit this bill.

Until now. Huh-huh, huh-huh.

Now Hear This

Which brings me to NHT's new Super-Zero loudspeaker. Forget about "small" speakers, "bookshelf" speakers, "mini-monitor" speakers. The Super-Zero is just plain lil'! Which happens to give it certain advantages over larger speakers. Because the Super-Zero's cabinet is so small, it's much more solid and rigid than most speakers. And what cabinet vibrations the Super-Zero does have are much higher in frequency—and lower in amplitude—than those from a larger cabinet made from the same ¾" MDF material. The Super-Zero's tiny front baffle also endows it with the imaging superiority of such classic imagemeisters as the LS3/5a and the various Celestion baby-speakers.

The smallest speaker made by NHT used to be the original $199.95 Zero. I bought a pair several years ago for use as Real World monitor speakers in the production studio of the radio station where I used to work. Nor because it was a killer lil' speaker, because it wasn't—it had no bass, the mids were very colored, and the upper mids and highs hardened pretty severely when you played them even semi-loud. No, I bought the Zeros because I wanted a small pair of speakers that sounded par for the course in terms of the station's target audience—mostly young, mostly female, and mostly non-audophile. If the station sounded good on the Zeros, I knew it'd sound good in the listeners' homes and cars.

But that was then and this is now. Ken Kantor, NHT's designer/founder, has totally redesigned his smallest speaker—the cabinet is the only thing left from the older Zero—giving it high-performance drivers, a better crossover, and real speaker connectors. And while NHT never claimed that the original Zero was anything but a decent budget speaker, they're calling the SuperZero a true high-end component that just happens to cost very little.

I first heard the SuperZero when NHT introduced it at the 1993 Las Vegas CES along with their new flagship 3.3 ($4000/pair). But while the 3.3 really knocked me out, the lil' SuperZero wasn't far behind. Having become very familiar with the original Zero's sound, I couldn't believe the level of sound quality I was hearing from the Super version. I promised you in my Show report last April that I'd review the new NHTs as soon as I could lay my hands on a pair. Hey, I may be, cheat, steal, swear, expectorate, saunter, and brush over sleeping cows in the dead of night, but a man's only as good as his word.

What's the Guts?

The NHT SuperZero is a true minimonitor—the speaker's 5.5" front panel is barely wider than the 4.5" paper-cone midrange/woofer. This acoustic-suspension driver is mated to a 1" fabric-dome tweeter. The new mid-woofer is a better-behaved driver than that of the original Zero, with a smoother response at the top of its band. The 1" fabric-dome tweeter—the same driver used in NHT's $1095/pair 2.3a—replaces the original Zero's inexpensive ¾" poly-carbonate-dome tweeter. The crossover has also been upgraded to better integrate these higher-performance drivers. Unlike most inexpensive speakers, both drivers were designed by NHT from the ground up, then made by Japanese OEM driver manufacturer Tonegen to NHT's specs.

The drivers are crossed over at 2.2kHz with a minimalist crossover consisting of just two small electrolytic capacitors (5µF/50V and 10µF/50V), three resistors, and one inductor. The low-pass feed to the SuperZero's woofer is a second-order 12dB/octave filter, while the tweeter is crossed over with a first-order 6dB/octave slope. Thankfully, NHT has replaced the original Zero's lousy spring-loaded speaker connectors with high-quality, five-way speaker posts that are actually better than the ones that came on my $1275 Spica Angeluses.

Unlike most speakers in the NHT's price range, the SuperZeros have a very high level of fit and finish. Although they cost only $230/pair, their piano-black finish gives them an elegant appearance that suggests expensive black-lacquer-finished furniture. For a time at my abode, the NHTs sat atop a $4500 Pion- neer Pro-76 projection TV whose own finish is high-quality gloss-black, and the SuperZeros' finish melded seamlessly with the expensive Pioneer. The Super-Zero's elegant appearance is miles ahead of the typical plastik-wood "near-veneers" and other cheezy finishes usually found in the Lower Reaches. I saw a similarly priced Boston Acoustics speaker recently that had a "finish" consisting of a piece of woodgrain-print wallpaper glued around the speaker cabinet. The edges were coming loose around the cabinet's corners—the perfect addition to any fine mobile home. Like Charles Kuralt's, maybe.

NHT SW2 Subwoofer

The SW2 subwoofer comes in two versions: one with an internal 130Hz 12dB/octave crossover, one without. The version with the crossover is meant for use with NHT's larger speakers—such as the $500/pair 1.3a and the $1095/pair 2.3a—to extend these speakers' LF response to -3dB at 21Hz. Used in this situation, two SW2s are employed, one for each speaker.

The crossover-equipped version of the SW2 has four pairs of five-way speaker posts on a sunken cup located on the rear panel to interface the sub with the rest of the system. One pair, Sub In, takes the speaker-level signal from the system's power amplifier; another pair, Sat Out, sends the portion of the music signal above 130Hz to the satellite speaker. The remaining two pairs of speaker posts are for using the SW2 with an external amplifier/crossover such as NHT's MA-1. Normally jumpered together for passive operation, the SW2's internal crossover may be bypassed for use with the MA-1 by removing these jumpers and driving the designated pair of five-way posts.

The SW2 I had on hand was finished in the same high-gloss, black-laminate finish as the SuperZeros, and looked just as boss—as long as I kept my grubby fingers off it. Even though the SW2 is a true subwoofer with response down in the low twinnies, it's only a 16" cube, and doesn't really dominate a room the way many other subwoofers can. Even when I had two SW2s set up in the living room, their small size made them easy to position so they wouldn't look ugly enough to send Dara after "El Diablo," the heavy

2 The 1.3a's earlier and mostly identical iteration, the 1.3, was enthusiastically reviewed by Robert Harley in Vol.13 No.9, p.149.
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cast-iron skillet she wields like it's a natural extension of her right arm.

**NHT MA-1 AMPLIFIER/CROSSOVER**

The MA-1 is an 80W solid-state mono amplifier expressly designed by NHT's Ken Kantor to drive the SW2 subwoofer. Aside from the passive crossover-equipped version of the SW2 described above, the SW2 also comes without the internal crossover as part of a $650 package (called the SW2P) with the MA-1. This version of the SW2 has just a single set of five-way posts, which are driven by the MA-1.

The MA-1 offers two ways to mate the SW2 subwoofer with a pair of speakers, and was designed to allow the use of other manufacturers' speakers as well as NHT's own models. Via the MA-1's speaker-level inputs and outputs, the signal from a system's main amplifier is taken to the MA-1 and crossed over passively at 100Hz to the main speakers. The MA-1 also sums the two channels and sends the signal to the active low-pass crossover, whose feed to the subwoofer is then adjustable in terms of level via the front-panel level knob and crossover frequency—50Hz, 80Hz, or 110Hz.² (The MA-1's crossover has a fourth setting, Bypass, which removes the crossover from the circuit and makes the MA-1 a full-range mono power amplifier suitable for driving the center-channel speaker in a Home Theater system, etc.) While the satellite speakers are always crossed over at 100Hz, NHT recommends that the user try all three subwoofer frequencies to find the best balance between the SW2 and the main speakers for a given system and room.

The MA-1 also has a pair of RCA jacks that allow for line-level signal inputs, such as an external crossover or the subwoofer output from a Dolby Pro Logic surround decoder. In this case, no signal is sent to the main speakers. The input signal is simply sent to the subwoofer and crossed-over at 50/80/110Hz; it bypasses the crossover entirely if the surround processor has its own crossover.

The MA-1 has a Standby mode that turns the amplifier off if no audio signal is detected by the MA-1 within several minutes. Standby mode is indicated by a green LED on the front panel, which remains lighted until the MA-1 revs up again in the presence of an audio signal. For those who do not appreciate such anti-high-end tomfoolery and like to use up them kilowatt hours on a steady basis, NHT dealers offer a simple internal modification to defeat the Standby circuit.

Overall, the MA-1 looks and feels much the same as most $300 power amplifiers—like Rotel and Adcom gear, for example—and its internal construction looks about on a par with either of those brands. Instead of the Far East, however, the MA-1 is built in LA by Dabryte. One aspect of the MA-1 that bothers me, though, is the use of cheap, spring-loaded speaker connectors for the speaker-level inputs and outputs. Ol' Dick Olsher had it right in his review of the original Hsu Research subwoofer in Vol.16 No.3, p.86: These cl-cheapo spring-loaded speaker connectors suuuuuuuuck, and shouldn't be seen on gear with high-end pretensions. Thankfully, the MA-1's subwoofer output has a good pair o' Heavy-Duty Judy five-way posts.

**SYSTEM**

As with other affordable gear that I review, I listened to the NHT SuperZeros and SW2 subwoofer in both my Home Man reference rig and my Real World living-room system. The first rig tells me what a product sounds like in absolute terms, and the second tells me how much of that information matters in an environment more typical of what non-audiophiles experience. The Real World system also tells me how well a product can sound when mated to similarly priced gear, which is probably the most important part of the review.

For LP listening with the He-Man rig, the analog setup consisted of the Well-Tempered Record Player, the Sumikko Blue Point Special cartridge, and the Exposure XVII preamp (with a phono stage via its Rec-Out jacks). CDS were played with a Theta Data II transport linked to Theta's Gen.III processor with Theta's Single-Mode laserlink. My 8-track tapes were handled by a Curtis Mathes 8-track deck. The line-stage was my own buffered passive preamp; the amplifier was either Aragon's 4004 Mk.II or the new Muse Model 160; cables were Kimber KCAG for interconnect and 4AG for speaker cable; and everything, including the NHT MA-1 amplifier/crossover, was plugged into API Power Wedge AC line-conditioners.

The Real World system included the JVC XL-Z1050, Rotel RCD-955AX, and NAD 502 CD players; my own buffered passive preamp as the line-stage; the Muse Model 100 amplifier; Kimber PBj interconnects and Kimber 4TC or AudioQuest Type 4 speaker cable; and raw AC as the power du jour.

**CONFLICT-OF-INTEREST ALERT**

As the reader of this assertedly unbiased review, you should be aware that I have seen the designer of these products totally naked. It was in a Taipei b&h when we were both overseas last year for the Taiwan High-End Hi-Fi Show. In fact, I was totally naked, too, and sitting on a wooden-slat bench in a steam room with my totally naked butt this close to the designer's own butt, which, again, was totally naked.

I like Ken Kantor. Even his naked butt. But I review products, not people, and I take my professional credibility very seriously. I have given highly negative reviews to products designed by people who, on a personal level, I like quite a bit. And I have given rave reviews to products from people who, on a personal level, I wouldn't piss on if they caught fire.

So if the knowledge that I have seen the naked butt of these products' designer undermines your opinion of my objectivity, I understand. But it's one hell of a butt, this one hell of a good speaker, and I think you should know about them both.

**SOUND**

The NHT SuperZeros ROCK!! I don't hear that many products that even meet the level of performance claimed by their manufacturers, much less set a new standard for sound quality at anywhere near the price of the SuperZeros. A $3000 amp that sounds about as good as many other $3000 amps? Zzzzzzzzz. But a $230 loudspeaker that competes with high-end speakers costing $3000? Now that's something to get excited about!

The SuperZeros aren't perfect. Although they can play impressively loud for their size, they don't perform miracles —drive them hard and the sound becomes edgy and hard, as can only be expected from speakers tiny enough to juggle. But what distinguishes the ll'l NHTs from their similarly priced competition is that, rather than go for a budget design that "fakes" a real low end with a midbass hump, and otherwise balances a panoply of flaws into a reasonable facsimile of a real high-end speaker, the designer of the NHT SuperZeros has completely ignored the bass range and all the problems that it entails in a budget design. Ken Kantor has instead concentrated on getting the range from 100Hz on up as accurate and as coloration-free as possible —within the constraints of his design budget.

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3 The actual markings on the MA-1's rear are "50Hz," "100Hz," and "200Hz," but as Corey's nomenclature coincides with the measured —3db points, I've left them as is.
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You’re not going to get great sound from the NHTs unless you treat them like a “real” high-end speaker, though. Just because they’re cheap, don’t be fooled into thinking that all the high-end attention you lavish on “real” speakers is a waste of time with the SuperZeros. Chuck the grilles. Give the NHTs a good pair of solid, stable stands, with a bit of Blu-Tack under the speakers’ corners. Toe them in so they directly face you. If you treat the SuperZeros like just another cheap speaker, that’s the kind of sound you’ll hear. But while most cheap speakers never really improve no matter what kind of attention you give ’em, the NHTs reward every bit of attention to setup detail with sound quality that has simply not been previously available anywhere near this price point.

So what did they sound like? Like true high-end speakers, except without any bass. They don’t have “some” bass—NO bass. Used solo, even on a good pair of solid speaker stands, the SuperZeros just didn’t have a real, or even implied, low end. I heard a slight emphasis in the upper bass around 150–200Hz that added a bit of cheesiness to male vocals, but the NHTs didn’t have the kind of “quasi-bass” midbass hump found in small speakers (such as the PSB Alpha and LS3/5a) that can fake you into thinking you’re hearing real low bass. The NHTs were more in the mold of a true high-end minimonitor: neutral and accurate, with no attempt to do anything in the low end, and focusing their strengths on the range above 100Hz. As crazy as it sounds, consider the NHT SuperZero a budget Wilson WATT. After you listen, you won’t think it’s crazy at all.

By themselves, the lil’ NHTs sounded extremely smooth and uncolored through the midrange, but with a bit of treble brightness (because there’s no low end to balance out their sound). Unlike the Spica TC-50, which achieves a good tonal balance by rolling off the high end to complement a similar rolloff in the bass, the bass-less NHT’s high end was unattenuated—in fact, the SuperZero had a slight treble emphasis that, while not an irritating overbrightness, served to further shift its tonal balance to the thin and forward. Without the SW2 subwoofer filling in the low end, the Super-Zero sounded overly thin and wispy, especially with gritty-sounding budget electronics. The SuperZero is not a “cheap’n’cheerful” low-rez speaker that’ll smooth over the rough edges in a poorly matched budget system. Like the true high-end speaker it is, the NHT accurately reproduced the signal fed it, warts and all.

Yet even when used without a subwoofer, the first thing that stood out about the SuperZeros was their incredible sense of spaciousness and sheer, vivid soundscape portrayal. You just don’t expect a pair of tiny $230 speakers to sound like a giant wall of sound when you close your eyes, but the NHTs did. As absurd as it may sound, the NHTs disappeared as well as or better than the $3000/pair ProAc Response Twos I lovingly reviewed in Vol.15 No.7, p.109. I set up the NHTs well away from the rear and sidewalls and was rewarded with a vivid, boundary-free soundscape that floated in the air without any aural clues that it was coming from those two tiny black boxes on the other side of the room. Recordings with a real sense of depth and soundstage, such as Los Lobos’ Kiko (Slash 26786–2), or the great new Jeff Palmer organ-trio workout Easy On (AudioQuest AQ–CD1014), came across with a sense of ambient detail and lack of boxiness that I just don’t hear from many sub-$1000 loudspeakers, much less ones costing only $230.

In this regard, the SuperZeros aren’t merely great for the money, they’re great period. Kiko’s “Wake Up Delores,” in particular, had as impressive a sense of palatable space around and between the hard-left and hard-right panned guitars at the front of the soundstage, with the drums at the rear, as I’ve heard in either of my two listening rooms. And the QSound-processed images from Roger Waters’ Amused To Death—effects CD extended way to the outside of the NHTs and in a 180° arc in front of me. Contrast this with the $695/pair Vandersteen 1BS I reviewed in Vol.16 No.9, p.98, which refused to image much beyond the speakers’ outer edges—they were more colored and congested through the midrange and presented an overall lower level of resolution across the band than the one-third-as-expensive SuperZeros.

That’s the word I’m looking for—resolution. The SuperZeros’ midrange smoothness and sheer resolution of recorded detail put them on a par with other high-end loudspeakers costing many thousands of dollars. This is no exaggeration. Compared to the pair of Spica TC-50s I had on hand, the Super-Zeros had a higher level of resolution and a less “muffled” character through the midrange and low treble. The clear-as-a-bell gospel vocals of the Fairfield Four’s Standing in the Safety Zone (Warner Bros. 26945–2) sounded much more present and clear with the SuperZeros, the Spicas tending toward an overwarm and rolled-off character in the low treble that made them sound far too reticent and chesty compared to the NHTs. The TC–50s were my reference speaker for a time when I was first getting into high-end audio years ago, but if the Super-Zeros had been around back then, I would have undoubtedly chosen them. Terrific-sounding as they are, the TC–50s do not have the coherence or neutrality of the SuperZeros. And while the TC–50s have much deeper bass extension and are extremely non-fatiguing to listen to, the SuperZeros are less colored overall and give a more accurate picture of the audio signal fed them.

STAND!

The SuperZeros obviously needed good stands to get them up high enough for serious listening. Unfortunately, most good stands cost more than the speakers themselves! While the SuperZeros are definitely deserving of as high a quality stand as you can find, I’m not gonna recommend that you buy stands that cost more than the speakers!!

So I builded me a pair of Aunt Corey’s Uneducated White Trash DIY Speaker Stands: cinder blocks, two per stand, stacked end to end. This gave me very massive, literally rock-solid stands 31” high, which happened to be a good height for the SuperZeros in both of my listening rooms.

I found that the NHTs sounded best when toed-in and firing directly at the listening position. I also liked them best when they were positioned fairly high, so that my ears were level with or below the woofers. In addition to using the cinder-block stands, I listened to the NHTs on the excellent $200 heavy-metal 24” speaker stands Merrill Audio has just introduced as an affordable alternative to the expensive imported British stands. (The $800 Target R2s, for example, are fine stands, but their price unfortunately reflects their overseas trek to your rumpus room.) Because the Merrill stands are shorter, the NHTs were placed upside-down to ensure the optimal listening axis.

I know what you’re thinking: “Cinder blocks?!! My wife’d KILL me!!” Well, fine then—buy the Merrills. But for the rest of us Real World audiophiles, four 45€ cinder blocks sprayed gloss-black with a $3 can of paint not only look tough, but the price is right! I’ve got ’em in my living room, and, so far, El Diablo

4 While the cinder-block stands were wobble-free on my living room’s hardwood floor, you might want to stick some of the large TipToe cones under the stands, points down, to increase stability on a carpeted floor. You might also Super-Glue the cones to the bottom of the cinder-block stands because the stands have a tendency to slide around on top of the cones when jostled.
**prelude** *(pré-loyd)*

*n.* 1. Serving as an introduction to a principal event, action, or performance. 2. In music, a movement introducing the main theme

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has not reared its grim and fearsome head.

**ALPHA WAVES**

I was so knocked out by these lil NHTs that I decided to compare them with a similarly priced babyspeaker that’s received a rave review in these pages: PSB’s $200/pair Alphas. Each pair of speakers was placed atop a pair of Aunt Corey’s Uneducated White Trash Speaker Stands, coupled to the stands with four small pads of Blu-Tack damping material per speaker, and positioned about 2’ from the rear wall. The NHTs were toed-in, but the PSBs were left to fire straight ahead, as recommended in the *Stereo Review*.

I found that the two budget speakers sounded radically different, each offering its own set of strengths and weaknesses. The wheeted-alignment PSB had a weightier, more full-range sound than the bass-less SuperZero. But while the Alpha had the deepest bass extension, it also rendered much more muddied and bloated than the NHT. The PSB definitely trades off clarity and tightness in the low end for some semblance of a full range, but I found this choice of extension to be transitory purity to really thicken and slow the sound down—especially on rhythmically intense material such as *Kiko*. The Alpha definitely had deeper bass extension than the SuperZeros, but the lack of definition and the plodding, one-note bass kept me from really digging the music as much as I did with the NHT.

In virtually all other areas of performance, the SuperZero walked all over the Alpha. The NHT was more neutral in character, possessing a level of clarity through the midrange and highs that the PSB didn’t even hint at. While the SuperZero approached the kind of midrange quality you get from something like a ProAc Response Two, the Alpha had enough nasality—a “hootiness” —that it kept them from reaching the same level of sound quality as the NHT. The allmighty Fairfield Four CD really showed up the difference in midrange coloration, the PSB adding a considerable amount of midbass heaviness and cupped-hands coloration to the voices. But the most dramatic difference was in the speakers’ renditions of space. On records and CDs that have a good sense of depth and breadth, the SuperZeros consistently threw up a much larger, more detailed soundscape than the Alphas. The NHTs are so impressive in this area that I went into Space-Trippin’ Hyperdrive and yanked out all my neat-o “wide open spaces” records, such as the Ry Cooder/Vishwa Bhatt *A Meeting by the River*, the “Angels With Dirty Faces” track off *Kiko*, and Jimi’s “Still Raining, Still Dreaming” off *Electric Ladyland* (Reprise 2-2RS-6307). And if I closed my eyes and forgot about the lack of any real bass, there were almost no clues that I was listening to a pair of $230 babyspeakers sitting on a pile of cinder blocks.

All those boundary-stretchin’ sounds—the church acoustics and image placement of the guitars on the Cooder/Bhatt CD, the “outside o’ the hands” kind claps and shaker sounds on the Los Lobos track, and the flying-around-the-room second-guitar solo on “Still Raining, Still Dreaming”—came through just as clearly defined in space and as detached from the black boxes as I’ve heard from far more expensive speakers, including the Spica Angelus, the ProAc Response Two, and the NHT’s flagship 3.3.

Bottom line: If you’ve got 200 clams and want a small budget speaker that plays surprisingly loud and sounds fairly full-range, and you’re not too picky about imaging or ultimate midrange, the PSB Alpha is a fine choice. But if you want a speaker that trumps off the PSB’s bass extension for an overall sound quality approaching multi-thousand-dollar audiophile speakers, the SuperZero is the one to buy.

**HARBETH, I HEAR YA CALLIN’**

As JA was fixin’ to review Harbeth’s latest iteration of the classic BBC LS3/5a minimonitor, I asked him to ship them to me for a few days so I could compare the SuperZeros to a more refined babyspeaker than the $200 PSB Alphas. The little NHTs were so good, I wanted to hear how they fared against the $1000/pair LS3/5a, the time-tested king of the genre.

Well, I can tell you that the $800 more-expensive Harbeths put up a lot more of a fight than the Alphas. And I can also tell you that all the classic good-time ingredients that’ve made the LS3/5a one of the most enduring of all speaker designs—terrific imaging, low midrange coloration, and a warmly balanced sound that just almost sounds like a full-range speaker—are intact in the current Harbeth version.

But I can’t tell you that the Harbeths creamed the SuperZeros—or that I’d rather own a pair of the “new” LS3/5as over the $230 NHTs—because I think the SuperZero is a more neutral, trans-

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**NHT SW2 SUBWOOFER & MA-1 AMP/CROSSOVER**

And what of the SW2 active subwoofer? Despite its smallish size, the NHT SW2 is a serious subwoofer that gave plenty of usable output all the way down below 25Hz in both of my listening rooms. The SW2’s ported 10” driver delivered amazing room-shaking output levels, even when driven by the 80W MA-1 (which I didn’t think was going to pump out the kind of seriously hardcore bass that the SW2 was capable of).

In terms of control and definition, the SW2 was very impressive, but not quite as tight or as “fast” as the $2750 Muse Model 18 225W active subwoofer I used for a time in my reference system. Strong basslines such as those from Stevie Ray Vaughan’s *Couldn’t Stand the Weather* (Epic KI 39304) were all there and then some, but the SW2 fell a bit short in terms of sheer tightness and clarity when compared with the much more expensive Muse. The SW2 was incredibly tight and well-defined, but didn’t quite match the Muse’s sheer clarity and transient purity or a really good scaled system like the 1W acoustic-suspension woofer of NHT’s own $4000 MA-3.

For only $650, I don’t know of a better subwoofer than the SW2—the only real sub even close in price and performance is the popular Hsu Research SW10, which costs $750/pair. However, that price does not include an amplifier to drive the Hsu subs, while the 80W MA-1 is included with the $650 SW2P package.

Taken on its own terms, the SW2 does an extraordinarily good job of reproducing the music’s bottom-most octaves—I was impressed enough with the SW2 that I bought one for my Home Theater system.

**I’M GONNA ADD SO-OME BOT-TUM**

As excited as I was about the NHT SuperZero, I have a hard time giving a blanket recommendation for a speaker

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*Stereophile, January 1994*
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—Lewis Lipnick, Stereophile, Vol. 11 No. 4, April 1988.

Recommended accessory in Stereophile, Vol. 12 No. 4, April 1989.

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—Ken Pohlman, AUDIO, November 1987.

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that has no semblance of a low end. That’s why I had NHT send along the SW2—so I could hear if the marriage of the SuperZero and the SW2 would result in a world-beating $880 speaker system. At first I tried using two SW2s in a passive configuration, with their internal 130Hz crossovers splitting the signal between each sub and SuperZero. NHT’s Ken Kantor told me that the SW2’s internal crossover was optimized for the larger NHT speakers and not for the SuperZero, but encouraged me to try the configuration anyway.

Well, I can tell you this: If the SuperZeros had no low end before, they DAMN WELL had it now!!! Ye gads!! Beavis and Butt-head would kill for a speaker setup like this! There was way too much bass with this setup, but I gotta tell you—the Butthole Surfers’ Independent Worm Saloon never sounded as athleticism WOMPIN’!! Man, I wish I’d had this setup when I was 13!! Cuz when you’re 13, you could give a rat’s ass about timbral accuracy and tonal balance—you want BIG, BAD BASS that’ll knock your dad clean off his feet and send him tumbling down the stairs when he has the gall to barge in yelling for you to turn that @#$% down!! YEAH!! LATER WITH YOU, POPPS!! WA-BOOM!! This is the setup that Beavis and Butt-head would go for in a BIG way. If you’re 13 and reading this right now, you have FOUND the SOUND!

But for us over-13 audiowusses, using two passive SW2s isn’t really the way to go if you want to listen to anything but AC/DC’s Back in Black, which I have to admit has never sounded better in my house than with the two passive SW2s. Way too much bass, and the transition between the subs and the SuperZeros wasn’t very smoothly integrated, either—not surprising in light of the fact that neither the SW2 nor the SuperZero was designed to go together in this fashion.

But pre-puta ya-yas out of my system, I went about hooking up the SW2 the way NHT intended: just a single SW2 driven by the MA-1 amplifier, crossed over to the SuperZeros with the MA-1’s own speaker-level crossover. The output of the main amp, a Muse 100 was taken to the MA-1, and the high-pass-filtered signal was sent on to the SuperZeros.

While this configuration was far better in terms of tonal balance and low-end control, the SuperZeros lost a good deal of their clarity and focus. There was a layer of opacity now that wasn’t there when they were driven directly by the Muse amp. No matter how I adjusted the sub’s level and/or crossover frequency, running the speaker-level signal through the MA-1’s internal speaker-level crossover caused a considerable amount of degradation of the satellites’ sound—so much so that I don’t recommend this hookup method. Much of what the SuperZeros did so well was lost when crossing them over through the MA-1.

AUNT COREY’S UNEDUCATED WHITE TRASH DIY HIGH-PASS FILTER

But I knew there had to be a way to mate these two terrific products into one awe-inspiring $880 loudspeaker system. I tried running the SuperZeros full-range with the Muse while sending my preamp’s output via a Radio Shack Y-adaptor to the MA-1’s line-level inputs—so the SW2 could fill out the bottom end, even though the SuperZeros weren’t high-pass-filtered at all.

Now I was getting somewhere! This sounded much better than using the MA-1’s crossover. The SuperZeros remained clean and clear, and the SW2—the MA-1’s 80Hz setting gave the best blend in my room—really fleshed out the sound to make for a truly full-range speaker system with all the SuperZeros’ amazing attributes, but coupled with a real bottom end.

Still, the transition between the SW2 and the SuperZero wasn’t as smooth and transparent as I’d hoped for. And driving the SuperZeros full-range did nothing to improve their dynamic headroom and midrange purity—reasons to use a subwoofer which are just as important as merely adding the bottom octaves. Like Martin Colloms, I can’t help mess ing with stuff. Martin bi-amps his Wilson WATTs/Puppies by inserting a passive first-order RC filter between his preamp and the amp that drives the WATTs, so I thought I’d try the same thing with the NHT system. I made up a couple of passive first-order 6dB octave line-level filters: simple RC networks consisting of a series 0.1µF “Kimber Kap” polypropylene capacitor shunted to ground with a 15k ohm Resistta metal-film resistor (fig.1). In conjunction with the Muse’s 51k input impedance, this gave a passive high-pass filter —3dB down at approximately 137Hz (fig.2)—high enough in frequency to roll off enough bass in the SuperZeros to give them more headroom, but low enough to ensure a seamless transition with the SW2. I soldered these components directly to an unmounted RCA jack at the filter’s input, and to an RCA plug at the filter’s output. These filter modules were plugged directly into the Muse amplifier’s input jacks, and the interconnects split from the Y-adaptor at the preamp output plugged directly into the filters.

This was the best-sounding configuration of all. With the high-pass filters providing a degree of bass attenuation in the SuperZeros, and the SW2’s own crossover set for 80Hz, the transition between the sub and the SuperZeros was much more seamless than when driving the SuperZeros full-range. And the system remained clean and clear at higher levels, too—much higher levels, in fact, than either the Spica Angelus or the ProAc Response Two, both of which cost a good deal more than the combined price of the NHT system, and neither of which approaches the full NHT system’s bass extension. I was surprised at how much this setup reminded me of the sound I enjoyed from my previous reference speaker system—the $3000/pair ProAc Response Twos mated with the $2750 Muse Model 18 subwoofer. In terms of finesse, musicality, and top-bottom coherence, the $880 NHT system came very close to the kind of sound I used to hear from that $5750 reference combo.

POLARITY

Depending on the room I used them in, the polarity of the subwoofer connection varied with the SuperZeros/SW2 system. In my He-Man listening room, I achieved the flattest measured response and smoothest blend between the sub and sats with the woofer connected in
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the same polarity as the SuperZeros. However, in my Real World listening room—my mild-mannered living room by day—I found that reversing the polarity of the connection between the MA-1 amplifier and SW-2 subwoofer gave the flattest measured response and the better integration with the SuperZeros. I determined the optimum subwoofer polarity in both rooms with the bassabelle tones on track 16 of Stereophile’s Test CD 2 and a $30 Radio Shack sound-level meter set for “C” weighting and “slow” needle.

NHT’s Ken Kantor agrees that there’s really no “right” subwoofer polarity, and that the user should try both in order to find the polarity that makes for the smoothest transition and the least excitation of room modes. This was certainly true of my living room, where a positive subwoofer polarity interacted with the pretty large bass hump in the 80–100Hz region. Reversing the subwoofer’s polarity nulled out this hump and gave a much flatter response through the whole bass range.

Bottom line: Try both polarities with various male vocal recordings (the Fairfield Four were ideal for this, as were Richard Lehnert’s spoken intros on track 1 of Test CD 2) to see which sounds more natural. The difference won’t be subtle, believe me.

I said before that if the $230/pair NHT SuperZeros had been around back when I bought my $550/pair Spica TC-50s, I’d’ve chosen the NHTs. Well, if the $880 NHT SuperZero/SW2P combo had been available when I bought my $1275/pair Spica Angeluses, I’d’ve gone with the NHT system. The Angelus is an amazing-sounding speaker, but it just couldn’t compete with the SuperZero/SW2P system in terms of bass extension or dynamic ceiling. And while the Spica has one of the most holographic soundscapes at any price, I don’t think the NHT system (hooked up the way I finally had it) lags too far behind. As with the Harbeth LS3/Sas vs the subwooferless SuperZeros: If I’d had to choose between the Angelus and the SuperZero/SW2P combo as a reference speaker system for my reviews, I’d choose the NHT.

HOME THEATER USE
The SuperZeros should also be considered a prime candidate for Home Theater systems that see double duty as music-playback systems. I tried using five SuperZeros for the Left, Right, Center, and two Surround speakers—with an SW2P to handle the bass—in my own Home Theater rig, and was extremely impressed with their performance when playing high-quality laserdiscs. And unlike every video-specific Home Theater speaker I’ve heard—including THX-approved models from Fosgate, JBL, and even the Snell 500 THX system JGH reviewed in Vol.15 No.12, p.202—the SuperZeros didn’t offer reduced performance when asked to play non-soundtrack music CDs through my Home Theater rig. Video-optimized speakers may work well when playing soundtracks, but none I’ve heard has offered even minimally high-end sound quality when playing back non-soundtrack music. The SuperZeros are therefore an excellent choice for those who have room for only one audio/video system, or who wish to listen to a lot of music in their Home Theaters.

Three pairs of the SuperZeros and the SW2P cost $1040—and since you only need five SuperZeros, consider this package as a true audiophile Home Theater speaker system, plus an extra speaker you can throw at the next wiseguy you see wearing a “Back to Mono” button.

HUH-HUH, HUH-HUH
I was totally knocked out by the NHT SuperZeros, either by themselves or in conjunction with NHT’s SW2P active subwoofer. While there are several inexpensive speakers on the market that are good at presenting an illusion of near-high-end sound, the SuperZeros are true high-end minimonitors that I would feel completely comfortable using as my reference speakers above 100Hz. They are really that good.

Mated with the SW2P subwoofer and a pair of passive in-line high-pass filters like those I described above, the SuperZeros are capable of delivering the kind of audiophile-quality, full-range sound that bears close comparison with some of the most well-regarded high-end speakers on the market. The SuperZero/SW2 system is one of the best values I know of in a full-range, high-end loudspeaker system.

Highly recommended!

—Corey Greenberg

JA MEASURES & LISTENS
Fig.3 shows the manner in which the SuperZero’s impedance changes with frequency. The peak centered just above 2kHz is due to the crossover; that in the upper bass is due to the scaled-box woofer tuning. Reaching a maximum of 19.2 ohms at 120Hz, it indicates a complete absence of mid- and low bass in the speaker’s output. Overall, the SuperZero is a super-easy load for an amplifier to drive, which, coupled with a calculated B-weighted sensitivity of 85dB/W/m—highish for the size—means that it can be used even with inexpensive receivers.

The NHT’s quasi-anechoic response, averaged over a ±15° window on its tweeter axis, is shown in fig.4. The treble is commendably flat for such an inexpensive design, though the upper midrange appears to be a little forward-balanced, there being a 2–4dB energy excess between 1300Hz and 2300Hz. As expected from fig.3, the SuperZero starts rolling out above the bass region proper. The nearfield response in fig.4 reaches its −6dB point at 88Hz, just above the lowest note of the electric guitar.

In my listening room, the spatially averaged 1/3-octave curve (fig.5), calculated by averaging 20 individual measurements, is quite flat. What’s really amazing is that the response of the SuperZero/SW2P combo is identical to that of the SuperZeros alone.

In fig.4, the SuperZero response is referenced to a tweeter-only response from the Wadia 11111, averaged across 30°. The SuperZero response, on the other hand, is referenced to a full-range, full-load tweeter-only response from the NHT Super Zero, averaged across 30°.

I find it interesting that, with the appearance of inexpensive multi-channel receivers for Home Theater use, Consumer Reports appears to have abandoned the testing of receivers into the more revealing 4 ohm loads. One could be cynical and say that if CR continued to test receivers into taxing loads, they would be forced to point out to their readers that they just can’t get high continuous powers into loads below 8 ohms with a six-channel receiver without expecting to pay a lot more than they used to for a good two-channel receiver. And that, given their parsonistic philosophy, I am sure they would never do.

—JA
Before it all hard haven't you
measurements taken for left and right speakers separately over a 72°-wide by 36°-high window centered on the listening position, confirmed both the Super-Zero's rather forward balance and catastrophically lightweight bass. Overall, however, this curve is much smoother than I would have expected from a pair of speakers in this price region, particularly in the treble.

This could readily be heard. Apart from a slightly "sniffy" quality in the high treble (this is almost a Ken Kantor trademark) which added some winitess to the sound of violin and emphasized the crackle that accompanies trumpet tone, the Super-Zero's high frequencies sounded clean. The midrange, too, was remarkably free from coloration for a speaker this inexpensive. (Remember that if the SuperZero sells for $230/pair, NHT's total parts cost for a pair can't be more than $45 if they are to make a profit and stay in business.)

Unlike CG, however, I had a harder time getting past the speaker's almost complete lack of low frequencies. It was very dependent on what kind of music I played. A lot of rock and small-scale classical music—string quartets, for example—emerged from the bass-truncation experience relatively unscathed, leaving me free to enjoy the NHT's excellent sense of recorded space, good sense of pace, and clean midrange (as long as I didn't play these tiny speakers too loud). But on large-scale orchestral music and power-rock with high-level low- bass lines, like Stanley Clarke's new East River Drive album (Epic EK 47489), it all fell apart, leaving me marveling that I hadn't noticed the emasculation of the music before. If choosing a minimonitor, and music with appreciable mid- and low bass contents is an important part of your life, you'd be better off choosing the LS3/5a or (better) the Harbeth HL-P3 over the SuperZero. Or experiment with the NHT SW2 subwoofer, of course.

The SuperZero offers good dispersion in both lateral and vertical planes (fig.6 & 7, respectively), measured using DRA Labs' MLSSA system with the Italian Outline speaker stand/turntable. Laterally, its top octaves do roll off more than 15° off-axis, and a suckout at the top of the woofer range and a complementary peak at the bottom of the tweeter range appear at extreme off-axis angles. As long as you sit with ears somewhere in the vertical vicinity of the front baffle, you should receive pretty much the same tonal balance. Fig.6 does show, however, that sitting below the speaker tends to compensate for the on-axis forwardness in the upper midrange/low treble. Putting the speakers upside-down on shorter-than-usual stands would accomplish the same thing, which would also bring the two drive-units into a degree of time alignment, if that's important to you. (The step response, fig.8, reveals that, on the tweeter axis, the tweeter's output slightly leads the woofer's.) The SuperZero's waterfall plot (fig.9) reveals an impressively clean initial decay. Though a number of resonant modes can be seen as ridges parallel to the time axis, these are all at a low level.

Corey talked about the SuperZero's tiny cabinet being more rigid than a larger one constructed from the same material—all things being equal. This will result in resonant modes that are higher in frequency and will therefore have less damaging effect on the music. Fig.10 shows that the mode highest in level lies at a very high 492Hz, or just below the B on the center line of the treble staff. Other modes are all much lower in level.

Moving on to the SW2 subwoofer, fig.11 shows the impedance plot with the subwoofer's jumpers removed for use
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There are two kinds of audiophiles: those who own Quad ESL speakers and those who don't.1 This review is for the former, although the latter may find it of some interest. The Gradient SW-57 subwoofer attempts to do for the original Quad2 what Gradient's SW-633 does for the Quad ESL-L63: supply the bottom octave while relieving the ESLs of the strain of reproducing low bass.

The Gradient SW-57 subwoofer utilizes two 8" woofers in a free-air enclosure. This technique attempts to mimic the dipole radiation pattern of the original Quad ESL. The SW-57 subwoofers also contain a circuit to protect the ESL tweeters from excessive voltage. This circuit can be bypassed, however, if the owner has had new protection circuits installed in the speakers or just enjoys living dangerously.

The Gradient SW-57 comes with an active crossover powered by a small external AC transformer. The box has a subwoofer-level control, a subwoofer-mode toggle switch for stereo or mono, and a midrange adjustment switch with bypass and two built-in equalization curves. This last switch is designed for ESLs that may have lost some of their high-frequency extension to age and wear. Original Quads often develop holes in their protective outer plastic bags that permit dust to settle on the drivers. This dust build-up attenuates the efficiency of the Quads' high-frequency drivers and results in lower SPLs. The midrange adjustment can sometimes restore Quad ESLs to their original harmonic balance.4

**System**

I used the following equipment for this review: Analog source was a Thorens/Terophonie TD-125 Mk.II turntable mounted with a Graham 1.5 tonearm, with arm tubes fitted with Denon DL-103 C/van den Hul, EMT/van den Hul, or Fidelity Research FR-1 Mk.3/van den Hul, van den Hul MC-1, and Audio-Quest BH-200 cartridges. Digital Sources were a SOTA Vanguard CD player and a Magnavox CDB-582 with Boulder SoundWorks analog section. Preamplifiers were the Dennesen JC-80 Mk.II gold in balanced and single-ended configurations, the Atma-Sphere MP-1 music preamp (balanced only), and the Vendetta SCP-2A phono preamp. Power amplifiers for the subwoofers included the Electrocompaniet AWD-100 and AWD-250 and the Parasound HCA Mk.II. Power amplifiers were the Atma-Sphere MA-1s, a Harman/Kardon Citation II with

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1 There is a third group: those, like me, who once owned original Quad ESLs, and every other day wish they'd never gotten rid of them. —JA
2 Dick Olsher reported on the Quad ESL in August 1987, Vol.10 No.5, p.164.
4 A better way to restore that original harmonic balance is to send your old Quads to QS&D Service, 33 McWhirt Loop #108, Fredericksburg, VA 22406, Tel: (703)372-3711. They can be disassembled, cleaned, and fully restored by folks who've been working on Quads for over 20 years. QS&D can also loan you shipping boxes for the trip to and from Virginia. The pair of boxes they sent me survived several trips via UPS quite nicely. I had QS&D restore my Quads as part of the Gradient SW-57 review process. After ten years of hard service, my Quads were in serious need of restoration. Not only did QS&D fully disassemble and clean them, but both tweeter panels were replaced, new protection circuitry was installed, and the original banana-plug connections were replaced with five-way binding posts.
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Kennedy Audio triode modification, and a Conrad-Johnson MV-75.

Other speakers used for this review were the Paradigm Studio Monitors, Vision Acoustics Soloists, and Green Mountain Audio Diamantes. Interconnects included Straight Wire Virtuoso and AudioQuest Diamond (both single-ended only), AudioQuest Lapis (balanced only), and WireWorld “Eclipse” (balanced and single-ended). Speaker cables were Straight Wire Maestro, Kimber KCAG, WireWorld “Eclipse,” and ART. Room-treatment products included RoomTunes CornerLoves, EchoLoves, and Ceiling Clouds. ASC Tube Traps are installed in the corners of the room.

Gear was placed on a RoomTunes just-a-Rack, an Arcic Superstructure IIIs, an Audiostream equipment rack, a Bright Star Big Foot and Little Rock for CD players, Sorbothane pucks and Target amplifier stands. Other accessories included a Fluxbuster for cartridges, Shun Mook wooden pucks on preamps, The Original Cable Jacket wraps on power cords and some input interconnects, Music and Sound ferrite beads, AudioQuest ferrite clamps, Chang Audio Light-sped 6400 power-line filters (one on input source and one for power amps), AudioQuest record brush, Nitty Gritty record-cleaning machine, Radio Shack spl meter, SOTA Record Clamp, Kleenmaster Brillianze CD cleaner, and the selected works of Harlan Ellison—specifically, “I Have No Mouth, and I Must Scream.”

The Quad/Gradient system was set up in my smaller listening room (see my Atma-Sphere MP-1 review in Vol.16 No.12, p.165). The speaker system was approximately 3½’ from the back wall and 3’ from the side walls. The speakers were toed-in so that the ESL panels pointed directly at the center listening position. A Proton VT-331 TV monitor was between the speakers. Quads are not well suited for placement close to TV monitors, as they can pollute the color at the edges of the screen. Magenta splotches, anyone?

SOUND
First, the good news. With the SW-57 subwoofers, the Quad ESLs play louder and with far less strain than when operated full-range. The subwoofers also remove the midbass hump around 80Hz that is very much a part of the original Quad ESL sound. In terms of harmonic balance and dynamic energy, the SW-57 integrates seamlessly with the Quad’s midrange/woofer panels—due to the two units’ very similar radiation patterns and the SW-57’s placement beneath the panels. The SW-57’s small footprint and its rigid screw mounting to the base of the ESLs make the Gradients convenient and unobtrusive, unlike a majority of other ESL subwoofer schemes I’ve seen. The addition of modern protection circuitry is a boon for foolish Quad owners who ignore the speaker’s 50W maximum power handling and insist on using overpowered solid-state amplifiers to drive the ESL panels. The three-point spike system on the SW-57’s base allows the integrated system to be tilted back at specific angles—important for optimizing vertical imaging characteristics.

The original Quad ESLs were among the first speakers made that could be said to “image”, ie, to actually re-create a semblance of a recording’s dimensional and spatial characteristics. The Gradient SW-57 manages to stay out of the ESL’s way in this respect. How nice. The original Quads, however, are still “one-person speakers” whose listening window is just large enough for one human head, as long as it isn’t too fat or prone to sway, bob, or weave (rope-a-dope practitioners are out of luck).

While the Gradient SW-57 integrated very well visually andaurally with the original Quads, from my listening position I found that the Quads were at least 4” too short to image optimally. If you don’t raise the speakers, you may get the “classic” Quad soundstage: looking down from the first balcony. Anyone who has tried to use the original Quads with their pitiful little standard legs (which make excellent kindling) will be familiar with this effect. I put bricks under each of the Gradients’ spikes, which brought the system to the correct height for listening from my futon couch. If you use a chair of normal height, you may have to raise the system 6–7”.

Now the bad news. Although the Gradient SW-57 is called a subwoofer, my definition of the term—is, a speaker that covers the 20–40Hz range—says that it is not. Although it does get down to 40Hz, anything lower is attenuated nearly to the point of inaudibility. Organ-music enthusiasts will be disappointed by the lack of bottom–octave power and extension. Aficionados of large-scale orchestral works will also be disappointed by the still-limited dynamic extension of the original Quad/Gradient SW-57 system. With some pieces—like Klaus Tennstedt’s live recording of Mahler’s Symphony 1 with the Chicago Symphony (EMI CDC 7 54217 2)—I found that the system ran out of steam, severely compressing anything louder than mezzo-forte.

My final and related complaint about the Gradient SW-57 subwoofers is their propensity to distort when fed substantial bass power. I ran some tests with the subwoofers alone and found that 15, 20, 25, and 30Hz test tones at any volume over 90dB at my listening position (7’ away) resulted in noticeable distortion in the forms of driver noise, harmonics, and cabinet buzz. Reggae-lovers beware: It’s easy to roast these suckers if the volume on your old Wailers records gets too insistent.

MEASUREMENTS FROM JA
With its two drive-units in parallel, the
Your ears have an amazing memory, which is why you seek a loudspeaker that's as unforgettable as live music. Had nature intended sounds to travel only forward, acoustics would be a simple science. Unlike conventional speakers, Mirage's M-si Series Bipolar loudspeakers set the music free over a full 360 degrees. It's only natural. Because what defines the sound of music is as much the physical space surrounding them as the instruments themselves. In reproducing music, a loudspeaker must place you, the audience, in that space. Mirage's Bipolar speakers do just that. But before you audition the M-si Series at your Mirage dealer, take in a live concert or two. Then you can experience for yourself just how unforgettable life-like the M-si's really are.
SW-57’s impedance (Fig.1) drops to 3.75 ohms in the upper bass. However, this shouldn’t present the amplifier with any problems, since the phase angle is benign in this frequency region. The 16 ohm peak at 32Hz indicates the drive-units’ resonant frequency, below which their output will roll off. The wrinkle in both magnitude and phase traces at 320Hz indicates some sort of resonant problem at this frequency.

The single-ended crossover is of basic build quality; outboard 15V AC supply, an onboard ’7815-type regulator chip, carbon-film resistors, and LF353 op-amps. Its input impedance was up to 5k ohms; and while its output impedance was also up to spec, this was relatively high, measuring 1100 ohms (1kHz, high-pass ESL outputs) and 960 ohms (50Hz, low-pass woofer outputs, level control at maximum). Aside from the right woofer output, which offered +14mV, DC offsets were below 3mV. Channel separation was moderate, with minima of 45dB (low-pass) and 55dB (high-pass). The unit’s distortion remained well below 0.1% across each output’s passband, though the high-pass outputs overloaded (defined as 1% THD) at 2.285V RMS input at 1kHz. While this may not seem like much headroom, remember that the crossover is inserted in the signal chain after the volume control. Any typical amplifier that’s fed more than 2V will be either heavily clipped or on the verge of overload.

The ESL outputs suffered a slight (1dB) insertion loss at 1kHz, while the maximum gain of the subwoofer outputs was 5.35dB. This allows for a degree of flexibility—using amplifiers of differing sensitivities—in matching the woofer level to the panels. The crossover’s shaped, high-pass output responses are shown in Fig.2. With the Mid-Adjust switch set to Off, the passband is basically flat, with a slight boost (1.5dB) at 300Hz. The –3dB point lies at 190Hz, with an ultimate second-order, 12dB/octave rollout slope. Position I of the Mid-Adjust switch gives a 2dB valley through the mid-treble; position II halves this depth.

Fig.3 shows the low-pass drive signal supplied to the amplifier used with the Gradients (be wary of the different vertical and horizontal scales of this graph compared with Fig.2). The rolloff slope is third-order, 18dB/octave, but there’s some additional response shaping apparent in the woofer’s passband. This peaks at 28Hz, with an 18dB/octave rollout.

The effect of this shaping can be seen in Fig.4, which shows the SW-57’s near-field acoustic response when driven both full-range and with the signal conditioned by the crossover. In the full-range trace, the small peak at 320Hz correlates with the wrinkle in the impedance traces; the crossover’s low-pass response suppresses this by 25dB. The free-air loading of the drive-units is intrinsically over-damped. The unequalized bass response starts to roll off gradually below 125Hz, reaching –6dB at 51Hz. But when the crossover is in circuit, the passband boost results in an overall woofer response that’s flat down to 28Hz, with then a fourth-order, 24dB/octave rollout slope that protects the unit against infrasonic overload.

Remember, however, that this is the unit’s small-signal response. Applying 10dB of boost to a free-air-loaded woofer’s low bass will drastically curtail its dynamic range. Luckily, many forms of music don’t have high energy in this frequency region, so this won’t be a limiting factor. Remember, too, that the Quad ESL has a limited dynamic range, accepting a maximum of 50 amplifier watts. However, even though the lows will be reinforced by the drive-units’ proximity to the floor and the additional baffling provided by the electrostatic panels, the SW-57 is still, as SS found in his auditioning, a woofer—not a subwoofer. Fans of organ and heavy rock music who want thunderous bass from their old Quads will still have to use a separate subwoofer, crossing over from the Gradient SW-57 below 50Hz or so.

(1) This is not such a silly idea. In my experience, the loudspeakers which have performed best with subwoofers are those which already extend quite low in the bass.)—John Atkinson

**BOTTOM LINE FROM SS**

“Too little too late” comes to mind when I think about the original Quad/Gradient SW-57 system. The SW-57’s window of opportunity has shrunk to a mouse-hole over the passing years.

If you’re the sort who must have your listening room neat, neat, neat, or your spouse has (through the goodness of her or his heart) allowed you to live with original Quads but has blanched at the idea of a large box taking up valuable space, the Gradient SW-57 subwoofer system may seem the answer to your prayers. For some original Quad owners, however, it’ll be an expensive step back from their own home-brew solutions to the Quad’s lower-octave problem. However, if you can live with only limited additional bass and dynamic extension, the Gradient SW-57 may be just the thing. But if you’re looking for a quantum leap in performance—which, at $2000, I believe you should expect— you may be disappointed. Caveat emptor.

—Steven Stone

6 Over the original Quad's 25 years of production, more than 60,000 were manufactured. The speaker regularly appears on the secondhand market; I suspect that SS is being too pessimistic in his prognostications. —JA
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“Uh! What is it?” I was being prodded on the arm. Admittedly it was gentle, almost polite prodding, but prodding it still was, a rude disturbance of the cocoon I had woven around myself in seat 31J of the American Airlines MD-11 winging its way across the North Atlantic. I pushed Pause on the Discman, insensitively not waiting for an opportunity to brazenly the HeadRoom Piano Quintet that had been my erstwhile virtual reality.

It was a flight attendant. “You’re annoying the other passengers,” she said, “Your stereo is way too loud!”

I was embarrassed, of course. I was also pissed. I was also intrigued. Could the Brahms leaking from the Sennheiser HD560 Ovation headphones be audible above the sound of air rushing past the fuselage and engines turning kerosene into carbon dioxide and water? I tried listening to the headphones with them in my lap. I tried holding them in front of me as far away as I was from my all-elbow neighbor. Just a faint rustling noise could be perceived above the 100dB low-frequency ambient background.

My listening time had already been partly eaten into by the new blanket rule forbidding the use of “approved electronic devices” until the airplane was well embarked upon its voyage. I realized what was happening. Rival headphone amplifier manufacturers were trying to abort my forthcoming review of the HeadRoom. And well they need to, I thought, as I took advantage of the opportunity by asking the stewardess to bring me another beer. (American’s flight attendants could usefully learn from British Airways in the art of keeping passengers well supplied with alcoholic beverages—“Boozehounds Fly British!” I must’ve read somewhere.)

Wait a minute. What other headphone amplifier manufacturers? Especially manufacturers of cute little portable battery-powered headphone amplifiers? Yes, the Melos SHA-1 has been selling very well since Corey Greenberg reviewed it for Stereophile in 1992, but the bulky tubed Melos is strictly a house-bound creature. Grado sells a battery-powered amplifier to go with its HP series of headphones, but the amp costs $750—too rich for my blood! And mail-order musician catalogs have always offered pro-audio headphone amplifiers that look like they’ve escaped from the early days of solid-state. But mobile high-end headphone amplification is a rather deserted play area.

Which brings me to Tyll Hertsen’s unique HeadRoom amplifiers.

**INNER SPACE**

The quest to make the headphone-listening experience more equivalent to normal speaker listening is not new. Back in the ’60s, the late Ben Bauer of CBS Laboratories devoted a lot of study to various equalization, interchannel crossfeed, and time-delay schemes intended to work the trick. Indeed, an article in the November 1962 *Audio*, authored in part by engineer John Eargle (better known today for his excellent—sounding Delos recordings), described a DIY device based on Bauer’s crossfeed circuit. The amplitude responses of the Bauer circuit’s two channels and the time behavior when fed a signal to just one channel, calculated using a circuit-analysis program, are shown in fig.1. The driven channel has a degree of HF lift applied to it, while being crossed to the undriven channel with an approximately complementary amount of HF.


3 A similar response diagram appeared in the January 1968 issue of what was then plain *Hi-Fi News*. I only include this information for pedantry’s sake, however, as HFN/RR now only keeps a limited supply of very recent back issues. Back before I edited that magazine, its publisher decided to save warehouse space by trashing almost all its stock of back issues. It might just have been the fact that I embarked upon my current career because I was a regular and enthusiastic reader of HFN, then HFN/RR, from 1967 through 1976. Nevertheless, I regarded this act as a tragedy, given the superb quality of its technical articles. There was nothing any of the magazine’s editorial staff could do about this historically wrongheaded decision.
Do you really hear the unique character of your music? The personality? The soul? To experience the essence of music, some audiophiles build systems based on impressive technical specs. Others rely on their highly developed perception. **Exposure Electronics** creates amplification systems which satisfy both inclinations. Extraordinary technology, capable of extraordinary performance. All built with an ingenuity which disproves the myth that stunning sound quality is achievable only at extreme prices. **The right system** enables you to hear the true character of your music. To Exposure character is everything.

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cut so that the total power in the treble remains about the same. In addition, the crossfeed signal to the undriven channel is delayed by about 0.4ms below 1kHz.

Why should it be necessary to so drastically mutate a stereo signal? When a binaural recording (one made with a dummy-head two-channel microphone) is auditioned on headphones, all the sounds appear to come from outside the listener's head. When a conventional amplitude-stereo recording is listened to via headphones, however, musicians and singers seem to be sitting on a clothesline stretched from ear to ear inside the head. "The instruments form a 'musical hat' on the observer's head," was how Bauer described this phenomenon; his EQ, time-delay, and crossfeed are intended to eliminate it by synthesizing the natural ear-to-ear crosstalk signals that a listener experiences when hearing a sound source from the front. (Sound to the side of one ear is heard by the other ear delayed by up to 0.7ms; it is also rolled-off in the treble due to the acoustic obstacle presented to the sound wave by the head.) This processing is intended to render the headphone listening experience more natural, more comfortable.

Fast-forward a quarter century. Any number of researchers are using Digital Signal Processing (DSP) to work the inverse trick: make listening to conventional stereophonic recordings via a single pair of speakers resemble the binaural experience, with sounds coming at all directions. (This is also something that was first suggested by Ben Bauer; QSound is the commercial realization of one of these algorithms.) Yet I thought Bauer's stereo-binaural quest had been long-forgotten—until I saw an advertisement from a new Montana company, HeadRoom, in the March 1993 Stereophile.

**HEAD ROOM**

The HeadRoom dual-channel head-

phone amplifier can operate conventionally, amplifying its inputs and driving a wide range of headphones of differing impedances and sensitivities. But when its unique Process switch is thrown, it feeds each channel through to the other with an amplitude and time delay that are carefully controlled with frequency. In this manner, it parallels what the obsolete Bauer circuit did: synthesize the around-the-head crossfeed information that a listener hears from frontally placed sound sources.

The HeadRoom's block diagram is shown in fig.2. The input impedance is defined by 100k shunt resistors; these also tie the inputs to ground in case the DC-coupled amplifier is turned on with a source component not connected to its inputs. With the Process disengaged, the signal passes through to the volume control, then the output op-amp, discrete complementary buffer stage, series 8 ohm resistors, and the ¼" headphone jack. (There is no 3.5mm stereo jack: this amp is meant to drive Arnold-sized cans.) A gain-setting resistor is looped around the output stage. With the Process switched in-circuit, each audio signal passes through Crossfeed EQ and Crossfeed delay networks and is summed into the opposite channel prior to the volume control.

Construction is to an excellent standard. The entire amplifier is housed in an extruded aluminum case. Two dual- AA battery holders from the English Bulgin company occupy the center-rear of the housing; the circuitry and front-panel hardware are carried on a U-shaped, double-sided printed circuit board that surrounds and is supported by the battery holders. On the right rear is a pcb-mounted AC power jack that takes in 5V DC from the supplied AC adapter; on the left rear are two pcb-mounted RCA jacks, these recessed inside rear-panel holes so that the RCA connectors are securely supported by the HeadRoom's chassis.

The DC supply voltage is smoothed with a 100µF electrolytic, then fed to an encapsulated module that converts it to the ±15V-and-ground supply required by the active circuitry. (This 100mA-capable DC/DC converter is said to be the most expensive single part used in the amplifier.) The front or base of the "U" carries the ¼" headphone jack, the front-panel switches, and the volume control, the last a conductive-plastic component from Clarostat. The other leg of the "U" carries a handful of resistors, 100µF supply capacitors, and the heart of the amplifier: a largish, 24-pin module that contains a smaller epoxy-encapsulated board carrying all surface-mount components. (This HeadRoom module is available separately at relatively modest cost.)

The amplifier is available in three versions: Standard, Premium, and Supreme, costing $199, $299, and $399, respectively. Apart from the Supreme's front-panel Filter switch, all three look identical, the differences being internal. The Standard's circuit module uses surface-mount LM383 op-amps, whereas those in the Premium and Supreme use the Burr-Brown 2604 op-amps—"a truly killer audiophile quality device," according to Hertens. The more expensive Supreme also uses Caddock 132 metal-film resistors on the main board, while the Standard uses ordinary 1% 0.25W metal-film resistors. The Supreme's filter applies a moderate amount of high-frequency boost to compensate for recordings that sound too dull with the crossfeed processing active.

**UP A LITTLE, LEFT A LITTLE...**

I started this review last Spring with one HeadRoom Basic amplifier sample. Before I even began my listening, Tyll Hertens sent me an upgraded unit, followed by what was the first of six different...
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DIGITAL INTERCONNECTS — RCA. In the world of RCA coaxial digital-interconnects, I have found one to consistently reveal more of the music than any other. It’s the Tara Labs RSC ($295). This cable sounds considerably better than any other RCA that I have run into... It’s, as you may have guessed, made of rectangular solid core conductors. The result is a digital cable that does not restrict dynamics and it’s a clearer window to inner detailing and timbre. It clearly out-performs all glass in the known universe. This is the first digital-interconnect to surpass the performance of the Cogan-Hall EM overall. I think that I can speak for Bob Sireno on this one, and tell you that he, a Cogan-Hall EM devotee, is fully enamored with the results obtained when using the RSC in his system. (The RSC has been bouncing between our homes like a ping-pong ball; now he wants it back.) I have to wonder how incredible this cable might sound if it were available terminated BNC.* Anyway, I consider it just about perfect as it is, and a must audition.

*Note from Tara Labs: Now also available with BNC adaptors and AES/EBU configuration.

Audition RSC Digital in your own system. Most Tara Labs dealers have a home trial program available. For the location of your nearest authorized RSC dealer, call 503 488 6465 or fax 503 488 6463.
Supreme samples. What was happening was that, in addition to Tyll's discovering better-sounding parts, his experience of different headphone models was being broadened. It had become apparent to him that his "one size fits all" philosophy regarding the amplifier's Process and Filter parameters was not going to work. The Sennheiser '580s, with their weighty low frequencies and extended highs, required different equalization from the very smooth but rather dark-sounding Grado HP-Is and '2s. And the totally in-the-ear Etymotics had different requirements again. The design-optimization process is best described in the words of the indefatigable Tyll:

"This revision activity was catalyzed by the Sennheiser HD580 headphones . . . Our first reaction was to significantly change the filter. We basically brought the whole high end of the curve up by about 5dB. This brought the highs up close to where they should be, but slightly overemphasized the information just before the notch. The box imaged [well], but the tonality was still hurt by the notch. If we brightened up the box enough in the notch region, the direct channel component (which is tonally unaffected by the processor) was too bright, and made the HeadRoom sound hard. If we eased off, we started to get the old problem back. What to do?

"We decided to turn down the crossfeed channel a little. The danger is [that, according to theory], the crossfeed level isn't much lower in amplitude than the direct channel. But . . . we knew that time differences are significantly more important than amplitude differences in correct localization. Therefore, cutting the crossfeed level in half should only slightly affect imaging. But—insert trumpet fanfare here, 'Ta-da'—cutting down the crossfeed level will have a dramatic reducing effect on the depth of the comb filter notch . . . It definitely sounds better tonally."

I congratulate Tyll for daring to depart from theory when his ears tell him the theory is not quite right. The amount of bass—shelf boost applied to the sum information and bass-shelf cut information will still depend on the particular headphones used, however. What Hertenss now does, therefore, is to offer a limited range of customization options. When the customer phones HeadRoom, he or she is either supplied an amplifier whose EQ is optimized for the customer's existing 'phones, or is sold a matched amplifier/headphones package.

POWERING UP
The HeadRoom's case gets hot after a couple of hours, implying that its circuit has a thirst for juice. I found alkaline bunny batteries worked best in the HeadRoom, giving about two and a half CDs' worth of listening pleasure, after which the sound degenerated into a clipped, crackling roar. NiCads were a pain, four AA cells not even lasting the 73 minutes of Beethoven's Symphony 9—for long journeys, a little more juice is required. Enter HeadRoom's optional external battery holder, which holds four D cells and plugs into the power jack. With alkalines, this gives a supply good for up to 20 hours. To my surprise, rechargeable Radio Shack NiCad D cells didn't last any longer than their AA cells. (I've since been told that these are a scam, merely mounting an AA NiCad cell inside a D cell's case.)

LISTENING
I used the various HeadRoom amplifiers Tyll Hertens sent me with a variety of headphones: Sennheiser HD560 Ovation and the new $349 Sennheiser HD580 Precision; Etymotic ER4S Ear Canal Phones; Sony MDR-484 ear buds; and Beyerdynamic DT901s and '911s. In the comfort of my listening room, I used a Mark Levinson No.31 and Panasonic 3700 DAT recorder6 driving either a Krell Reference 64 or a Counterpoint DA-10 (UltraAnalog DAC version) as source. For music on the move, I used a Sony WD-D3 Walkman Pro cassette recorder, an Aiwa HD—S1 portable DAT recorder, or my own Panasonic SL-NP1A portable CD player—followed by a Denon DCP-150 portable CD player on loan from HeadRoom. (CDs were carried in the excellent Laserline case, which holds 12 discs by the center holes. Unlike the cases which hold the discs in clear plastic wallets, the Laserline keeps both top and bottom disc surfaces away from anything that might scratch them.)

I mainly used the Straight Wire LSI Encore minijack—RCA cable provided by HeadRoom to link source components to the HeadRoom amp. This was sufficiently oversized that it wouldn't plug all the way into the Denon, however, so for that player I used a premium OFC cable from Sony.

I first compared the amplifier with the headphone output of the ancient Advent 300 receiver I use in my office system.

Well, used as a simple amplifier, the HeadRoom stomped all over the Advent. The AC-powered receiver's bass sounded lumpy and spongy compared with the little battery-powered amplifier. This was probably due to the Advent not having a true headphone output, instead padding down its speaker-level outputs with series resistors. But it sounded so grainy in the highs compared with the HeadRoom that I ultimately ruled it out of contention.

The Denon CD player, on the other hand, has a surprisingly good headphone output, capable of driving Sennheiser '580s to moderately high levels without strain. However, it didn't go as satisfyingly loud as the HeadRoom. With levels matched at 1kHz, the CD player sounded rather thin compared with the separate amplifier, lacking both the HeadRoom's bloom and its clarity. Headbass also lacked a little definition; the HeadRoom sounding considerably more authoritative throughout the bass due to its greater low-frequency extension and power reserves.

Against the mighty Melos SHA-1 I habitually use as a preamplifier, however, the match was more even. The tube preamp sounded warmer in the lower midrange, the solid-state having more apparent clarity in the treble. Surprisingly, given the 6D8R/6922 tube's reputation for having a rather bright character, the upper midrange and lower treble of the two amplifiers were very close in tonal quality. Where the Melos walked away with the honors, however, was in the feeling of unrestrained power it gave to low frequencies. Where the HeadRoom scored over the direct output from the CD player was where the Melos went even further. Recorded bass drum gave more of an impression that it was going to smooth out the folds in your cerebellum. But all things considered, the little HeadRoom still gave a very good account of itself in this exalted company.

How about the HeadRoom's Process process?

With early versions of the HeadRoom, I couldn't get past the bass boost applied to dual-mono signals to appreciate any changes in spatial perception. With recordings with a strong low-frequency mono content—virtually all rock recordings, which have the kick drum and bass guitar panned to a central position—the

5 Some readers were disturbed by Robert Harley's discovery last November (p.93) that this popular DAT machine's SPDIF output has remarkably high levels of jitter. (His finding, as gleaned from measurements made of two different samples.) They should note that the 3708's AES/EBU output has lower jitter. However, I found that both its AES/EBU and SPDIF output sounded a whole lot better when conditioned by the Digital Domain VSP Digital Control Center described by Robert Harley in this month's "Industry Update."

6 Readers should be warned that the enhanced loudness capability of the HeadRoom makes it even more important to take care about how loudly they listen to head. This requires a commitment to a listening lifestyle that includes adulthood with crippled ears, due to their habitual playing of portable tape and CD players at hearing-damage levels throughout their teen years.
"At the risk of perturbing owners of my earlier work, here are my best cable designs ever."

— David Salz

Please don’t imagine I’m ungrateful to those audiophiles and reviewers whose ears and hearts were won over by my designs in the past. It’s just that time has marched on, and I’ve founded a new company. Once again, I have designed a new generation of audio cable.

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The materials I have utilized, grain-optimized copper or solid silver conductors and teflon or microporous teflon dielectrics, are the finest available at each price level.

I ask only that you audition and compare before your next purchase. That’s how certain I am you’ll share my enthusiasm.
sound muddied up to the point where I preferred using the unit as a straight amplifier. With the current versions, while a warming-up of central images was still noticeable, this didn't get in the way of other aspects of the sound.

Well, to my surprise, I didn't get the out-of-the-head, binaural-type imaging from stereophonic recordings that I expected from reading both HeadRoom's literature and the original Bauer and Thomas papers. (Neither did '60s HFN correspondents who had tried the Bauer circuit, as I later discovered.) What I did get was a more coherent presentation of the soundstage within my head. Off-center images didn't seem to clump at the far-left and -right positions as they did with straight headphone listening. Simple recordings made with a spaced pair of omni mikes lost some of their characteristically unstable center imaging, and far-away sound sources captured by this mike arrangement did appear to come from behind my head.

But this-making-more-coherent factor was, at best, rather subtle compared with the tonal changes. Simple A/B-switching on the fly paradoxically made it harder to detect. Switching the Process in or out, then settling in to appreciate a recording's gestalt, was much more effective in revealing its effects. Choricles, the excellent collection of Stevie Winwood classics (Island 9 25660-2), provided a suitable test circuit for the HeadRoom to negotiate, with its combination of driving bass guitar and bass synth coupled with rather hashy high frequencies. With the Process bypassed, I was all too quickly annoyed by this disc's treble quality (though the Sennheiser HD-580's alleviated this considerably compared with the earlier '560s or Beyerdynamic DT901s and '911s). With the Process engaged, there was a satisfying solidity to the music's presentation which made the album much more listenable. Ambient information, too, seemed to be more coherently associated with the sound sources exciting it, giving rise to a greater sense of realism to the image. In this respect, switching in the HeadRoom's Process made its musical presentation more believable, in the sense that the unprocessed Melos's presentation was more tangible than that of the unprocessed HeadRoom (or the same sense that LP is, in broad terms, more tangible than CD). Given the choice between the Melos driving the Sennheisers and the processed HeadRoom, I'd opt for the HeadRoom.

True binaural recordings—such as one I made at the final hairpin of the 1992 Montreal Grand Prix, and which I might include on Stereophile's forthcoming Test CD 3—reproduced in the Bypass position with a true sense of the sounds taking place outside the head, of the listener being immersed in the acoustic environment. Front-placed images, however, as always appears to be the case when a generic dummy head is used, were perceived as being positioned in my temples rather than in front of me. Switching in the HeadRoom Process appeared to have no effect at all on this recording, even though the recording time and amplitude cues were then effectively doubled.

Overall, my time spent with the HeadRoom amplifiers was very satisfying. I spent a lot more time listening to music on headphones than I had done before—always a sign that something good is going on.

**Measurements**

The HeadRoom amplifier was non-inverting for all control settings, and its input impedance was a little lower than specification at 21k ohms at 1kHz. Channel separation in Bypass mode was better than 70dB at low frequencies, worsening to 37.5dB at 20kHz due to capacitive coupling between the channels, probably between the parallel pcb tracks carrying the signals to the volume control. The HeadRoom's background noise was a little higher than I expected, its S/N ratio measuring about 62dB (unweighted, 22Hz–22kHz, ref. 1V).

(An earlier sample of the Supreme offered about 6dB lower noise.) Nevertheless, I was never bothered by audible noise, even with the volume control fully up and the CD player in Pause.

The HeadRoom's output impedance was very low, at 0.4 ohms. (Contrary to what the block diagram implies, negative feedback appears to be taken from the socket end of the current-limiting 8 ohm output resistors.) Its maximum voltage gain into a high-impedance load with Process and Filter bypassed was 16.6dB, which, given its measured maximum voltage output into a 150 ohm load of 7.5V, corresponds to a sensitivity of 1.1V. Fig.3 shows the changes in THD+noise for different RMS output voltages into 150 and 40 ohms. The negative slope of the curve to the left of this graph reveals that the reading is dominated by noise; as the output level increases, the constant level of noise becomes a smaller percentage of the signal. The sharp knee of the traces is when the true distortion starts to rise due to the amplifier running out of the ability to swing sufficient volts. The extra current demanded from the amplifier by the 40 ohm load cuts the clipping voltage (defined as % THD+noise) from 7.5V to 4.4V. (These are equivalent to power levels of 375mW and 129mW, respectively.) The latter is still plenty enough to produce deafening sound levels.

Also shown in fig.3 is a trace produced when I added a 0.22µF capacitor in parallel with the 40 ohm resistor to see whether the HeadRoom would misbehave with higher capacitive loads. With the exception of a marginally higher distortion level between 2V and 3.6V, this trace exactly overlays the one made with a pure resistive load. Given that this load represents the HeadRoom driving several power amplifiers in parallel at the end of about 700 yards of AudioQuest interconnect cable, this minimal change in clipping behavior would suggest that a good headphone amplifier also makes rather a good line stage (as Melos has discovered). I shall explore this possibility in a Follow-Up.

That the amplifier's intrinsic distortion is very low in level is confirmed by looking at the spectrum of its output when reproducing a low-frequency tone at very high level into 150 ohms (fig.4). The only harmonics popping their heads up above the -100dB level are the second at -95.6dB (0.0015%) and the fourth at -99.3dB (0.001%)—completely inconsequential at these levels, particularly given the sonically benign nature of these two specific harmonics. (As track 21 on Stereophile's Test CD 2 will inform you, even 1% of second harmonic is very hard to hear!) The higher current demand of the 40 ohm load at this 4V level brings up the distortion somewhat (fig.5), the second harmonic rising to -80.5dB (0.01%) and the fourth to -91.8dB (0.0025%). The third and fifth also now make appearances above -100dB [polite applause from the gallery], but I doubt very

---

7 I'm much more impressed with these headphones than Alvin Gold appears to be in this issue's "Industry Update." Yes, they sound very smooth compared with earlier Sennheiser cans. But the lack of aggression is due to their more natural presentation of high frequencies, not to a lack of pace. I accordingly used the '580 headphones for monitoring during Stereophile's most recent recording activities (see this issue's "As We See It").
Accuracy in Performance - Elegance in Appearance
Bryston’s BP-20 Preamplifier

Bryston’s new BP-20 line level preamplifier offers a significant step forward in capturing the subtleties, nuances and emotions of recorded music.

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You will find the noise floor has been significantly improved, reducing background hash to far below audibility. Input-to-input crosstalk is essentially nonexistent to eliminate signal bleed-through from one source to another. Channel-to-channel interaction has been improved, reducing any possibility of component crosstalk.

Signal switching and audio connections utilize heavy gold plating to provide long-term trouble-free connections. Two pair of XLR balanced inputs and one pair of balanced XLR output connectors are standard as well as five pair of unbalanced inputs, 2 pairs of paralleled unbalanced outputs and one processor loop. This provides total flexibility for integrating other balanced or unbalanced audio equipment into your system.

The power transformer is mounted externally to eliminate power-supply noise and interference. The BP-20 is housed in a steel cabinet for shielding to reduce electromagnetic interference effects. Buffered inputs provide for lower distortion and improved linearity from source components. A ground plane has been incorporated in this new design to further reduce crosstalk and noise throughout the internal circuitry.

Our feeling is that Bryston’s BP-20 is one of those fortunate circumstances when the long hours and extended listening pay off. The sense of transcending the recording medium and experiencing the original performance is captured with exceptional realism.

Nothing but a listening test will convey the feeling of musical perfection available in the Bryston BP-20. We invite you to audition one today.
This much loads—don'tcha HeadRoom. This predominantly second-harmonic—plus—noise signature is confirmed by fig.6, which shows the distortion waveform with the amplifier working hard driving 1kHz at 4V into 40 ohms. (I averaged 32 individual measurements to produce this graph, dropping the signal's noise content by 15dB to enable its harmonic content to emerge.)

So, how to examine the HeadRoom's response shaping and crossfeed? In its bypass mode, the amplifier was flat in response up to the mid-treble, with then a gentle ultrasonic rolloff. This can be seen in both the rounding of a 10kHz squarewave's leading edges (fig.7) and in the amplitude response (fig.8). The ~3dB point lies at 27kHz, meaning that audio- band response is down 2.2dB at 20kHz. This will be audible as a slight softening of the overall sound—not a bad idea with headphones! The effect of the filter is also shown in fig.8; it can be seen to shelve up the mid-treble by a mild 3dB.

Driving just one channel with Process engaged but looking at the output from both channels shows you the nature of the crossfeed. As can be seen from fig.9, the result is not too similar to the Bauer circuit responses (fig.1). The driven—channel response is basically the same as in Bypass (fig.8), while the cross-

![Image of graph](image_url)

**Fig.6** HeadRoom Supreme, 1kHz waveform at 4V into 40 ohms (top), distortion and noise waveform with fundamental notched out (bottom).

![Image of graph](image_url)

**Fig.7** HeadRoom Supreme, 10kHz squarewave at 1W into 8 ohms.

![Image of graph](image_url)

**Fig.8** HeadRoom Supreme, frequency response at IV into 100kHz (bottom trace at 1kHz) and with Filter engaged (top) (right channel dashed, 2dB/vertical div.).

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*Note: The above text is a transcription of the content provided in the image. It includes diagrams and figures that are not explicitly described in the text.*
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feed signal is nearly 12dB down in level and starts to roll off above 1kHz. (This measurement doesn't reveal the time delay, of course.)

What happens when the HeadRoom is handling signals in both channels? The Audio Precision System One allows you to drive a stereo component with both in-phase and out-of-phase dual-mono sweep signals. The results are shown in fig.10. When a signal is the same in both HeadRoom channels, it is shelved up 2dB below 1kHz, with rolled-off highs and a broad 2dB notch centered on 2kHz. This is for the amplifier customized for use with Sennheiser '580s; the bass shelf is 1dB higher for the 20k/6800pF version that works best with Beyerdynamics; and 1dB higher still for the 10k/8200pF version for use with Etymotics and as a line-level processor for Stax Lambda Pros. For a signal that is identical but out-of-phase in the two channels, this is equalized in the complementary manner.

Another way of looking at the HeadRoom process's effect is to drive the amplifier first with dual-mono pink noise, then with completely uncorrelated pink noise (ie, the two channels are completely different, not just out-of-phase). Track 15 on Stereophile's Test CD 2 was ideal for this test. When the pink noise was the same in both channels (fig.11), the same sum-channel trace was obtained as in fig.10. (Actually, this test was performed on an earlier version of the HeadRoom; the 2kHz valley is correspondingly about twice as deep.) But when there is no relationship between the signals in the two channels—ie, an instrument or voice is panned hard left or hard right—fig.11 confirms the fig.9 result that each channel is reproduced with a flat response. (The bumps and dips in this curve should be ignored; noise signals only measure truly flat when you can average the power at each frequency over a long period of time.)

**SUMMING UP**

With some products, to see them is to want to possess them; the HeadRoom headphone amplifier falls into that category. It also sounds superb. Even though I couldn't reproduce any significant out-of-head imaging with the Process switch engaged, it did sound more natural on nonclassical recordings. Don't bother with the Standard unless you're really strapped for cash. Buy the $299 Premium if you don't need the HF-boosting capability of the Filter; otherwise do what I'm going to do and spring for the $399 Supreme. A remarkably well-thought-out, well-engineered product at an excellent price. Long-distance travel will not be the same again. Highly recommended—give that 800 number a call!

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libretto of The Magic Flute, so, too, does Beethoven's transformation that of Fidelio into compelling theater, vivifying its time-
less themes of devotion, love, heroism, and the triumph of good over evil.

The work poses, of course, many prob-
lems. It requires singers of exceptional
virtuosity, musicality, and dramatic
sense. Leonore must not only be a con-
summate vocalist, she must also be a
superb actress capable of projecting the
wide-ranging emotions the role de-
mands. Don Pizarro must exude evil, and
Florestan must be at once tortured, suf-
ferring, sensuous, and jubilant. In addi-
tion, Fidelio is especially sensitive to pace.
Thus, for all the demands it makes of the
actors, it is very much a conductor's
opera. The opening scene must retain
required lightness without sounding
trivial; the orchestra must be given its
due as a commentator on the action and
a catalyst of mood; and everything
should build toward a triumphant climax.

Then there is the pragmatic problem of
what to do between the two concluding
scenes, when the action shifts from the
dungeon to the courtyard—requiring
considerable change of scenery and cast.
Mahler's solution (and the one generally
followed in live productions today) was
to insert the Leonore No.3 between the
scenes, thereby providing the time
needed to carry out on-stage changes.
Unfortunately, such an insertion is har-
monically and dramatically redundant,
summarizing, in effect, the entire opera
and thus throwing its dramatic progress
into reverse. What results is a surfeit of
C-major tonality, with the glorious
finale becoming almost anticlimactic. (I
have always thought a better solution
might be to use the less dramatic Leonore
No.1 between the two scenes.) And in
the recording studio, where staging is not
an issue, there is no reason for the inclu-
sion of anything at all between the
scenes.

Other issues of theatrical practicality,
however, pertain to the studio. They
involve creating a suggestion of stage
ambience and a retention of at least some
of the opera's spoken dialogue, without
which the running of one vocal number
into another becomes jarring and dra-
matically senseless. This is what has been
done in most recordings, and in the fol-
lowing discussion it might be assumed
(unless otherwise noted) that dialogue
is included and the Leonore No.3 omitted.

Fidelio remained unrecorded during the
78rpm era. The two earliest LP ed-
tions were stopgap sets of European
radio tapes of no major consequence.
Indeed, it was not until 1955, with the
release of recordings led by Toscanini and
Furtwängler (performances that remain
available on CD), that the opera gained
phonographic representation to reckon
with.

Both conductors were eminent Be-
ethovenians, and both had significant
associations with Fidelio. Furtwängler's
extending over a long period, and
Toscanini's from La Scala in 1927 and
Salzburg in the mid-'30s with Lotte Leh-
mann as Leonore. Some have called this
latter Toscanini production "the" opera
performance of the century. Unfortu-
nately it is the only one of Toscanini's
four opera productions at Salzburg not
to have been preserved in its entirety.
The recording released by RCA (60273-2)
derives from two concert performances
the conductor led in 1944 at NBC. It
contains some admirable things, but sev-
eral factors work against its deserving
recommendation as a prime acquisition.
For one, studio 8H's cramped sound is
totally evident. Furthermore, all dialogue
is omitted, and Rose Bampton in the title
role sings with a shrewdness that gratifies.
Still, there are admirable things here: Jan
Peerce's Florestan, with passion and tona-
dryness that seem just right for the role;
Toscanini's clarification of key orchestral
strands; and his superb shaping of the
concluding scene. I suspect, however (to
drive from a surviving, sonically primi-
tive shortwave aircheck of portions of
Toscanini's Salzburg Fidelio), that this
later effort is a far cry from that produc-
tion's glories. In this new CD edition,
incidentally, RCA restores the 1944
account of the second act's Leonore No.3, which
had been excised six months after the initial
LP release in favor of Toscanini's more
technically polished studio recording of
a year later.

Furtwängler's 1953 studio effort (EMI
64496) disappoints for two reasons. Like Toscanini's, it includes a Leonore No.3 and
omits all dialogue. But to a far more
demonstrable degree than Toscanini's, it
is unrepresentative of Furtwängler's
best work. The sessions, I've been told,
took place immediately after a live Salz-
burg Festival performance had con-
cluded, and ran into the early morning
hours. Everyone involved was tired.
Under such circumstances it's amazing
that things move as well as they do. Still,
the fatigue shows, especially when the
recording is compared to the preceding
live performance, preserved (with dia-
logue) on Virtuoso set 2697727, which
I have seen in such New York stores as
Tower and HMV for as little as $8 for
two CDs.

This is a bargain of bargains. The sound,
if a bit limited on top, is clear and
benefits from ample presence. And

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everything moves with a bit more thrust and tautness than in the succeeding studio effort. The major weakness of Furtwängler's direction is his heaviness-handedness in the opening arias. But as the drama unfolds, he leads a powerful performance, with Martha Mödl conveying the gamut of Leonore's wide-ranging emotions. Sena Jurinac proves an especially appealing Marzellina, and Otto Edelman brings sufficient, if not ideal, demonic edge to Pizarro. The performance of Leonore No.3, despite a jolting gaffe from the brass at one point, is as fine as any I have heard among Furtwängler's several surviving accounts of the work.

Not to be overlooked is a live 1950 Furtwängler production, also from the Salzburg Festival. Available for some time in a decent-sounding Arkadia set (CDWFE 354.2), it has recently been released in a considerably better-sounding edition by EMI (64901) which corrects the slightly sharp pitch of the Arkadia set. Unfortunately it includes no libretto. And the performance, although similar to the one of three years later, is less tightly organized and a bit fussier. In short, it is less dramatic. For example, the orchestra at the beginning of the second act is far more suggestive of a gloomy dungeon in the 1953 performance than in 1950. But the 1950 production has one major virtue that cannot be ignored—Kirsten Flagstad in the title role. By 1950 her voice may have lost a bit of its bloom on top, but her control, the pure beauty of her tone, and her grasp of the role remained extraordinary. Fine as Mödl was in 1953, Flagstad is finer still. For her performance alone, this EMI set is worth having.

Of historical significance, too, is a 1955 broadcast performance led by Erich Kleiber (Arkadia 34048). It suffers from a hasty, rather shapeless account of the closing scene. But Kleiber, who had extensive experience in the theater, elsewhere demonstrates a superb sense of pace and flair for drama, and with Birgit Nilsson in the title role, the set commands interest. The sound, though, is at best mediocre and flawed by slightly sharp pitch. Neither libretto nor plot summary is included.

Three years elapsed after the advent of stereo before Fidelio gained its first multichannel recording. Directed by Hans Knappertsbusch and originally released by Westminster, it has been reissued in an excellent CD transfer (MCA 9809), its two discs selling for the price of one. But this is a bargain only for those who may respond to the performance's peculiarities. There has never been a reading like it, and probably never will be. To be more specific, this is the slowest Fidelio one will ever encounter. In the overture, the broad pacing works well. Knappertsbusch's attention to detail, crisp accents, and sharp motivic contouring suggest a production that may have an urgency that does not grow from sheer speed. But as one number follows another at an almost surreal crawl, things become increasingly dreary, with any suggestion of dramatic character giving way to ludicrous caricature. Yet even through such limitations, Sena Jurinac manages a splendid projection of the title role. (At one point she jumps the beat, suggesting she simply cannot endure the straggling.) And Jan Peerce's Florestan remains as impressive here as it was 18 years earlier under Toscanini. All the same, this set, which is well engineered, should have very limited appeal. One curious aspect of the reissue: while it includes a German-English libretto, it doesn't identify who sings what role (Murray Dickie is Jacquino; Gustav Neidlinger, Pizarro; Denzo Erster, Rocco; and Maria Stader, Marzelline).

Shortly after the Knappertsbusch set's release, the Klemperer account appeared. To this day, it remains one of the phonograph's most imposing Fidelios, and a performance that some critics consider the

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finest the work has ever received (Angel Studio 69324). If I demur from this view, it is not without admiration for its many existing virtues: Klemperer, who towers over the whole in his almost monolithic control of things; broad tempos that never seem to drag; and a sure sense of the orchestra's role, with details of scoring often italicized to highlight character. Particularly noteworthy are the sharply delineated brass used to suggest Pizarro's malice and the well-defined oboe that brings out the underlying sensuality in Florestan's vision of Leonore at the beginning of Act II. And the cast is strong, with Christa Ludwig in the title role proving that a mezzosoprano can handle the part very well.

What, then, is missing? Above all, a convincing sense of theater. It is not merely that this recording includes less of the dialogue than some others do, or that little attempt is made to suggest live opera with the use of appropriate sound effects. Rather, its main flaw is that it sounds too much like a recording. The perspective is close and flat, with virtually no physical movement of the characters conveyed. Such engineering works against the drama. The "Prisoners' Chorus," for example, sounds simply like voices gathered around a microphone rather than a group of suffering inmates emerging from a dungeon. Then, too, for all of Klemperer's attention to detail, for all of his rhythmic rectitude, and for all the precision he secures, there is a certain monotony to his pacing that neutralizes contrasts needed to bring out the work's emotional impact. One need only compare his way with the final scene to that of Furtwängler's or Toscanini's, both of whom project a superbly controlled yet wildly jubilant courtyard rejoicing. With Klemperer, in contrast, the finale sounds more like an antiseptic rendering of a joyful-noise concert da to.

Let me add that these reservations are raised to some extent because of the lavish praise this set has received and the high regard in which it's still held. Depending on taste, it may well be a prime set to own. However, you may find it wanting in theatrical effect.

But Bernstein's 1978 production is wanting in much more (DG 419 436-2). Although Gundula Janowitz is often impressive in the title role, the conductor's many mannerisms and lack of dramatic flair make this set uncompetitive. Tempos are manipulated arbitrarily, the closing scene ends more in a frenzy than jubilation, and the inclusion of the Leonore No.3 (which Bernstein "modulates" into by amputating its opening chord) simply adds to the shortcomings of the whole. Interestingly, there is a less mannered Bernstein Fidelo available in a live Rome Opera production with Nilsson in the lead (Arkadia 34049), but poor sound and a second-rate orchestra that cannot cope with all of the music's demands prevent endorsement.

One might expect Solti to be an ideal conductor of this opera, and his recording (London 410 227-2) has many distinctions: superb playing by the Chicago Symphony, with magnificent horns in "Komm Hoffnung!"; an apt lightness in the opening numbers that produces a fine foil for the unfolding drama; a touching tenderness in the "Mir ist so wunderbar" canon; and Solti's splendid treatment of the "Prisoners' Chorus," where the music's pointed harmony is underscored to lighten the mood of the moment.

But against this are several shortcomings: a close, over-miked perspective that fails to suggest theater; a hard, glossy sound typical of some early digital technology; and singers who, though technically compatible with their roles, fail to convey character. Hildegard Behrens's account of Leonore's "Abscheulicher," for instance, projects little of her "inner Treibe" (internal drive); Peter Hoffman is bland in Florestan's "In des Lebens Frühlingsstagen"; and from a conductor of Solti's renown, it's surprising to encounter so many examples of how, in contrast to Klemperer, he fails to bring out significant detail, the prevailing orchestral sonority sometimes being too homogenized to complement the action.

Utterly different is the Haitink account, released in 1990 (Philips 426 305-2). Indeed, for many reasons it ranks as a preferred edition. The cast is strong; Jussi-Norma's Leonore, if lacking some of Flagstad's delicate control, suggests a blend of heroism and tenderness, and she has the vocal equipment to handle the part's technical demands. Reiner Goldberg may possess too thin a tone for some roles, but his timbre suits the beleaguered Florestan perfectly. And Pamela Coburn's vocal tone is sharply contrasted to Norma's so that, in Act I, the roles of Marzeline and Leonore are easily distinguished.

Then there is the production's prevailing theatricality. Without resorting to special effects, the engineering (more distant than in the Klemperer or Solti versions) makes pointed use of echo in the second act to suggest a dungeon. Furthermore, the spoken parts are delivered with uncommon conviction. In the context of the unfolding action, for example, Florestan's question, "Meine Leonore, was hast du fur mich getan?" (My Leonore, what have you done to me?)
and her response “Nichts, nichts, mein Florestan” (Nothing, nothing, my Flor-estan) prove almost as riveting as Bee-ethoven’s glorious music.

And finally there is Haitink—passionate, intense, yet in firm control—displaying an emotional involvement rarely encountered in his usually competent but often somewhat neutral directing. Here, his sense of pace is sure, his attention to orchestral detail telling, and his responsiveness to the music’s dramatic range complete. The opening numbers are rendered with welcome lightness, the orchestral introduction to Act II almost smells of a dungeon, and the conductor’s emotional grasp of what follows goes to the work’s core. Note the sinuous, sensuous oboe in Florestan’s great aria, the rage projected in Leonore’s defense of her husband, the fury in the confrontation between her and Pizarro, and the tender sensuality in “O namenlose Freude.”

And Haitink’s shaping of the final scene produces a seemingly ideal blend of tenderness and jubilation, with the chorus sounding like it is singing in a prison courtyard, not a recording studio. Not to be overlooked is the Dresden orchestra, which plays like a world-class ensemble. A Leonore No.3 is included, but (wisely) after the finale. If it’s not quite a match for the rest of the performance, such a shortcoming is utterly irrelevant given this release’s prevailing distinction.

Like Haitink’s account, a new one led by Dohnányi (London 436 627-2) benefits from its conductor’s sense of pace and style. From the overture’s crackling statement, it’s clear that this performance will be shaped by commitment from the podium. In fact, Dohnányi sounds a bit too committed, at times forcing an accent or altering the tempo where such adjustments seem unnecessary. And he doesn’t bring the same careful shaping and range of emotion to the finale that Haitink does.

Still, there is much about Dohnányi’s approach to admire. It boasts a sense of coyness in the opening numbers that suits their content perfectly, and the opening of Act II has an apt grimness. On balance, however, this release falls short of Haitink’s achievement for a few key reasons. Gabrielle Schnaut has no match for Norman in the title role. Her voice is less attractive and becomes a bit screechy on top, a flaw possibly magnified by London’s very close perspective. Also, Josef Prot’s Florestan is not as sharply delineated as Goldberg’s. And the controlled abandon that stamps Haitink’s set, with particular distinction at the point where Leonore reveals her identity to Pizarro, is absent here. Finally, the dialogue, although accompanied by appropriate sound effects, does not have the same dramatic conviction found in the Haitink version.

Sonically, too, London’s engineering is less attractive than Philips’s. Everything is closer and harsher, lending the strings an unmusical glassiness. This set is certainly superior to many others, but when measured against the very best, it proves uncompetitive.

As a closing thought, I would suggest that anyone interested in this opera try to hear a recording of its original version, Leonore. Two have been produced: a generally fine version with dialogue included, led by Herbert Blomstedt and released on EMI and Aravéesque LPs, is currently out of print but often turns up in secondhand stores devoted to vinyl. Another, more recent, edition (lacking dialogue) with Ferdinand Leitner conducting is available on CD (Memories 4251/2). I have not heard it, but assume, from what colleagues have told me, that it gives a good sense of the music. Most significantly, knowing Leonore makes clear the miraculous reductive process that Beethoven employed in honing his greatest creations into works of artistic perfection in which there is seemingly not an extraneous note.
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AAD

Every once in a great while a rock musician comes along who not only sums up everything that has come before him, but who sounds so new his appeal is irresistible. Elvis Costello didn't just "burst" upon the moribund rock scene in 1977 with My Aim Is True—he went supernova, leaving behind not one atom of ash. How one little guy could all at once be so angry, so smart, so literate, so musical, so rockin'—so necessary—was, and is, beyond me. The man's fury burned brilliant and clean, and immediately distanced him from a punk movement of whose it's-only-rock'n'roll-and-anybody-can-do-it ethos he was never truly a part. There's nothing democratic about Costello's talent.

I remember playing that first album for the first time. The resultant instantaneous Attitude Adjustment gave me cognitive whiplash, half of it just from trying to dodge this insane ex-computer slave with the Buddy Holly spectacles and the ridiculous name (he's kidding, right?) who sounded as if he was about to jump right through my KLH 22A speaker grilles, grab me by my effete post-hippy ponytail, stick his nerdy face into my nerdy face, and cover my glasses in sour spittle as he shouted "What are you DOING?! Get a LIFE!! You're pissed off and powerless you DON'T EVEN KNOW IT!!" He did the same on his next four albums, too—but harder,louder,faster,better.

Costello's musical appetite is omnivorous. But unlike the work of another rock scavenger, Frank Zappa—the very point of whose music is its disjointedness, its stylistic culvism—Costello's final product is perfectly digested, entirely seamless. You can hear all of American and English pop music in his records, and all of it is all Costello. He's also one of the most distinctively passionate vocal stylists of our time. Listening to him then, now, and in between, sometimes I've almost felt just like a human being.

2½ Years comprises Costello's first three albums—two of which Rolling Stone named to their "100 Best Albums of the Last Twenty Years" list (#507, August 27, 1987)—in much-expanded and re-mastered versions, plus a live date that only bootleg collectors have known about until now. Rykodisc has once again followed their own tradition, established with their exhaustive re-releases of the Zappa and David Bowie back catalogs, of reissues guaranteed to satisfy all but the most fanatical completist. Here is all the original cover art; revealing, disarmingly self-critical notes by Costello himself; reinstatement of the original UK albums' running orders; the addition to each disc of at least 20 minutes of material not included on either the original US or UK versions of each album; and, last but not least, the much-bootlegged Live at El Moambo bonus disc, recorded in Toronto in March 1978 with the Attractions but never officially released until now.

With the exception of Taking Liberties, Ryko will eventually reissue all of EC's Columbia albums, up through Blood and Chocolate. (Get Happy!! and Trust are slated for April release.) The 20 singles, B-sides, and outtakes compiled on Liberties will all eventually appear, appended to the chronologically appropriate albums (12 of the Liberties tracks are already accounted for on 2½ Years). The original UK version of This Year's Model, for example, didn't include "Radio, Radio," but did include "(I Don't Want to Go to) Chelsea" and "Night Rally"—which the US version did not. Ryko's disc contains them all.

Also included are three songs recorded live at Hollywood High and originally included as an EP with the first edition of Armed Forces, plus, on My Aim Is True, seven songs from EC's Declan Patrick MacManus days. These early tracks, mostly just EC and his acoustic guitar, are fascinating. You hear MacManus, barely 20 years old, apprenticing himself to his favorite singers—in his notes, EC lists Randy Newman, The Band, Hoagy Carmichael, Lowell George, and John
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Prine (I'd add Tom Waits). He sounds like each of these in turn, but throughout also manages to sound like the once and future Elvis Costello. Included are an early version of "Mystery Dance" with a whole new verse, the superficially funny but disturbingly violent "Wave a White Flag," and "Poison Moon," which—to turn the anachronistic table—sounds like John Wesley Harding.

This Year's Model has "Running Out of Angels," a fast-paced, early-'60s-style acoustic rumba with classic EC lyrics about men victimized by their own addictions to women. There are also self-sufficient acoustic demos of "Green Shirt" (with an extra verse) and "Big Boys" which make their final versions on Armed Forces sound over-produced.

Armed Forces (original title: Emotional Fascism) itself remains as fresh as the day it was recorded. Here Costello gave the language of romantic love a tongue-lashing from which, thank God, it has yet to recover. (One careful listening to "Two Little Hitlers" is worth all the codependency books ever written.) Not only that, each song's arrangement, wound up so tight its ribs squeak, sounds as if reveling in its own glory. One of the most self-confident records ever made.

The live-at-Hollywood-High "Accidents Will Happen" showcases Costello's ballad singing, at that point in his career an unknown quantity. The live "Alison" and "Detectives" meaner a bit but are excellent concert recordings.

One good thing about the original LP was that its final track, Nick Lowe's "(What's So Funny 'Bout) Peace, Love and Understanding?" was mastered at about twice the level of the rest of the album—hearing that desperately funny plea for compassion blast out at the end always lifted Armed Forces above itself. It's followed on this new CD by the solo "My Funny Valentine," mastered at exactly the same volume. Anyone ever heard of dynamic range?

Live at El Mocambo is 14 songs in 48 minutes played by rock's tightest quartet at its in-concert prime. EC & the Attractions. The tunes are all from the first two albums, the sound is punchy, and the band sounds as if it can do anything—which it then went on to do with Get Happy!!, Trust, and Imperial Bedroom. The concert is what record companies call "high-energy" (read: loud), and reveals just how well the Attractions could deliver EC's often difficult song structures and stay-on-a-dime rhythmic reversals. The only drawback and (probably why this record was never released) is some stage-hugging Toronto cowboy who, at 38-second intervals throughout the entire concert, screams "YEEEEEEE-HAAAAWVVWWWWW!!" at the top of his tireless pipes. This disc is available only with the 2 1/2 Box, but if you buy the other three separately, send Ryko the enclosed coupons: they'll send you El Mocambo free.

Columbia's CD reissues of My Aim Is True, This Year's Model, and Armed Forces have gone down in audio history as the Worst CD Remasterings Ever Made. (The original US LPs weren't all that great to begin with.) The reputation is well-deserved: two-dimensional walls of boxy, bassless, undifferentiated hash, Costello's words fighting their way through a scrim of white noise and not always making it. Comparing those botches with this mostly wonderful remastering job by Roger Bechirian—who twiddled dials for Costello as early as 1978—reveals differences that are anything but subtle. For one thing, there's bass. For another, the instruments sound like real instruments with dimensions of depth and roundness, instead of grainless sonic newspaper photos of themselves. Plus, you can hear a number of instruments that simply went missing on the Columbia CDs. For instance, on the second verse of "Big Tears," there's a soaring lead guitar figure that I'd never heard before. Throughout 2 1/2 Years, the layers of background vocals, organ sustains, and rhythm guitars—not to mention the now-luscious kick-drum and bass of Attractions Pete and Bruce Thomas, respectively—make many of these songs sound entirely new. My Aim Is True is a bit harsh, but the original CD and LP sounded downright smothered.

This is the first time Stereophile has named a reissue our "Recording of the Month:" That's how good this set is. I can't wait to hear what Ryko and Bechirian do for Imperial Bedroom and Blood and Chocolate.

—Richard Lehnert

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Oleg Kagan, violin.

Erato 2.292-45805-2 (2 CDs only). Kox, prod.; Jonker/Hulshor, engs. ADD/DDD. TT: 2:33:34

It's too bad Oleg Kagan didn't achieve greater renown in the West during his 43 years. This Russian student of Boris Kuznetsov and David Oistrakh won both the Tchaikovsky and Sibelius competitions, and for 20 years was a regular chamber-music partner of Svjatoslav Richter. Made in 1989 (about a year before his death), Kagan's recording of the Bach sonatas and partitas reveals a talent worthy of widespread acclaim. His approach to this music leans toward the Romantic, with generally relaxed tempos, a broad vibrato, and a characteristic cantabile line. Kagan downplays the strict, metronomic bounce typical of Baroque performance practice, and is unafraid to grace his interpretations with generous portions of heart.

Indeed, heart prevails over precision here; these live performances do not benefit from the editing that is nearly universal in today's recording industry. If not equal to Perlman's or Milstein's, Kagan's technique is still formidable, and his interpretations are poignantly deep. The Sonata 1 Schiullino's lyric legato, the Partita 1 Coutarde's double's sublime delicacy and graceful speed, and the Partita 3's bittersweet, almost valedictory cast attest to a remarkable artistic sensitivity.

Kagan's subtle contrasts in tempo and dynamics make up for a somewhat unvaried instrumental tone, and are very effective in establishing the warm, singing character of these readings. If this recording does not achieve the highest audiophile standards, it is nevertheless smooth, devoid of glare or harshness, and richly ambient.

Kagan's lyrical style contrasts with Perlman's grander, more buoyant approach on EMI (see Vol.12 No.10, p.191), and with Milstein's inexorable sense of inner drama on DG. In listening to all three performers, it seems that Perlman's salient quality is his extraordinary technique, Kagan's heartfelt emotion. For me, Milstein combines the best of both heart and hand to create music that seems to rise effortlessly as a cause of itself. I recommend Kagan's recording as a valuable and enduring second-tier choice. —Robert Hessen

BACH: St. John Passion

Nico van der Meel, Evangelist; Kristinn Sigmundsson, Jesus; Ansegeer Sumpfhus, soprano; James Bowman, alto; Christoph Prégardien, tenor; Peter Kooy, bass; Netherlands Chamber Choir, Orchestra of the 18th Century, Frans Brüggen Philips 434 905-2 (2 CDs only). Sieuwert Verser, prod. DDD. TT: 1:07:43

While there's much to enjoy in this new recording, it isn't top-of-the-line. Still number one is Peter Schreier's account (also on Philips), which to my ears strikes the perfect balance between drama and piety, new instruments and period approach.

Brüggen, however, is incapable of being shallow or uninteresting, and his St. John is worth hearing. For starters, it's very beautiful—textures are transparent, the Netherlands Chamber Choir sings sweetly and accurately, and the all-period-instrument orchestra makes a superb case for their use—gone are the scratchy old days. Brüggen likes to get things done; this is even faster than Schreier's by four
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minutes, and Schreier’s was the fastest on disc. But Brüggen forces nothing; it’s a delight to hear something so honest.

Some of the soloists are superb. Bowman’s plaintive singing of “Es ist vollbracht” stays in the memory for quite a while, Sigmundsson (a voice new to me) is an impressive Jesus, and Prégardien is an elegant soloist in the tenor arias. But van der Meel is odd; there are moments of great beauty as well as of great drama, but every so often he whines—sounding like Mime in Siegfried.

Soprano Stumphuis is lovely. Perhaps we’re just too well-off lately to appreciate how good this is; were it not for the Schreier and the Corboz (on Erato), this would be a thrill to own. As it stands, it’s in third place (I find Gardiner cold, or he’d be in third place), and the superb recording—as open as the performance—is a real plus.

—Robert Levine

BACH: Solo Cello Suite 1
VERESS: Solo Sonatas for Violin, Cello; String Trio
Hansheinz Schneeberger, violin; Tabea Zimmerman, viola; Thomas Demenga, cello
ECM New Series 1477 (437 440-2, CD only): Manfred Eicher, prod.; Teije van Geest, eng. DDD. TP 64:15

As always, this ECM New Series issue is beautifully produced. The recording setup for both solo instruments and string trio is exemplary, and the performances are quite beautiful—and what a delightful and original combination of pieces.

The Bach needs no introduction, but there are as many excellent performances of the work as there are dry and uninspired note-spinners. Thomas Demenga’s reading is so expressive; it might be a little too Romanticized for some, but he has an amazing ability to express harmonic sense in a single line. The same must be said of his performance of Sandor Veress’s Sonata for Solo Cello.

The composer, though born in Hungary, became a Swiss citizen and teacher in both countries’ prestigious music schools, thus ensuring a wide scattering of eminent pupils such as Ligeti, Kurtag, and Heinz Holliger. The three of his works included on this disc represent some 32 years of changing musical development. The earliest, the Violin Sonata, is a complex intellectual exercise in counterpoint tersely argued here by Hansheinz Schneeberger. The much later Cello Sonata is more emotionally driven, as the titles of its three movements—Dialogo, Monologo, and Epilogo—suggest. The String Trio sits somewhere between these two, chronologically and aesthetically; it is a fusion of Veress’s formal strengths and his spontaneous expressiveness.

—Barbara Jahn

HONEGGER: Symphonies 3 & 5, Pacific 231
Neeme Järvi, Danish National RSO
Chandos CHAN 9176 (CD only): Iver Munk, prod.; Jørn Jacobsen, eng. DDD. TP 56:39

When I wrote my “Building a Library” on Munch/Boston Symphony recordings on RCA (Vol.15 No.11), I had not foreseen this recent Chandos release when I implied that Munch’s BSO mono recordings of Honegger would render later stereo recordings of these works irrelevant.

While the Munch/BSO recording of Symphony 5 is in no way devalued, especially for those who enjoy comparative listening, this new recording by Järvi/DNRSO takes its own place as the fully digital, truly stereo, definitive rendition for the ‘90s, and quite likely for decades. If the Danish orchestra lacks the idiomatic insights and the stylistic eccentricities that make the Munch/BSO so fascinating, they make up for it in the polished virtuosity and honest intensity with which they grapple with this challenging repertoire. These are up-front, in-your-face performances, rarely heard in today’s carefully tailored commercial recordings.

Chandos has announced no plans for a Honegger cycle, though one seems likely, and would be welcome. A pirate recording of Symphony 3 by Munch/BSO in Prague on Multisonic is a fizzle-out, as are recordings of other Honnegger symphonies by Munch and Parisian orchestras on Disque Montaigne and Erato. The cycle by Dudot/Bavarian on Erato is unrelievedly pedestrian, and while EMI’s recently reissued cycle by Michel Plasson with l’Orchestre du Capitole de Toulouse has its impassioned moments, the orchestra is no match for the Danish Radio Symphony.

The competition for Symphony 3 comes from an early-’70s recording by Kara-
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This live recording is surprisingly bad. Conductor Riccardo Muti, as is his wont, adheres to the very letter of the score, despite the fact that one of the glories of verismo opera has always been interpolated high notes and certain liberties which, I'm certain, the composer would have wanted, let alone tolerated. The interpolations are so familiar that most opera lovers assume they're written: Tonio's high A-flat near the close of the Prologue, the high G at "incominciare!" at the very end, Canio's B-natural (if the tenor has one) on "a venti- tuite ore" at the end of his first scene, a high B-flat in the highly charged "No, Paglacci, non son," and so on. But Muti, by disallowing any unwritten alternatives, has lightened the drama and undercut its cast: This is a testosterone-free Pagliacci; gilded, the opera's nothing.

Add to that the facts that Daniella Dessi is a wimp of a Nedda with an unreliable voice to boot and Juan Pons is even less focused than usual, and what you're left with is excellent orchestral and choral work. Oh, yes—I almost forgot Pavarotti. He's in very good voice, and sings with his customary superb diction, but if you want to hear him letting loose in this role, go back to the 15-year-old London recording in which he's partnered by Mirella Freni. It's led by Giuseppe Patané, who sounds positively brilliant compared with Muti's fussbudget, scholarship-for-the-sake-of scholarship approach. —Robert Levine

MESSIAEN: Quatuor pour la fin du temps
Eduard Brunner, clarinet; Trio Fontenay

Messiaen wrote this work while a prisoner of war and, as the pianist, was joined by three other inmates in its first performance at Stalag VIII in Gorlitz on 15 January 1941. It was inspired by Revelations and is in eight religiously ecstatic movements, each prefaced by a highly emotive title. The Trio Fontenay give a gentle, unburdened performance, which, in movements such as the second, sixth, and seventh, takes the bite out of more driven passagework. They are best in the soothing, meditative movements, and the third, with an extended clarinet solo, is really quite beautiful. Eduard Brunner, the clarinetist here, spent years studying this work with Messiaen himself, and it shows. It is thus a pity that there is such a nasty, jarring edit after five minutes of his totally enthralling playing in this movement. However, the recording is, on the whole, very good: warm, buoyant, and well-focused. But, with a depressingly mean playing time, this is not a disc I can recommend.

—Barbara Jahn

MOZART: Piano Concertos 5 & 6; Rondo in D, K.382
András Schiff, piano; Sándor Végó, Camerata Academica of the Salzburger Mozarteum London 430 517-2 (CD only). Christopher Raeburn, prod.; Simon Eadon, eng. DDD. TT: 52:15

MOZART: Piano Concertos 15 & 16
András Schiff, piano; Sándor Végó, Camerata Academica of the Salzburger Mozarteum London 432 374-2 (CD only). Christopher Raeburn, prod.; Jonathan Stokes, eng. DDD. TT: 48:27

I'm tempted to describe the latest issues in this ongoing set of integral Mozart concertos for keyboard as among the most desirable performances that one can hear of these four works (five, when you count the later alternate finale, K.382, to the earlier Concerto 5). That applies not only to Schiff's consummately stylish and sensitive playing (though I wonder why he doesn't appear to be playing continuo in the tutti passages, as Mozart intended), but also to the superbly shaped orchestral direction of Végó: majestically virile, reflectively tender, witty, and full of pathos, all as needed. The wind sound is exceptionally well balanced (Heinz Holliger, by the way, is first oboist), the strings are transparent, and the piano emerges beautifully from within the ensemble. Highest recommendation. —Igor Kipnis

PROKOFIEV: Cantata for the 20th Anniversary of the October Revolution
Plus: The Tale of the Same Flower, Excerpts
Neeme Järvi, Philharmonia Orchestra & Chorus; Gennady Rozhdestvensky, speaker (Cantata) Chandos CHAN 9095 (CD only). Brian Couzens, prod; Ralph Couzens, eng. DDD. TT: 72:45

PROKOFIEV/PALMER: War and Peace: Symphonic Suite
Plus: Summer Night: Suite from The Duenna; Russian Overture
Neeme Järvi, Philharmonia Orchestra & Chorus Chandos CHAN 9096 (CD only). Brian Couzens, prod.; Ralph Couzens, eng. DDD: 63:49

PROKOFIEV: Violin Concerto 2, Violin Sonata 2
Chin Kim, violin; Paul Freeman, St. Petersburg Philharmonic Orchestra (Concerto); David Oei, piano (Sonata) Fanfare CDS 3442 (CD only). Adam Abeshouse, prod.; eng., David Oei, prod. DDD: 50:13

PROKOFIEV: Piano Sonatas 1-9
Plus: Lieutenant Kijé: Romance & Kijé's Wedding (arr. Chiou)
Frederic Chiu, piano Harmonia Mundi HMU 907086.88 (3 CDs only). Martin Sauer, prod.; Tonstudio van Geest, eng. AAD! TT: 2:52:43

PROKOFIEV: Piano Sonatas 3, 7, & 8
Andrei Gavrilov, piano DG 435 439-2 (CD only). Werner Mayer, prod.; Ulrich Vette, eng. DDD. TT: 52:12

The most spectacular prize in this latest assemblage of Prokofiev releases is the second recording of his 1937 patriotic paean, the Cantata for the Twentieth Anniversary of the October Revolution, a three-quarter-of-an-hour work for a massively out-sized orchestra, an ensemble of bajans (accordions), an extra brass group, a collection of percussion, chorus, and, very briefly, a narrator who represents the voice of Lenin making a stirring announcement through a megaphone, here dramatically read by Gennady Rozhdestvensky. Not performed during the composer's lifetime because of a political climate unfavorable to the arts, it was finally premiered in 1966 and recorded in somewhat bowdlerized form on Melodiya (subsequently released on Angel) by Kiril Kondrashin. Järvi's, however, is the first complete recording, and, in spite of what on the surface might appear to be the worst sort of propagandist
On Chandos 8806 Järvi had previously recorded excerpts from the politically inspired 1953 Stone Flower ballet, also not performed in Prokofiev's lifetime. Filling out the Cantata CD is another 26-minute set of excerpts, again played with vivid excitement and color.

Järvi's second disc continues his Prokofiev survey with an effective suite derived by Christopher Palmer (who also provided the extremely informative and cogent annotations to both CDs) from War and Peace, the 1944 opera whose complete recordings are not present available in the US. Especially effective here, and not entirely unreminiscent of Romeo and Juliet, are the three sections belonging to the Ball sequence. The Summer Night Suite, from the composer's comic opera of 1950, The Duenna, and the Russian Overture of 1936-37 round out the second of these excellent discs. In both, the orchestral sound is widespread, slightly distant from the listener but with good imaging. Multi-language texts and translations are provided.

The Korean-American Chin Kim, a violinist with impressive teacher (DeLay, Galamian, Gingold, etc.) and competition (Montreal, Brussels, Genoa, Indianapolis, etc.) credentials, makes a very strong impression with both the concerto and the sonata, performing each with consummate technical ease, attractive tone, and an excellent lyrical sense. His pianist displays the same appealing qualities and stylistic understanding in the Sonata, which has an especially exciting second-movement Scherzo. Perhaps only toward the end of the Concerto, well-played by both soloist and orchestra, did I feel a slight lack of impetus in the final sequences as the tension rises. The orchestra, well-balanced with a nice sense of airiness but without an overly cavernous ambience, is particularly impressive for the way in which bass frequencies reproduce, notably the tangible bass drum of the Concerto's finale. In contrast, the Sonata appears less localized, the two instruments sounding slightly unfocused; furthermore, one wonders why the masking of the Sonata, with an entirely different ambience, had to be at a level unrealistically higher than that of the Concerto.

The 30-year-old Chinese-American pianist Frederic Chiu, a former student of Karen Shaw and Abbey Simon and now a resident of Paris, has the essentials of the Prokofiev style pretty well pat in his essay of the nine complete piano sonatas (he skips the fragmentary No.10 and plays the revised Op.135 version of No.5). The neoclassicism is there, as are the mechanistic, the grotesque, and the lyric. Chiu's awareness of the composer's extended scale of dynamics also helps, to some extent, to set his playing apart from that of so many percussive-minded pianists for whom Prokofiev is but a reason to constantly hit the instrument as hard as possible. This is not to say that all is delicacy here; there's plenty of hard-edged attack (the close miking of a shallow-sounding Yamaha probably doesn't help that aspect; try the harsh opening of 6), but Chiu causes the lyrical, slow movements to flow in a most attractive way. In an area that many have claimed as their own, the pianist, who sports a first-class, exciting technique, manages to carve himself a worthy niche. The filler, his own remarkably effective piano arrangements of two Lt. Kijf orchestral movements, is exceedingly well played, though unorthodox in tempo. I only wish that the reproduction overall had been more sympathetic to the pianist.

Finally, there's the kinetic, tightly knit playing of Andrei Gavrilov, whose driven performances of three sonatas, in spite of undeniable technical excitement, largely evoke grimness and violence. With the exception of the more expansive slow movements, the ferocity tends to be overwhelming, and the recorded sound, unfortunately without clatter, tends to mirror the percussiveness of the performer's approach.

—Igor Kipnis

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Ten days after completing his viola concerto in 1985, Alfred Schnittke suffered a near-fatal heart attack. Much of the anxiety stemming from his failing health can be detected in this dark, restless work. Yuri Bashmet, for whom the concerto was written, gave the world premiere in January 1986 and first recorded it in 1987 with Rozhdestvensky (Melodiya SUCD 10-00068). Kim Kashkashian recorded the work a mere four months after the premiere, during Bashmet’s recording by a year. We are fortunate that this first recording has finally been released. Kashkashian’s brisk and committed performance—the fastest on record (29:05) —is closest in spirit to Bashmet’s first recording (35:21). Kashkashian matches Bashmet’s fearless virtuosity, but doesn’t quite convey his (and Schnittke’s) range and depth of emotion. The recording is outstanding, however, with Kashkashian’s instrument mixed up-front and the orchestra (sans violins) heard in a deep and balanced mix. Clearly superior to both Bashmet’s 1990 recording (34:44) with Rostropovich (RCA 60446-2-RC), and Nobuko Imai’s delicate 1989 reading (33:42) with Lev Markiz (BIS–CD-447), Kashkashian’s is the second choice in this repertoire. It’s good to have this vivid recording added to the Schnittke discography.

Giya Kancheli’s *Mourned by the Wind*, a dialog for viola and orchestra, has high ambitions indeed. Although Kashkashian does all she can, pairing such a work with a masterpiece like the Schnittke concerto is a decided mismatch. Kancheli is to Schnittke what Górecki is to Lutosławski: overrated. For the Schnittke, however, this disc is solidly recommended.

—Carl Baugher

SCHUBERT: Winterreise Dietrich Fischer-Dieskau, baritone; Murray Perahia, piano; Sony SK–48237 (CD only). Thomas Frost, prod.; Sid McLaughlin, eng. DDD. TT: 71:33

SCHUBERT: Die Schöne Müllerin Kevin McMillan, baritone; Warren Jones, piano; Dorian DOR-00162 (CD only). Randall Forsyth, prod.; Craig D. Dory, Douglas Brown, David H. Walters, Brian C. Peters, engs. DDD. TT: 69:02

With something like seven recordings of *Winterreise* to his credit, four of them studio-made, the rest live, one can trace Fischer-Dieskau’s career between 1952 and this most recent 1990 version. Originally made for a TV production in Berlin and also available in video formats, this performance, with Perahia as a wholly sympathetic partner, does not display the baritone with the freshness of voice and flexibility featured in his earlier years. One can, for example, at louder moments, vocal rawness, at difficulties in sustaining held notes. But, that said, the singer’s artistry is so incredible, the effects so movingly presented, the dramatic insights so chillingly captured, that one can only describe this performance, with its exquisitely realized accompaniment, as a disc to treasure. The balance between voice and piano is excellent, and Fischer-Dieskau’s voice, slightly recessed, has been captured with great clarity, even at some of the singer’s most daringly soft moments.

*Die Schöne Müllerin*, featuring an impressive, light-timbred Canadian baritone, Kevin McMillan, almost balances the piano ahead of the vocal part. But given the sensitivities of both performers, the result, albeit a little unusual, is reasonably realistic and dramatically sound. These highly intelligent interpretations, sometimes heart-rending in their evocation of pathos, have great character and expressive warmth (try “Die liebe Farbe,” for example). On occasion, a tempo or two could be described as overly leisurely, and one might sometimes have wished for a greater variety of vocal color as well as wider contrasts of mood. Overall, however, these are flexibly sung, strongly accompanied performances which have the benefit of excellent recording.

—Igor Kipnis

SIBELIUS: Symphonies 1 & 7 Lorin Maazel, Pittsburgh Symphony Sony SK 52566 (CD only). Steven Epstein, prod.; Bud Graham, eng. DDD. TT: 66:22

SIBELIUS: Kullervo Marianna Rorholm, soprano; Jorma Hynninen, baritone; Helsinki University Chorus, Los Angeles Philharmonic, Esa-Pekka Salonen Sony SK 52563 (CD only). David Motley, prod.; Bud Graham, eng. DDD. TT: 70:14

I wish I could be more enthusiastic about Maazel’s Sibelius, but it leaves me disappointed. He creates some beautiful sounds in a very sunny and optimistic performance of Symphony 1, but it’s all so undiomatic. In fact, the whole work is full of idiosyncratic quips: tempi are expanded and contracted like elastic, the second movement is sentimentalized beyond belief, the scherzo is flaccid and lacks attack, while the finale is embarrassingly overblown. Sibelius just can’t take such indulgent exaggeration.

Symphony 7 is little better. The cragginess of this music has been tamed out of all recognition, its spaciousness restricted by Maazel’s desire to dominate. I really can’t recommend this disc.

*Kullervo* is a very early, five-movement symphonic poem, given five times in 1892 and ’93, then withdrawn from the concert hall with strict instructions that it never be performed again. Sibelius was extremely self-critical, but I must say, on this occasion, I think he may well have been right. Others, however, have liked it very much, and I do agree that Salonen and his strong soloists and orchestra give a very fine performance that has been excellently captured in this recording.

The work describes the life and death of the hero Kullervo through folk–like themes and Karelian and Russian dance melodies molded into fairly strict Sonata, Variation, and Rondo forms. The final movement, *Kullervo’s Death*, is the most effective, the opening movement’s Runic melody and Kullervo’s motif combining to mysterious effect. The Sony recording is excellent: clean, detailed, and coping admirably with the occasional addition of soloists and choir. If you like Sibelius, give this a try.

—Barbara Jahn

TCHAIKOVSKY: Symphony 6 ("Pathétique"), Romeo & Juliet Andrew Litton, Bournemouth Symphony Virgin CDC 7 59239 2 (CD only). Andrew Keener, prod.; Mike Hatch, eng. DDD. TT: 67:01

Andrew Litton is certainly inspiring some wonderful playing from the Bournemouth SO these days, and what a culmination to his Tchaikovsky cycle with them. Opening with one of the best performances of *Romeo and Juliet* I have ever experienced, I was anxious to sample more.

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Litton has the pacing just right in the March, not sticking to a rigid meter but leaning in and out of phrases. The light, beautifully articulate strings which introduce it again promise something special. Contrast the Finale’s full-blooded passion and you have an exceptional performance, backed up to an exceptional recording. After so many hackneyed versions of it, this has renewed my love for this great symphony.

BARBARA JAHN

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Friedrich Gulda, piano
Sony SK 52499 (CD only). Friedrich Gulda, prod.; Manfred Frei, eng. DDD. TT: 54:10

The Viennese-born Gulda, a multi-talented pianistic personality, has for years been an iconoclast, especially provocative to many Europeans who find his combined activities in classical and jazz/pop unacceptable. That he unquestionably has an enthusiastic following may be heard in this live Nov.19, 1990 program before a Munich audience. Gulda quickly segues, often in programatically skillful and intriguing combinations, between his own jazz or simplistically inspired classical works and the traditional concert repertoire for piano. Interestingly, Gulda’s dynamics are scaled widest, if rather self-indulgently so, in the classical pieces; his own derivative and overly sequential “jazz” emerges far too often in monochromatic, hard-hitting clatter. The Schubert and some of the Chopin show sensitivity. The rest, I’m afraid, veers into crowd-pleasing pretentiousness combined with all the digital subtlety (as in the Debussy Puerta del vino) of a steamroller. Of course, none of this is helped by oppressively close miking, but then some listeners might enjoy hearing these Liberace-like hijinks from directly inside the piano.

— Igor Kipnis

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**WEBER: Oberon**

Gary Lakes, Oberon; Ben Heppner, Hûon; Deborah Voigt, Rezia; Delores Ziegler, Fatime; Dwayne Croft, Scherazade; Chorus of Cologne State Opera, Cologne Philharmonic, James Conlon EMI CDCB 54739 (2 CDs only). Hartwig Paulsen, prod. DDD. TT: 2:14:54

Oberon is somewhat of a mess. Weber composed it for an English spectacular in which the music was of secondary importance, and died before he could turn it into a full-fledged opera. There is some gorgeous music, but it never makes sense as a stage work. Musicologists have tried to fix it since then; one of them was Gustav Mahler, whose version is recorded here. Mahler added “melodramas” (music-accompanied spoken scenes), with music taken from elsewhere in the opera rather than having been newly composed, as well as brief reprises of earlier arias. In a way, it all doesn’t matter; the good music is worth hearing, and the longueurs are easily skip-pable.

This performance is good, but no knockout. There’s still available a 1971 recording on DG with Birgit Nilsson and Plácido Domingo, under Rafael Kubelik, which, while not ideal, has more blood and guts than this one. The pluses here are qualified ones: Deborah Voigt is a fine singer, but she’s taxed by the finale of her huge “Osean” aria, as is almost every soprano who has ever tried it. But the voice is lovely, and she’s impressive. I like Heppner’s Hûon, even if Domingo’s sound was rounder; any tenor who tries this part deserves an award. (An appendix, with an extra aria for Hûon, shows Heppner at his best.) Lakes is a good Oberon (he sounds amazingly like Heppner); Ziegler’s healthy tone is a bit joyless for Fatime; and Dwayne Croft is a baritone to watch. The rest of the cast is good enough.

James Conlon does his best to make the opera work, and his orchestra and chorus are convincing. The sound is warm and forward, but the whole show could have been more magically, atmospherically produced. If you’re looking for an Oberon—and there are a few reasons why you might be—the DG remains my first choice, but Voigt is worth hearing.

— ROBERT LEVINE

---

The stylistic diversity of contemporary music is nowhere more evident than in the current writing for string quartet. While today’s composers generally take different paths through instrumental thickets, the one common denominator is their almost complete rejection of centuries-old traditions of sonority and harmony. Except for a few stubborn neoclassicists who prefer the mainstream aesthetic, the serious notated music of our time has been, until recently, fiercely devoted to dissonance and uncompromised atonality.

These Music & Arts discs offer three spirited slices of modern string quartet music. The Babbitt/Wuorinen disc is a reissue of the well-known 1972 Vox LP. The other two, released here for the first time, feature more recent recordings. Elliott Carter’s Quartet 4 (1986) was dedicated to the composer’s wife, composers, and he play it with insight and passion. Although the Juilliard Quartet’s recent Sony Classical set of all four Carter quartets offers a more settled, homogenous blend of Carter’s often conflicting lines, this Composers Quartet version has a rhythmic precision and control of dynamics that make it essential for the Carter collector. Mel Powell’s String Quartet 1982 is a less structurally integrated work than Carter’s, but its relentless pursuit of texture and its probing, angular rhythms are always energetic. Milton Babbitt’s Quartet 5 (1982), originally dedicated to the Sequoia Quartet, is, though less statistically dense than its discates, no less piquant. With an emphasis on pitch rather than rhythm, Babbitt demonstrates the great variety to be found in so-called avant-garde American music.

Babbitt’s Quartet 3 (1970) is a much more relaxed work than his 4, especially as performed by the Fine Arts Quartet. The gem on this disc, however, is Charles Wuorinen’s Quartet 1 (1971). This underrated yet bonafide masterpiece, dynamic and excitingly varied, was commissioned for the Fine Arts; they play it with all the sensitivity, affection, and devotion it deserves. The warm analog recording
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The now-disbanded Sequoia Quartet is well represented on these recordings from 1984–85. Benjamin Britten’s Quartet 2 in c, Op.36: Lord of Aldeburgh, while not as willfully ground-breaking as the works of the American composers in this survey, is every bit their musical equal. The Sequoia perhaps lack the suave insight of the Britten Quartet’s reading (Collins Classics 10252), but there’s little missing in technical assurance and fiery emotion. John Crawford’s 1965 Quartet is a short work in two parts whose contrasting sections of angular counterpoint and tonal lyricism give it a depth that belies its almost conventional tonality. Finally, Paul Chihara’s Sequoia and Ellington Fantasy give further evidence that diversity is the single common trait of modern compositions for string quartet. The ruminating, swaying textures of Sequoia (1984), Chihara’s fourth quartet, suggest everything from Debussy to Bartók, while the delightfully evocative Ellington Fantasy is a tribute to the jazz genius Chihara calls “our American Mozart.” In three movements—entitled “I’m Beginning to See the Light,” “Take the A Train,” and “Sophisticated Lady”—Chihara succeeds in suggesting his subject without losing his own musical personality.

Seldom have I encountered anything but first-class production values from Music & Arts. Here’s hoping there will be further M&A releases—both new performances and perhaps more reissues of classic Vox recordings—dedicated to the modern string quartet repertoire. —Carl Baugher


Although the common denominator here is the interpretation of Frank Zappa compositions, these three groups (large and small wind ensembles and an augmented brass quintet) are actually quite different. From the meticulously astute CCCM Wind Symphony to the impeccably virtuosic Omnibus Wind Ensemble to the muscular and edgy Meridian Arts Ensemble, these discs offer a wide array of contemporary performance approaches. With the Zappa pieces as a focus, here’s how they stack up.

Songs & Dances would be worth having if only for the rich readings of Vincent Persichetti’s Masquerade, Op.102 (1966) and Florent Schmitt’s Dionysiques, Op.62 No.1 (1913). The Persichetti, in particular, is rife with inventive melody, surprising angularity, and rhythmic momentum. The darkly emotive Schmitt composition suggests a composer deserving of more attention on modern agendas. Zappa’s Envelopes (1978) is given a deliberate, almost careful interpretation, with the percussion in the forefront. Likewise, The Dog Breath Variations (1970) is somewhat more deliberate than the recent Ensemble Modern traversal in the modified Dog Meat arrangement from their and Zappa’s The Yellow Shark. Elsewhere, Bernard Gilmore’s Five Folksongs for Soprano (1965) and David Gillingham’s Serenade: Songs of the Night (1990) flesh out an intelligently programmed disc of chamber music.

The Omnibus Wind Ensemble presents a much more traditional façade, but also demonstrates appealing eclecticism on their aptly titled disc. Mozart’s Overture to The Marriage of Figaro and Serenade 12 in c, K.388 are idiomatic and lively, with the Figaro overture appropriately propulsive. Zappa’s 2:16 Bebop Tango receives the same kind of urgent, energetic approach, much to its benefit. In between the Mozart and Zappa, Omnibus takes on the works of Karl-Erik Welin, Tor Aulin, William Seymer, Florent Schmitt, Johan Helmich Roman, and none other than Gioacchino Rossini with selections from The Barber of Seville. Again, the Schmitt work (Lied et scherzo) is impressive, with its shifting
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tonality and dramatic instincts. In sum, this is a delightful package of well-played, enthusiastic music. The sound is also wonderful—here's an audiophile recording of exceptional transparency and realism.

Finally, the Meridian Arts Ensemble, a brass quintet with drums and percussion added, has released the Zappa composition with maximum empathy. Their rock/jazz orientation and classical precision allow the execution of Jon Nelson's fine arrangements to succeed with ease. Zappa's Big Swifty (1970), "Harry, You're A Beast" (1967), "The Orange County Lumber Truck" (1967), "T'Mershru Duwen" (1973), and Dupree's Paradise (1972) are all performed with equal measures of respect and swagger. Consulting with Zappa, they did prior to recording these pieces, Meridian benefited from the composer's tweaking of their arrangements; these are essential discographical acquisitions for any self-respecting Zappa collector. Including everything from Hendrix's "Purple Haze" to Billy Strayhorn's "Lush Life," this disc offers a dizzying array of variety. The Meridian's performance of the title piece, written for them by Kirk Nurock, is representative of the excitement these brass players can generate. Works by John Halle, Phillip Johnston, and Norman Yamada round out this exceptional collection.

—Carl Baughner

Show Music

LOST IN THE STARS: 1992 Studio Cast
cast by Kurt Weill, libretto by Maxwell Anderson
Julius Rudel, Concert Chorale of New York,
Orchestra of St. Luke's
MusicMasters 01612-67100-2 (CD only),
John McClure, prod.; Paul Goodman, eng. DDS.
TT: 71:41

Lost in the Stars represents Kurt Weill's attempt at a reconciliation between the seriousness of his early German works (eg. Mahagonny) and the more "frivolous" style of his American period (eg. One Touch of Venus). Based on Alan Paton's novel, Cry, the Beloved Country, Lost in the Stars deals with interracial and intergenerational conflict in South Africa. As one might expect, it's not exactly a barrel of laughs. I don't know how effective it is on stage, but, on record at least, I found much of it tiresome and a bit "preachy." 1 I must also admit that I was put off by the liner notes, which read like they come from a term paper submitted in an undergraduate course on 20th Century Drama (eg. "The second act develops from the emotional base established at the end of Act I, building to a series of dramatized trials and social ceremonies that lead to the work's tragic end.").

Having thus jeopardized my complimentary subscription to the Kurt Weill Newsletter, I'd better make it clear that I do admire a great deal of the music in Lost in the Stars (I bought the sheet music for the title song when the price was still a mere 75c). I found the performances on this CD to be generally excellent. Except for Carol Woods—playing Linda, described as "an entertainer"—the singers all have strong operatic backgrounds, which gives the proceedings a rather highbrow air. Given that Lost in the Stars was first presented on Broadway, some might prefer a more Broadway-styled performance, but I think the piece is closer to opera than to the traditional "musical." Alfred Woodley is certainly superb in the central role of Stephen Kumalo, singing with beautiful tone and emotional involvement. Julius Rudel has been a champion of Weill's music; he conducts with the skill of one who knows what it's all about. The recording is more complete than the original cast album (recently re-released on MCA MCAD-10302), and sounds commendably smooth.

—Robert Deutsch

Jazz

**TOM HARREL: Uprising**

Tom Harrell; trumpet; Phil Woods, alto sax; Joe Lovano, tenor sax, David Redman, tenor, piano; Peter Washington, bass; Bill Goodwin, drums

Cheksy JD103 (CD). Steve Kaiser, Bill Goodwin, prods.; Bob Katz, eng. DDS.

TT: 70:59

For two years, Tom Harrell's alto saxophonist and occasional employer, Phil Woods, has been calling Harrell a genius. Perhaps Phil Woods has an agenda: in Uprising's notes, he writes, as if saying that Harrell "is showing the way for people who yearn for a return to the melody." I don't hear genius in Harrell's otherwise state-of-the-art trumpet playing, but I hear plenty of melody in his bell-like tones, which are clear, centered, and almost without vibrato, and I can see why Woods, who has done so much to update bebop and keep it fresh, would be thrilled with Harrell's writing.

Harrell has a way of making even such a genre piece as "Train Shuffle" interesting for both musicians and listeners. Trains have been the subject of shuffling jazz compositions at least since Ellington's "Daybreak Express." "Train Shuffle" uses the introduction's eight bars to set this beat, then continues with an attractive, bluesy, 16-bar theme, followed by a much more complex bridge passage that has the musicians scrambling over the changes. The variety is invigorating, and the piece is played beautifully, as we hear in the instruments' careful blending in the final ensemble's crescendos and descrescendos.

The band features toptoch players to a man. Phil Woods has been a star for over 30 years. (The longevity of his appeal may surprise some people; the Gitler's notes to Woods' 1964 album Sugarman lament that he doesn't often hear music like this anymore. Thirty years later, bebop lives on.) Woods' fluency and passion, his growling, bearish tone, are familiar, but I was surprised to hear his entrance in "Emergence." In a manner that reminds me of Eric Dolphy, he seems to emerge from left field.

Joe Lovano offers a spiky solo, and pianist Danilo Perez swings mightily in an understated way. Except for Ornette Coleman's "Blues Connotation," all tunes on Uprising are Harrell's. There's only one ballad, "Time's Mirror," its melody so inconclusive that its meaning seems to elude even the soloists. Elsewhere, Uprising features the highly professional writing and precise playing of a major jazz talent.

The recording is helped by Bob Katz's engineering. At low volumes, I noted that some of the soloists sounded marginally off-mike. When I brought the volume up, everything fell into place, and I heard the natural sound I have come to expect from Chesky.

—Michael Ullman

SCOTT HENDERSON/GARY WILLIS/
TRIBAL TECH: Face First
Bluenoise RR 79190 (CD only).
Scott Henderson, Gary Willis, prods.; T.J. Helmerich, eng. AAD.
TT: 70:46

WAYNE KRANTZ: Long to Be Loose
Enja EBJL-70902 (CD only). Wayne Krantz, prod.; Malcom Pollack, eng. DDS.
TT: 61:50

The first tune on Face First finds bassist Gary Willis surging out of the gate with a full-frontal groove a la Francis Rocco Prestia, Tower of Power's legendary funkmeister. A downshift mid-tune into a slow blues allows guitarist Scott Henderson to sneak in. Moving through the gears, Henderson gradually escalates into a whammy-bar-strangling wah-wah workout that offers the abandon that has always energized Tribal Tech's live shows, but has, until now, been largely absent from their recordings. In fact, Face First improves on previous outings in every way.

Gone are the swamps of sequenced synths, replaced by more stabs of keyboard color. Willis says these are largely first takes, and they sound it—live, spontaneous, and edgy. A couple of years as road rats has honed these guys into a lean, mean, screaming jazzrock/funk machine.

Taking the message to the people has improved their composing as well. Tunes like "After Hours" show a much better emotion/intellect ratio; in general, the tunes on FF make one more aware of the product, less of the process.

Last, but certainly not least (at least not in this mag), the sound: Much drier and more open than earlier TT discs. Willis's busy bass lines are punchy and well articulated, while Henderson's ferocious guitar comes out of the speaker to attack you and drag you back to its lair.

The increased accessibility of the tunes, the improved recorded sound, and the years of roadwork have helped Tribal Tech to forge a sound that's less academic, more personal, and truly exciting.

Like Henderson, Wayne Krantz is a guitarist not so much equally at home with jazz and rock as oblivious to any dividing line. His work with Leni Stern alerted me to his muscular yet thoughtful sound. One might best describe his style as Richard-Thompson—meets—John—McLaughlin—meets—James-Brown.
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**Dick Hyman: Plays Duke Ellington**


Attention: Stereophile readers will recognize Dick Hyman Plays Duke Ellington as the gold-plated, direct-to-disc CD reported on in the January 1993 Stereophile. Bob Harley described in detail the complicated process of recording this CD by satellite uplink. The main problem was that, in order to have the recording of the final CD's individual tracks, the track timings must be programmed in advance. According to producer J. Tamlyn Henderson, this information must be accurate to 1/4 of a second. Since jazz performances are relatively open-ended, a direct-to-disc performance of a jazz recital seems impractical.

So Reference Recordings had Dick Hyman record Ellington on the Bösendorfer Reproducing Piano—a grand piano that can "record" a performance and play it back, and also allow for the editing of minor mistakes. With the timings set, the recording team set the piano to replay the recital, and recorded the master from that re-creation.

Reference insists that not even the performer could tell the difference between the actual performance and that re-recorded by the Bösendorfer. Nonetheless, the whole thing made me nervous—especially after I heard the disc. The piano, which sounds as if it was played in an empty hall (it was), has a big, warm tone. To me, that extra resonance, although not particularly bothersome, is not ideal.

I wonder if Hyman was affected by the situation. He plays in a somewhat grander style than I've heard him before, as if he's playing to the hall. Although there are subtle tonal and volume variations, there is a lack of intimacy, especially on the infrasound ballads. Hyman's "On a Turkish Cloud" has little of Ellington's wistfulness and suggestiveness.

Hyman is at his best during the up-tempo numbers—and the earlier they were written, the better. His lusty "Jubilee Stomp," which he recorded three times during 1928, captures the early Ellington's good spirits and humor. Ellington never played it better. Hyman resurrects a charming dance tune, "Doin' the Voom Voom," and plays "Drop Me Off in Harlem" with appropriate bounce. He also plays a remarkable rendition of Ellington's mini piano concerto, "Clothed Woman," whose opening notes remind me of shattering glass. In this piece, an exuberant yet striking passage is uniquely sur-rounded by an introduction and conclusion that are harmonically ambiguous and rhythmically powerful. However, there is not enough time between the startling ending of "The Clothed Woman" and the beginning of the succeeding "Succesicated Lady"—the lady almost treads on the clothed woman's toes.

Although Dick Hyman Plays Duke Ellington isn't perfect, it's sonically and musically fascinating. It's a disc Stereophile readers will want to argue about. —Michael Ullman

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**J.J. Johnson: Jazz Quintets**

J.J. Johnson, trombone; Cecil Payne, also sax; Sonny Rollins, tenor sax; Leo Parker, baritone sax; Bud Powell, Hank Jones, John Lewis, piano; Leonard Garment, Al Lucas, Gene Ammons, bass; Max Roach, Shadow Wilson, drums

Savoy Jazz SV-0151 (CD only). AAD. TT: 33:41

J.J. Johnson/Kai Winding: "Jazzy and Kai"

J.J. Johnson, Kai Winding, trombones; Leo Parker, baritone sax; Billy Bauer, guitar; Walter Cirillo, Hank Jones, Lou Stein, piano; Charles Mingus, Eddie Safranski, bass; Kenny Clarke, Tiny Kahn, Shadow Wilson, drums; Al Young, bongos

Savoy Jazz SV-0163 (CD only). AAD. TT: 43:35

**J.J. Johnson: Let's Hang Out**

J.J. Johnson, trombone; Terence Blanchard, trumpet; Ralph Moore, Jimmy Heath, sax; Stanley Cowell, Renée Rosnes, piano; Rusus Reid, bass; Victor Lewis, Lewis Nash, drums


J.J. Johnson, who has set the standard for modern jazz trombone, has been at the top of his profession for over 40 years. On Jazz Quintets, Johnson plays "Jay Bird," "Copin' the Bop," and two other tunes with bop master Bud Powell, whose rattling piano style has set the standard for modern jazz piano. In the late '40s Johnson played rapid, cleanly executed figures with a limited vibrato. With his technical facility, he made the trombone seem like a larger, warmer trumpet. Johnson has proven that he is more than a virtuoso by performing ballads such as "Don't Blame Me," and by writing pieces that have become standards, like the mid-tempo swinger, "Bernie's Tune," and the influential ballad, "Lament," both of which are found on Jay and Kai.

Both Jazz Quintets and Jay and Kai have been remastered by Denon, and sound better than ever. Quintets includes music from three sessions recorded in 1946, 1947, and 1949: the young Sonny Rollins solos on his own "Audobon" on the '49 recording. Jay and Kai contains three sessions from the '50s, when Johnson co-led one of the most popular jazz groups with Danish trombonist Kai Winding. Fans will want this disc for Johnson's "Lament" and "Blues for Trombones," and for the map and sizzle of "Kenny Clarke's Hammer." Denon has added two numbers to Jay and Kai. One of these—"I Could Write a Book"—is identified as a "bonus track." It sounds like something for the "Sesame Street" crowd.

Let's Hang Out is Johnson's 1992 recording. Its "sober" "It Never Entered My Mind" has full-bodied, sensitive solos by both Johnson and Jimmy Heath. Let's Hang Out also has a solo trombone feature, "Beautiful Love." Johnson's "Kenya" is a raucous gospel blues featuring a beautifully rounded trumpet solo by Terence Blanchard. There are other pleasures here, including the rollicking piano of Renée Rosnes, who sounds more outgoing here than I have heard her before. Except for a short "Friendship Suite," which sounds oddly truncated, Let's Hang Out contains the intelligent writing and exuberant playing we have expected from J.J. Johnson for decades.

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Dick Hyman: Plays Duke Ellington

Stereophile, January 1994

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In 1972, Diana Ross became a movie star with a lamentably lachrymose performance as Billie Holiday in *Lady Sings the Blues*. In the movie, she looked overwrought and sounded off balance. Judging from *Stolen Moments*, a live recording in which she returns, 20 years later, to the Billie Holiday repertoire, while working in a few Bessie Smith numbers, Diana Ross has since become a better jazz singer. She can't reproduce Holiday's drama and range of expressiveness, and she doesn't have the weight, or the incipient sarcasm that motivates Bessie Smith on "Give Me a Pigfoot!". Still, Ross sings poised, upbeat versions of tunes such as "Mean to Me" and "What a Little Moonlight Will Do" that will please many listeners.

Her relative failures are predictable: "My Man" is a Holiday number that begins with an almost spoken introduction to a particularly bleak romance. Holiday manages to sound cynical, but not defeated: her sudden drops in pitch, the pauses at the end of a phrase, are worked to perfection. Ross can't handle that kind of drama, or the more lively acceptance of a bad situation that Holiday describes in "Don't Explain." (Ross introduces this tune as "actually" one of her favorites, as if trying to convince herself.) But much of the rest of this disc contains attractively silky performances in Ross's own style.

The title, *Stolen Moments*, comes from a jazz piece by Oliver Nelson which she does not sing: it's a metaphor for the fleeting quality of jazz improvisation. Ross lives up to the concept by appearing with a variety of great and near-great jazz musicians: we hear fine solos by Roy Hargrove, Jon Faddis, Jerome Richardson, and Ron Carter. The instrumentation varies: on two tunes, Ross sings with only a pianist—I assume it's Bobby Tucker—and on the others she works with small, mid-sized, and big bands. She works the crowd as well—we can hear her exclam as she sidles her way into the audience. The sound quality is generally good, though a bit harsh in the upper range in the big band charts.

—Michael Ullman

**MURRAY ATTAWAY: In Thrall**


Gee, you don't often see an A&R guy up there on the cover of the CD credits, billed second to the producer and before the artist's management company. But hey, label owner David Geffen knows marketing. At this point, hip-to-the-point-of-David-Letterman-should-be-so-lucky-talent-spotter Tom Zutaut's name on an album is better brand identity than Attaway's own.

Not a household word unless you're a fan of smart, twisted, arty guitar pop-meisters Guadalcanal Diary (similar, in some ways, to Boston avant-garde smarties Birdsongs of the Mesozoic and, thanks to "jangly" guitar work, R.E.M.), front-man Attaway wrote their songs—a deviant and booze-induced mix of characterizations scoped in the malls and gutters of hometown Marietta, Georgia.

Here he's solo, and in a confessional mode. But like a kid with a hot-rodded Quadra, suddenly there are too many possibilities. His strange but tuneful takes on things (think Billy Joel deeply into Warren Zevon) stumble under too much production and too many guests.

Lines from nifty little songs—"Great Godamighty! Is that really me? Looks like bad Fellini" ("Fall So Far")—can't make it up for air under producer Berg's touch of the Sorcerer's Apprentice. So okay, he produced Robert Plant. He should know dunking guitar-based arrangements in keyboard soup and strings makes for "Knights in White Satin." Headphone fans will find some deliberately cheesy effects. The Mellotron and Wurlitzer are fun.

Another sign of someone on the marketing side hedging bets, *In Thrall* boasts a star-studded guest list about as compelling, alas, as the MTV Music Awards. They're famous, good, and semi-hit—but musical contributions from pros like Benmont Tench, Nicky Hopkins, Aimee Mann, Robbie Blunt, and Jackson Browne are about as apropos as Paul McCartney backing Randy Newman.

But "No Tears Tonight," "Evensong," and "Under Jets" (recalling a child in love with technology when Lockheed was the aeronautical name with which to conjure) are fine: carefully composed, evocative, and about as demure as a mint julep made with double the Jack. And the closer, "Home," completes a cycle (starting with "August Rain") informed by the recent death of Attaway's father. If you concentrate on the main thrust of *In Thrall*, there's plenty to warrant a listen and, if you're feeling pensive, a purchase.

—Beth Jacobs

**IRIS DeMENT: Inorious Angel**


Paula and I have been buying a lot of our fruit from an Amish grower in Lancaster County who has, among other things, 24 varieties of peaches, each with its own distinct savor. People who are used to those abominations they sell in the supermarket may find these a bit too much. I suspect that people who listen to Vince and Garth and Reba and believe they are hearing actual country music may find Iris DeMent a bit too much as well. The real thing has that effect.

Iris DeMent

Make no mistake about it, this lady has the genuine country touch that Randy Travis would give all his designer cowboy duds to have. She's the direct lineal heir of the Carter Family: hers is the voice that John Jacob Niles heard on those frosty evenings in the Carolina Hills. Musically and lyrically it's a voice that is evocative of a lost time and different ways of thought and life. Here it's presented in sparse but solid arrangements, with rock-steady rhythm from Roy Husky, Jr. on bass and plenty of tuneful fiddle and mandolin work from Stuart Duncan. This is probably the band that Bill Staines's young lovers heard at the Roseville Fair, and Iris surely sang at their wedding. If, like me, you mourn the red Dolly Parton (remember "Jolene"?), you'll have to have this one.
Rich Adler and Jim Rooney have given Iris DeMent a sound that's a lot like a '60s folk recording, natural and unprocessed, but a bit soft around the edges—as if there were one too many analog generations somewhere in the recording chain. It doesn't much matter. If you stick around through Infamous Angel until Iris's mom and musical inspiration, Flora Mae DeMent, takes off on lead vocal for the gospel standard "Higher Ground," then, my friend, you are hooked but good.

—Les Berkley

BOB DYLAN: World Gone Wrong

I can't decide if World Gone Wrong is an album of gruesome love songs or a collection of tender tales of murder. If that sounds strange, consider the fact that the best album in the better part of 20 years from America's greatest songwriter is an album of covers. Go figure.

At first blush, World Gone Wrong could be mistaken for a bunch of outtakes from 1992's Good As I Been To You. And while Dylan again applies the same straightforward "bedroom tape" production values, I'd suggest that a more apt touchstone is his cover of Woody Guthrie's "Pretty Boy Floyd" on Crossing. World Gone Wrong has a harder, bluesier edge to it, and a sharper focus, too. There's no "Froggie Went a-Courting" on this record.

Make no mistake, these traditional songs—performed before by artists ranging from Blind Willie McTell to Doc Watson to the Mississippi Sheiks—have been so carefully chosen and work together so seamlessly that the voice is clearly Dylan's. World Gone Wrong, both in tone and content, reminds me of nothing so much as the quiet menace of Springsteen's Nebraska. I say this fully aware of Bruce's debt to Bob (and the debt both of them owe to John Hammond, Sr.). The album's angriest sound is a plucked guitar string, yet there's not a song that doesn't mention murder, death, and worse.

And not a cut that isn't a love song, either. One of the most remarkable moments, among many on this album, is Dylan's handling of the epilogue about "Delia" and her loverkiller, Cutty. "Cutty's in the jailhouse, drinking from a tin cup / Delia's in the graveyard, she must never, never get up / All the friends I ever had are gone." Dylan sings that last line as though Delia and Cutty were the lucky ones. The blues don't get any deeper than that. Other high points are Dylan's crack at "Stack-o-Lee," a version of "Blood in My Eyes" that Joel Rifkin could identify with, and what's more, the quiet and mournful closer, "Lone Pilgrim."

The sound is pretty good in a minimalist way. The guitar miking is fine, but Dylan's close-miked vocals often tax the tape's dynamic range, pinning the meters and sending the sound straight into Distortionland. On the plus side, this is 99.9% of what you'd have heard had you pulled up a chair during the sessions.

While virtually every song on this album predates the copyright laws, the thin line between love and hate that runs through World Gone Wrong still dominates today's headlines. In fact, as I write this, the tabloids are having a field day with the John Wayne and Lorena Bobbitt marital rape/mutilation trials. I'll wager that Bob Dylan wasn't particularly surprised when he heard the news. And Blind Willie McTell wouldn't have been surprised neither. Except maybe that they sewed it back on.

—Allen St. John

JOHN HIATT: Perfectly Good Lover

John Hiatt's latest album reeks of mid-life crisis. A settled, sober family man for a number of years now, and reeling from the failure of the much-touted Little Village project, he does what many men have done before: he takes a too-young mistress. In this case, the mistress comes in the guise of a producer and band more suited to a
teenage personality dealing with life’s doubts and emotions for the first time, than to the fortyish, lapsed-romantic author of tunes titled “Old Habits” and “Permanent Hurt.”

This sort of artfully primitive grunge guitar works for an older like Neil Young, because he’s been doing it since day one. Hiatt knows better. Still, just like those older men with their “nieces,” he’s unaware of the slightly ridiculous figure he cuts. Somehow, this former master of the ironic fails to even consider the contradiction in writing a song that puts down people who smash “Perfectly Good” guitars while trying to sound like one of them.

How do you follow up on mega-zillion-selling albums that turned the masses onto grunge? If you’re Nirvana, you turn inward and try to remove yourself from the commercial appeal of your breakthrough record. If you’re Pearl Jam, you move even further into the pantheon of commercial rock ‘n’ roll. In Utero had to have been one of the most eagerly awaited releases in a long time. Would Kurt Cobain, Chris Novoselic, and Dave Grohl duplicate the success of Nevermind and their giant, giant hit “Smells Like Teen Spirit”?

Fortunately, they haven’t. With the vocal-hating Steve Albini manning the boards, In Utero wipes away Nevermind’s instant appeal and replaces it with a harsher, less accessible, guitar-driven sound—more like what the band was doing on their first album, Bleach. There’s nothing on In Utero that smacks of an instant pop triumph, though “Heart Shaped Box,” remixed by Bob Weston, comes the closest. That’s all to the good—there’s a coarse honesty coming from these songs that makes it hard to just sit around and hum them. They make you squirm.

The lyrical concerns of In Utero are a slap in stardom’s face, an exploration of just what it means to be adored by millions. Cobain, understandably disturbed by all the adulation, tries to make light of it in the album’s first song, “Serve the Servants”: “Teenage angst has paid off well/Now I’m bored and old.” From there, In Utero veers between the joys of family life—as in “Scentsless Apprentice” (Cobain’s and Courtney Love’s daughter, Frances Bean Cobain, was born after Nevermind’s release)—and the pain in the ass of fame, as in “Frances Farmer Will Have Her Revenge on Seattle.” (Farmer was another Northwest native who freaked when she became celebrated.)

But just like Nevermind, In Utero has some incredibly gorgeous moments—as when the band blends in with a cello on “Dumb” and “All Apologies.” Throughout the album Nirvana, is razor-sharp, each song upping the ante until, with “Tourette’s,” they totally deconstruct before coming back for the serene finale, “All Apologies.” Cobain has never sounded better, both vocally and musically, his guitar accenting each word he sings. Bassist Novoselic and drummer Grohl trade off each others’ strengths for a frenzy of backbeat and musical mayhem. This album is a triumph for Nirvana. They’ve answered the chant of “sellout” and proved that there will be none. In Utero may not sell into the stratosphere, but it’s still a powerful musical statement.

Pearl Jam is another story. They, too, had a monster hit from their last album (Ten’s “Jeremy”). I.S. has nothing that even comes close to duplicating that success. Vocalist Eddie Vedder is wrestling with demons that go beyond his concern for the band’s sudden popularity. From all appearances, these devils reside deep within his psyche; the only way for him to exercise

John Hiatt

Hiatt, like Maria McKee on her latest, has mistaken primitivism for simplicity and raucousness for energy. Like McKee, Hiatt is a sophisticated, complex talent ill-served by trying to talk down to his audience—musically if not lyrically. Bring the Family was simple, but informed by the experience of the musicians (Cooder, Keltner, Lowe). While it’s understandable that such a high standard might start to feel like the proverbial albatross, it need not call for replication. There are abundant players and producers equal to framing a mature (no, I don’t mean old) talent in a supportive and exciting setting. Hal Willner (Marianne Faithful) and Mitchell Froom (Richard Thompson, Los Lobos) are but two that immediately come to mind.

I prefer not to believe that this record is a crass attempt to appeal to “young folks.” I would rather believe that it’s a mere misstep in the career of an artist who has given us great songs, great records, and will do so again.

—Michael Ross

**NIRVANA: In Utero**

DGC DGC-24607 (CD), Steve Albini, Bob Weston, prod.; Scott Litt, eng. AAD. TT: 41:23

**PEARL JAM: VS.**

Epic ZK 50136 (CD), Brendan O’Brien, Pearl Jam, prod. AAD® TT: 46:18

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them is to lay bare his fears and pain. That makes for a dark streak running through V.S. that I haven't been able to put my finger on. Something incredibly complicated is going on with Vedder. The whole album is filled with references to blood, violence, guns, and pain—sometimes it's hard to follow along lyrically as Vedder vents that pain and anger. On one of the best tracks, "Reearviewmirror," Vedder explores a troubled past: "Took a drive today / To emancipate / Was the beatings / Made me wise." Later in the song he literally yells, "I gather speed from you fucking with me. / Once and for all I'm far away." So much agony comes through that you can't help but feel his pain.

The band then throws a curve with the smooth, melodic "Daughter," a crisp, steady groove during which Vedder strains his flow of vitriol. But this is short-lived: the band jumps into "Glorified G" and a slam at the NRA: "Got a gun / Fact I got two / That's okay man, cause I love God."

The thing about V.S., or most of it, is that it's so un-grunge-like. Pearl Jam could easily be mistaken for nothing more than an average arena-rock band. They take long, overstated guitar solos, the tons of riffing up and down the frets filling almost every song. If it wasn't for Vedder's painfully honest lyrics and powerful singing, Pearl Jam would be nothing more than another Cheap Trick or Journey, but without their formulaic approaches.

Don't get me wrong—V.S. isn't all dross and contrivance. Its standout tracks lift the album above the merely pedestrian: "Dissident," "Blood," "Pat," and "Leash," while not strictly grunge, are built around the gritty beat provided by a crack rhythm section and are powerfully played and sung, with some really sharp guitar work from Mike McCready and Stone Gossard. "Dissident" and "Pat" grab and shake, but at the same time don't make you want to don flannel and move to Seattle. "Blood," the closest thing to grunge, is a small slice of punk angst, Vedder vehemently screaming "It's my blood" while the band walls away behind him in a speed-fest of noise. V.S. may not be a bad follow-up to a mega-zillion-selling album, but it doesn't fulfill the promise of Ten... —Geary Kaczorowski


AWRIGHT SLACKERS, Generation X-ers, twentysomethings, and whatever other names you should never let Boomer media pukes call you: It's time to holter real loud that you're getting a burn deal.

Not only can't you get a decent job, 'cuz the cowards who run American business—freaked out by the prospect of having to make money honestly without that good old Cold War corporate subsidy—have stopped hiring, but you also can't afford a house, 'cuz the Boomers speculated prices through the roof, then lowered their property taxes, seeing to it you can't get as good a public education as they did.

So what do you do about it? At least some of you are wallowing in '70s nostalgia. I admit that an Abba revival is the perfect in-your-face tweak to the Boomers' "Rock's been going downhill since Dylan" wheeze. But I was a teenager during the Decade That Taste Forgot (a great tag I got from a Time article), and it wasn't so great. I mean, the Bee Gees in SoMa clubs? At least no Peter Frampton yet.

If you're into the '70s, want to hear the best, and want to feel good about your own expansive, improvisatory maleness, then you owe it to yourself to check out this excellently selected, packaged, and documented Parliament collection.

This Blackest of bands was created by impresarios/legendary George Clinton to play antimonial foil to the severe Afro-Calvinism of brother band Funkadelic ("P-Funk" in conjunction, mostly same personnel, very different concept). Parliament's language is Funk, the dominant form of black popular music in the '70s. That decade was arguably the high point of black popular music in America. Bands such as P-Funk, Ohio Players, Kool and the Gang, and the Bar Kays absorbed from the spirit of their priapic time a freedom of expression hardly imaginable to their more commercially constrained Motown forbears. Funk is about sex, sex as a powerful healing and liberating force, superseding and transforming politics, poverty, and general institutional tight-assedness.

Clinton uses Funk to spin elaborate myths spanning several record albums, juxtaposing Old Testament prophesy ("Swing Low Sweet Chariot/Come and Let Me Ride") with faith healing, ancient astronauts, the Pop Gothic legend of Dr. Frankenstein—or, Funkenstein—and a cast of mutant clone characters as bizarre, if generally more benevolent, as ever inhabited W.S. Burroughs's most bizarre hallucinations.

This being the '70s, Parliament's creative output shows no small influence from hallucinogens. It also shows no small amount of chops. Here are some of the most intrinsically fugal horn arrangements to be found West of Sun Ra, with legendary saxman Maceo Parker frequently leading the fray. Parliament's signature sounds are those horns as an integral part of the music (not just tacked up as dressing in the mix), demented post-Hendrix guitars, amazing athletic vocals, and, as foundation, the voluptuary bass of Bootsy Collins.

But what makes this music unique is Clinton's ability to express serious social themes with a disarming cosmic laugh. A Parliament song like "Bop Gun," hook-ridden and anarchic on the surface, is really about redemption through harmony between mind and body, achieved scatologically and salaciously. The song's subplot of "Endangered Species" seems prescient 15 years later, after Reaganomics,
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Clinton is just as concerned as Frank Zappa with “priests, pimps, and politicians” running his brain; he’s just not misanthropic about it. (I’ve long thought of Clinton as Zappa’s great-hearted twin.) And gangsta rappers take note: When Parliament’s prehistoric Afraunos descend from their Motherhood to reclaim the Pyramids, it is, of course, a spin on the Muslim Original African-Asianic Man theory. Only now it’s comical, not hateful.

That’s why Clinton requires disclaimers if you sample his old stuff and reuse it in your own records in a violent context quite opposite to his intentions.

So, guys, listen to Uncle Funk and be powerful again. There’s no better source of amoral Fire-sign life force. It sure beats hell out of tromping into the woods with Robert Bly and his Boomer accountant friends to beat on drums.—Kevin Conklin

JANE SIBERLY: When I Was a Boy
Reprise 26824-2 (CD only). Jane Siberry, Brian Eno, Michael Brook, prods.; Michael Brook, Michael Philip-Wojewoda, Sid Wells, engs. AAD? TT: 67:46

Jane Siberry seems to have forgotten how to swing—though she’s sure got her makeup skills down on When I Was a Boy. (The way she’s duded up on the cover, the boy she was was George.) Her unique combination of fragility and power—once her greatest strengths, and the ones that made The Walking and Bound by the Beauty such successful balancing acts between preciousness and perfection—have here unraveled to become her greatest weaknesses; she’s taken the Big Tumble into sheer self-indulgence. When I Was a Boy is, by a mile, Siberry’s worst record.

The beginning is promising enough: “Temple” and “Love is Everything” are tuneful and attractive, and “Calling All Angels” is a real song, with k.d. lang’s amazing pipes thickening Siberry’s gossmamer textures and elfin, wayward vibrato. But so much of When I Was a Boy sounds like the made-up-as-you-go songs we all used to sing when we were six or seven: endless, tuneless vocal meanderings that may have sounded like the very soul of music to us, but that drove our parents out of their skulls. One of these songs is just that: the seven-minute “Sweet Incarnadine” was edited down from a 20-minute vocal improvisation recorded live at a club. I guess it could have been worse—When I Was a Boy could have included the unedited version.

Throughout the rest of the album, Siberry and co-producers Brian Eno and Michael Brook seem to have attempted to re-create a sort of naïve artlessness via studio wizardry, long spoken narrations, muchero reverb, and vocal drop-ins à la Ultra-Naté. Unfortunately, it adds up to little more than an hour spent with a bunch of studio dilettantes. Guess you had to be there.

Funny thing: At album’s end, following a minute of dead silence, “Love is Everything” is repeated in a slightly different mix. The song reappears as if to remind those who’d forgotten (I sure had) that some actual music had indeed occurred an hour before. But this last-minute return to substance only underlines the rest of the album’s echoing vacuity.

The rumor is that this is the second version of When I Was a Boy—Reprise reportedly returned Siberry’s first master tape as “unreleasable.” I figure it was either a whole lot better or a whole lot worse than this one. Who knows? The point is, Jane Siberry is an important and unique artist; she can do and has done much, much better than this, and should have had better guidance in the studio. If you haven’t heard them, buy her previous Reprise albums, The Walking or Bound by the Beauty—you’ll not have heard their likes.—Richard Lehnert

SHERYL CROW: Tuesday Night Music Club

ELIZA GILKSON: Through the Looking Glass

EMMYLOU HARRIS: Cowgirl’s Prayer

JANIS IAN: Breaking Silence

RICKIE LEE JONES: Traffic from Paradise
Geffen GEF0–24602 (CD only). Rickie Lee Jones, prod.; Julie Last, eng.; Doug Sax, mastering. AAD? TT: 44:40

Increasingly in recent years, much of the most consistently vital, interesting, revealing, intelligent, and downright disturbing music in the rock, pop, “alternative,” and singer-songwriter scenes has been made by women. Whether Janet Jackson,
Tori Amos, Natalie Merchant, Grace Jones, Marianne Faithfull, Liz Phair, Babes in Toyland, or the formidable PJ Harvey, women have not only seized a high ground abandoned by the rock cocksmen of paradigms past, but have opened up new territories that men have either always avoided or never even knew existed.

Even today, I find that when I talk these artists up to other male music writers and musicians, their initial response is skeptical: "Yeah, sure, RL; women can't rock. Women can't lead a band." Corey Greenberg hears no blues influences in PJ Harvey's music. TAS's Michael Fremer, though respectful of Tori Amos's musical abilities, finds the subject matter of her songs—ie, the messily unromantic details of daily life in a female body—so disturbing that he dismisses them out of hand (TAS, Issue 80, p.200). Nor do I mean to single out these otherwise excellent writers—I've done the same. (See the footnote to my review of Rickie Lee Jones's Flying Cowboys in Vol.13 No.4; I'd take it back if I could.) These attitudes remain all too typical, entirely justifying women rockers' frustration and anger, even paranoia.

The most surprising of these five releases is Janis Ian's Breaking Silence, which, as the title implies, is her first album in a long time. After million-selling mid-'70s hits like Stars and the No.1 Between the Lines, Ian found herself "turning into an idiot who could only discuss music and business." She took a dozen years off to write songs, move to Nashville (she calls it "the last home of songwriters"), build a house, lose that house to pay off back taxes and recording costs, come out as a lesbian, and generally get a grip. Ian has only improved as a songwriter since writing hits like "Jesse" 20 years ago for such then-superstars as Roberta Flack. (Ian's "Some People's Lives," which is on Breaking Silence, was a hit for Bette Midler's 1990 album of the same name.)

Breaking Silence is about the Holocaust, incest, spouse abuse, the '60s, and sex. Such subject matter is not inherently ennobling or significant—something young and/or unseasoned writers have to learn the hard way. It's far easier to end up with a pretentious song about wife-beating than one about gettin' down at the Friday-night dance—the stakes are higher, and failure a lot easier to come by. But Ian's maturity and intelligence demand the attention of the serious listener. These are not songs of knee-jerk liberal finger-pointing, but studies in empathy, compassion, and acceptance of complexity and irresolution that have been written from the inside out ("His hands would never hit me sober"); charbroiled portraits drawn in the lightest strokes of gritty charcoal.

It's one impressive record: almost entirely acoustic, understatedly powerful, quiet without once compromising its confessional intensity. It's a masterpiece of chamber-sized, folk-based rock, every note carefully selected and placed against a well-respected silence. Ian's tiny voice is consummately trained, as is her bluesy acoustic guitar—she doesn't miss a single trick of interpretive nuance. Percussionist Jim Brock, who gets well-deserved top billing in the band, lays out for whole verses, only to crash in with a few notes here and there so dramatically right that they chill the spine. "Folk" albums rarely have drum solos, but this one does; it'll leave you wishing for more. Some of the album was recorded live to two-track, and all of it was mastered by Doug Sax. It's one of the best-sounding pop records I've heard in a long time.

Emmylou Harris's Cowgirl's Prayer, despite its title, is a long way from being a western or a country album—whatever those might be these days. Contrary to rep, Harris is a pop singer pure and uncomplicated. For nearly two decades now she's felt secure enough in her roots and talent to give the impression of singing country when she was doing anything but—sort of like Patsy Cline, who was no more a "country" stylist than Ella Fitzgerald or Ray Charles. Harris can make a Springsteen song sound like country and give "Diamonds are a Girl's Best Friend" a punky edge. She continues this bent with added strength on Cowgirl's Prayer, the sort of state-of-the-art collection of contemporary songwriting talent we've come to expect from her over the years. Here are great tunes by Tony Joe White, Jesse Winchester, Lucinda Williams, Leonard Cohen, and Emmylou herself, among half a dozen others, all produced and arranged to perfection with Richard Bennett's unerring freshness of taste.

What's new is Harris's restored vocal strength on this, her 19th album and her first for Asylum. In recent years her voice had deteriorated rapidly from endless touring, each album finding it thinner, drier, more strained; on last year's At the Ryman, she sounded downright ragged and exhausted. Harris has since given up life on the road, and her voice shows it: she hasn't sounded this strong or this committed to the material in years. Sound is a little too clean/pristine for me—like those $700 hand-tweaked, Technicolor "cowgirl" boots found in Santa Fe shopwindows which you know will never kick a chip or slip into a stirrup. But it is shore is pure. Recommended.

Speaking of Santa Fe purity, the City Different's very own Eliza Gilkyson (whom locals remember as "Lisa" from the days before she moved to Austin) has released an album that maybe won't satisfy fans more in love with her pure-folk vocal sonorities than with emotional immediacy, but should make her long-delayed career take off. Gilkyson's previous albums, an independent production and two on the now-defunct Gold Castle label, suffered from overproduction and the omission of some outstanding original tunes that always wowed us Santa Feans. And when they were recorded, they were so far removed from in-concert immediacy that they were unrecognizable. Why couldn't someone just hand her a guitar and let her rip?

Well, no one has yet, but Gilkyson's self-produced Through the Looking Glass is her closest record to that ideal, nothing-added session. Here she works lower in her range, with more grit and grunge in her voice than I've ever heard. There's less pure vocal "beauty" here than on her other albums, but I don't miss it a bit: Gilkyson's big-hearted singing style is that much more open and vulnerable for the smoke and husk in her throat, but her voice can still swoop up an octave at a stride, like a night-hawk riding the Cerrillos updrafts. Gone are the synths and endless overdubs that drowned whatever soul Pilgrims and
that gets Jones back on track, with mostly acoustic backing from the likes of Leo Kottke, David Hidalgo (Los Lobos), Dean Parks (Little Feat), Brian Setzer (Stray Cats), and John Leftwich, in laid-back arrangements produced by Jones herself (and mastered by Doug Sax, who gets around). The result is an album that has all the woody, dark, elegiac mystery of Daniel Lanois's productions of his own albums—about as high a compliment I can think of.

Jones begins with a lazy, drifting groove that most would end an album with: "Pink Flamingos," all sun-melted, margarita-drenched languor. But that's just to soften you up for the astonishing "Altar Boy": "A monk with a hard-on in a lavender robe / that scratches his thighs for the height that he strode / he follows a path filled with errant desire / and mimics his footsteps, and sets his prayers on fire /// I too have chosen that which left no choice / to sing without loving my solitary voice / to observe with passion each careful denial / the provocations which give my life meaning for a while."

Until I read the liner notes, I never occurred to me that Jones had written this song herself—not because I lack any respect for her songwriting abilities, but because "Altar Boy" has no trace of the street-smart L.A. hipoise to whom Jones has so religiously apprenticed herself since her career's beginning. Here she sounds more like Leonard Cohen at his darkest, daintest, and most prophetically poetic. An awkwardly amazing song.

The same is true, in an entirely different way, of "Beat Angels": standard Jones turf, you'd think, but written by Sal Bernardi. These Beats have died and gone to heaven somewhere south of Cancun, where they play with the big dreamcatchers Jones writes about in the next song, the very Lanois-ish: "Tiger's Thighs," which is now always think of as a Rickie Lee Jones song; then the most relaxed Cajun backbeat you've ever heard ("Jolie Jolie"); and lots more.

*Traffic from Paradise* is a rich album that goes down so easily you don't realize at first how very good it is. It's also the first Rickie Lee Jones album that does not give me the impression she's waving her diploma from the Tom Waits School of Cool in my face. That was cute in her precocious mascot years, painted so lovingly in "Danny's All-Star Joints" on her first album. It got old fast. Jones has grown up, as "Running from Mercy" tells: "There is no sorrow that heaven can't bear."

And boy, hearing this record is heaven: real musicians listening to each other as they play real instruments in an almost real room.

Way recommended.

Lest you think this group portrait constitutes a gender ghetto: I've highlighted these artists because each is a musician of substance and talent worth going out of your way to hear. Whether for songs past, present, or to come, the music of these five women has improved the quality of my listening life. I'm grateful.—Richard Lehneret

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**Stereophile, January 1994**

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Thomas J. Norton


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WorldRadioHistory
FORSELL AIR FORCE ONE
Editor:
Forsell Mediphon would like to thank Jonathan Scull for his knowledgeable and inspired review of the Air Force One and Air Reference turntables. It was a pleasure to read such a fine and descriptive work. It is nice to see a reviewer with such an interest in and involvement with the product. We think the review is very accurate and goes into a great depth of detail. We have a little difficulty making the full connection with some of the Marx Brothers quotes, but trust both Jonathan and the American sense of humor.

Since JS’s sample of the Forsell Air Reference turntable was manufactured, we have made dramatic improvements to the power supply and released the Mk.II, which also has a new air bearing. The Reference’s performance has moved considerably closer to the level of the Air Force One. This makes the Forsell Air Reference much more suitable to the customer looking for Forsell sound quality, but who doesn’t wish to use the flywheel. The difference between the two is really much smaller with the improved power supply, although the flywheel still gives that extra edge you receive from “a platter weighing 6000 pounds.” The performance increase with the new power supply is so dramatic that we offer modification to all owners of the first type, at cost-price.

For new sales of the Forsell Air Force One from January 1994 on, we will supply one extremely quiet, high-pressure pump, with regulators, to supply the tonearm, platter, and flywheel platter. This is as a replacment to three separate low-pressure pumps supplied previously, as described in the review. We take the pressure down from high to low with regulators.

There is a lot of poor-quality dental floss on the market. The right type is available from us. We recommend only the old, smooth, rounded type, by Johnson & Johnson. Johnson & Johnson also have a new model of poorer standard, so contact us to be sure.

In Sweden, the air filter’s life expectancy is one to two years, depending on playing time and environment. In New York maybe you need to change three times a year. Replacements are available via our distributors.

PETER FORSELL
President
Forsell Mediphon Scandinavia AB

MFA MC REFERENCE
Editor:
MFA thanks Jack English for his thoughtful review of the MC Reference.

Our design goals were: to create a high-gain, low-noise preamp which would allow the user the choice of any moving-coil cartridge regardless of output, without the necessity of step-up devices; to have wide dynamic range; to create an accurate soundfield without being forward and aggressive; to avoid an exaggerated mid-bass characteristic of tube preamps in the past; and to focus complex musical passages without smearing the images.

Much to our delight, Mr. English’s review makes it clear that we met our goals.

As an “ardent audiophile,” what pleased me most was reading about Jack and his friends setting aside reviewing responsibilities and spending night after night mining his record collection “for unending hours of sheer delight.” After all, that’s what it’s all about, and that’s why we are in this field of high-end audio.

PETER EVANS
President, MFA

NHT SUPERZERO & SW2
Editor:
We appreciate the review of the SuperZero and SW2. A great deal of time and care went into design in an attempt to remain true to the music while maintaining their affordable price. One issue that requires mention has to do with the SW2’s impedance (fig. 12). NHT recommends in the owner’s manual that the passive SW2 be used only when there is a speaker load present. This can be accomplished by using the RK1 resistor kit (included with the SW2), if satellite speakers are not connected. Configured in this manner, the minimum impedance actually rises, making it acceptable for almost any amplifier.

CHRIS BYRNE
General Manager, NHT

MACH 1 ACoustics DM-10
Editor:
Thanks for a most thoughtful and comprehensive review of my DM-10 Signatures. Your kind words are appreciated. Before getting to my main comments, I’d like to take this opportunity to extend my thanks and gratitude to Dave Mohler (member of technical staff, AT&T Bell Labs, proprietor Transformation Audio Systems) for his invaluable assistance throughout the development and testing of the DM-10 Signature. In fact, I should note that many of the critical design decisions were based on Dave’s research. Following the conceptualization of the DM-10 Signature, there were a number of tough design decisions to be made. In regard to bass performance, I was left with a choice between higher Q and its resultant bass extension, or lower Q and its superior bass quality. This represents a classic “more vs better” scenario. And, as the DM-10 Signature is an attempt at true “state-of-the-art,” that decision was actually a fairly easy one to make.

Thank you again for the review and your interest in MACH 1 products. Oh, I almost forgot. JA: Keep your eye on MACH 1, because in coming months we’re going to enter the “cutthroat” arena with some speakers that incorporate many of the design and construction philosophies found in the DM-10 Signature, at prices more accessible to the average audiophile.

MARC MCCALMONT
MACH 1 Acoustics

GRADIENT SW-57
Editor:
Thank you for your review, which I think clearly shows the two different approaches in adding new wine to old flasks.

When designing the subwoofer (woofer) system for the original Quad ESL, we have kept in mind those customers who have been listening to their speakers for decades. The SW-57 system will improve the bass without changing the footprint of the speakers.

The Quad ESL is a marvelous piece of hi-fi for its age. It’s [been] evident during the last 35 years that its quantity performance is limited.

The Gradient SW-57 is designed to work only with the Quad ESL. It is able to produce low notes sufficiently relative to the capability of the ESL’s higher frequencies. Thus the Quad/Gradient system is well balanced, keeping in mind tonality and timbre of the reproduced instruments.

The highest permitted input voltage to the ESL is 33V peak (factory spec). Exceeding this voltage will lead to damage due to arcing. We must bear in mind that an electrostatic speaker will more likely be destroyed by excessive voltage than by power.

The built-in protection circuit of the
The making of an expert.

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SW-57 clips the peaks for safety at 1dB below this limit. When activated, this circuit produces a noticeable distortion so the listener can reduce the volume setting. When listening to the Quad/Gradient system, it is always the protection circuit which will set the level limit, not the SW.

Steve Stone's ESLs are equipped with Quad's own protection circuit (QELCLPK), and I assume those inside the SW-57 were bypassed. Quad's circuit clips more gently, and its function is not so easily audible. When activated, the circuit reduces dynamic range and for this reason the harmonics dynamics achieved by adding the SWs is less than expected.

The term "subwoofer" has a different meaning in Europe than in the US, perhaps due to cultural differences. However, with proper positioning in the room, the reproduction of the ESL/SW-57 is extended down to 30Hz. Minimum distance to the back wall should be 1m (40').

When the SW-57 is raised 4" off the floor, its radiated sound power is reduced by 2dB because of the gap between the SW and floor. The SW-57 is intended to be positioned directly on the floor; the mirror image of the source "below the floor" will then be fully utilized. Short spikes or pads have no influence on this phenomenon. If someone is able to raise the acoustic center of the ESL, a better solution is to put something between the ESL and SW.

All resistors in the crossover are of metal-film type, not carbon-film. Crosstalk attenuation (high-pass) was probably measured with an open input. [Actually, no.—Ed.] A more real-life value is achieved when the unused input is terminated by a 1k ohm resistor. In this case the attenuation is typically >70dB. How the separation of the low-pass section could be only 45dB is more difficult to understand. This value is typically over 90dB. Designing a filter of this kind with only 46dB crosstalk attenuation would require a special skill.

Jorma Salmi

Brian T. Tucker

Quad USA

Gradient Ltd., Finland

HeadRoom standard, premium, supreme

Editor: I think the most important thing I can say is I can't possibly tell you the readers the things I feel the need to tell them about HeadRoom in a Manufacturer's Comment. We have a comprehensive 14-page white paper on headphone psychoacoustics and a 24-page HeadRoom manual that we'll happily send free to anyone who wants to learn more. Just call the 800 number.

Other than that, I'll just make a few comments where I think I can add a little info for your readers.

Yah, sure, you betcha—HeadRoom is a power-hungry little bugger. At first we thought, "It's just a little portable amp, we should be able to get it to run for 10 hours, no sweat." Boy, were we wrong. Physics is physics. Look at your system at home: bet that big mother Krell keeps your listening room toasty. Try as we might, we couldn't get away from the basic truth that grabbing hold of dynamic drivers and making them do what they're supposed to takes energy, and lots of it. It means you've got to have juice flowing in the amp just waiting to go out there and make your eyes blink. It means you eat batteries. (All amps come with an AC wall adapter.)

Thanks for comparing HeadRoom with the Melos; I haven't had the opportunity to sit down and compare them side by side. That unstrained power you got from the Melos is no surprise—just think of those poor AA batteries in the HeadRoom sweatin' their little brains out. Actually, the DC-to-DC converter in the HeadRoom is the bottleneck. When you think about it, it's quite extraordinary that it manages to keep up as well as it does. I think this observation should encourage manufacturers of modest-cost audiophile equipment to at least consider the size, weight, and cost advantages of switching power supplies to some applications (automotive and portable audio spring to mind).

Okay, now I'm mad. You say, "I didn't get the out-of-the-head, binaural-type imaging from stereophonic recordings that I expected from reading HeadRoom's literature and the original Bauer and Thomas papers." In defense, I quote from the HeadRoom White Paper (p.8, current ed.): 'HeadRoom does not solve 'In-Head-Localization.' To do this you must re-create all localization cues.' John, you were hoping for too much. I know it seems like such an easy thing to do: "Just make an electrical circuit that models how we hear." Thirty years ago, a whole bunch of research engineers tried. In the end, they found out that it's not so easy to play God. As you imply in your footnote, the only way to get out-of-head headphone imaging is to stick mikes inside your ears, and later play back that recording. There's just no replacing your original equipment when it comes to hearing. So for goodness' sake, everybody, don't play your music too loud. (In a whisper, "Did you hear that, 'Corey'?"

The problem with all that early headphone-imaging research was they just threw their hands in the air and gave up when they couldn't get out-of-head imaging. You and I have been stuck with lousy headphone imaging ever since. What's said is that they had found ways to improve headphone imaging. All we did here at HeadRoom was polish up some of this old technology with modern silicon, and start a business with the result. (The latter was by far the hardest part.)

I suffer from the same confusion as you when I switch back and forth rapidly between process and bypass. But when you think about what your brain is trying to decode, you can understand why. Each position (Processed or Bypass) is a type of warning. Throwing the switch back and forth is tantamount to being magically Star Trek—transported back and forth between two rooms, blindfolded, and in an artificial acoustical headphone world that really doesn't exist. No wonder you get confused. Bottom line: Your brain needs time to build its understanding of the current acoustic environment—especially since it has no head movement or visual cues.

The difference between headphone listening and HeadRoom listening is that headphone acoustics are so foreign to your brain that you never really accept what you're hearing. Your brain continually asks the subconscious question, "Where the %&@# are we?" followed within an hour or so by, "Will you please get me the heck out of here!?" (listener fatigue). With HeadRoom, your brain tends to react differently—"I'm not quite sure where I am, but the tunes sure are good in here," followed shortly thereafter by, "You know, if I sit real still and forget I've got a body [your outside-world physical reference], the image is actually pretty good.

You say in "Summing Up,"... it did sound more natural on nonclassical recordings. Are you inferring that HeadRoom doesn't work with classical music? Oh boy, I could burn up some space here. Classical is no different in principle from jazz or rock or whatever. It's still reproduced through two speakers, and you still need to crossfeed the different signal or your brain will fatigue. If HeadRoom is marginally less effective, it's because most classical discs have more ambient information from which to build an image. Give it time. I bet you'll end up preferring classical with HeadRoom.

Thanks for taking all the measurements. Some of the noise might have been RF leakage picked up in your probe/cables from the switcher. We've made some minor changes to keep pushing RF noise down, but it's kind of like grounding—a black art. As you say, you can't hear it anyway. We may have published some of our specs incorrectly; the reader in doubt should probably believe the Stereophone test figures. By the way, I should acknowledge the chief designer of HeadRoom at this juncture, Charles "Chuck" Knighton. If the box specs good, it's 'cause Chuck sweated bullets making it spec good. If it weren't for the fact that he watches far too much "Beavis and Butt-head," he'd probably qualify as a true audiophile designer.

Last, but certainly not least, I promised myself I'd say this regardless of the outcome of the review. I feel strongly that Stereophone's review process and editorial policies are executed in an extraordinarily exemplary manner. We (readers, writers, and manufacturers) may haggle and disagree with the findings of the reviews (as always, and all together now, the audiophile motto: "You Should Trust Only Your Own Ears"). But issues of favoritism, special treatment for advertisers, or old-boy networks are not issues here. Believe me, I have no desire to listen to the headstand information in and out of Stereophone. No way, no how. And I'm good at it. Dear Reader:

Stereophile, January 1994
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If you read it in this mag, it's an honest review.
I'm glad you like the HeadRoom amp for travel, that's what got me started in the first place. But you might be surprised to know that over 80% of our customers bought them for use at home with their jackless high-end systems.

Regards and Good Listening, everybody,
Tyll Hertens
President, HeadRoom

HARBETH HL-P3

Editor:
Thank you, JA, for the thorough review of the Harbeth HL-P3 and LS3/5a speakers in December. As you refer to the founders of Harbeth and Spendor as the “fathers” of speaker-cone technology, one must rightly conclude that the LS3/5a is indeed the “mother” of all minimonitors. Thus, the P3 is the heir apparent.

Your praise of the P3 reminds me of the speaker’s own understated (English?) performance: “I still had nothing to say about the HL-P3’s midrange character, which is itself a compliment.”

However, the misplaced comment about the P3’s mid-treble balance seeming a bit forward-balanced actually appears to be a system-related aberration. This seems to be corroborated in your excellent “Measurements” section, where you state, “The overall response on the tweeter axis is superbly flat through midrange and treble.”

Indeed, the P3’s superb performance in your “Measurements” section is a direct result of Harbeth’s use of sophisticated computer testing systems in design, assembly, and final testing. During my recent visit to the Harbeth factory in Haywards Heath, there were numerous MLSSA systems used in the production line. Alan Shaw remarked, as we watched P3s being assembled, that his own component testing and matching for the P3 were even more demanding than those required by the BBC.

This stringent testing and quality control earned Harbeth special recognition at the recent 1993 Penta show, and are prime reasons for the BBC to select Harbeth as the sole UK vendor of the new LS3/12a speaker.

The ultra precision used by Harbeth in the manufacture of each pair of speakers is directly responsible for the superior imaging. Eschewing fancy sculpted baffles, sloped façades, and “baffleless” designs, these perfectly matched rectangles do throw a soundstage comparable with speakers costing a great deal more: Alan Shaw once commented to me that speaker enclosures were a necessary evil, but he simply did not have the time to invent the superior alternative.

Yes, we agree that multiple P3s (with or without a subwoofer) do make a very high quality home theater system. We recommend three pairs, with one pair dedicated to center-channel duty. We also feel that this type of intimate home theater (screening room?) is best based around a high-performance, direct-view (tube) television.

As with direct-view vs projection televi-
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MELOS SHA-1
sion, the P3 represents the triumph of quality over quantity. Finally, we hope that music lovers everywhere, not just those attracted to the BBC-designed LS3/5a, audition the Harbeth P3. As John Atkinson and Corey Greenberg have both stated, the P3’s musical qualities rival [those of] speakers costing considerably more. Garth Leerer

Golden String

HARBETH LS3/5A & HL-P3
Editor:
I appreciate the work John Atkinson has expended on the Harbeth LS3/5a and HL-P3 loudspeaker reviews.

The myth quoted—that the BBC needed a small monitor for OB use—is in fact a fairy tale! What actually happened was that the BBC was building 1/2-scale models of proposed studios. The idea is that if the model is 1/2-scale and the frequency of sound played in the model is multiplied by 10, then a probe microphone can explore the resonances and standing waves very easily (and cheaply). A small box about 1/5 the size of a normal BBC monitor was developed with the KEF B110 and T77. At that stage, the quality of sound was not even considered—any transducer that offered an equivalent bandwidth would have sufficed.

One lunch time (the story goes), an engineer wanted to listen to the news, and out of curiosity he hooked up the miniature transducer to a nearby receiver. To his amazement, the sound quality showed remarkable promise and set in motion development of the LS3/5 (never put into production), and then the LS3/5a. As the prototypes gathered pace, users like the OB engineers put forward applications for this new minimonitor. The rest, as they say, is history.

As a matter of interest, I was still at school when the LS3/5a was being developed, but managed to get involved as a volunteer behind the scenes at a local BBC radio station. My first personal involvement with the LS3/5a was when I obtained copies of the plans and made my own cabinets and crossovers. I always associate that summer of 1976 with sweating away in my garage making those little boxes and spending hours French-polishing the veneer.

From the LS3/5a my interest developed into the LS5/6, the BC1, and the whole philosophy behind the BBC approach to monitoring. How many teenagers can say they attempted to mold Bextrecon cones under the kitchen cooker grill using an old vacuum cleaner! The smell of burning plastic lingers with me to this day—thank goodness my mother was out! So you see, the desire to manufacture the LS3/5a was one ambition fulfilled, the design of the P3 as its successor another.

It is not my view that the LS3/5a design has been revised just once (I think you really meant revised just once as well as the bi-wiring). The reason for the 1988 “computer optimization” was because the performance had drifted so severely from the original specification. In fact, there were numerous tweaks to the crossover over the years to try to bring the performance into line. Harbeth (which I took over in 1986) waited in the wings until the computer-optimized design was made available, and we were, I believe, the first licensee to offer substantial deliveries of this new model.

We do not believe that bi-wiring makes a scrap of difference to the LS3/5a, and understand that the BBC’s concession was because they were satisfied that there is no difference in sound quality. We think it is rather disappointing that other licensees chose to tart up this respected old lady.

The BBC specification calls for a birch plywood cabinet, and Harbeth adheres to this specification. We have heard that not all licensees have maintained this specification, and MDF has been used as a substitute; the BBC is investigating.

It is interesting to note that early LS3/5as had a 2dB lift in the 10–20kHz region, probably to deliberately enhance tape hiss.

Thank you again for your time and dedication. I am confident that you will find other current Harbeth models as satisfying, and future models even more interesting.

Alan Shaw
Managing Director, Harbeth Acoustics

RICHARDSON KT88S
Editor:
Contrary to the information that appeared in your November 1993 issue ("Sam’s Space," p.77), Richardson Electronics does indeed continue to manufacture KT88s at its US manufacturing facility.

David Ross
Richardson Electronics

MUSE ELECTRONICS
Editor:
In reading the December issue of Stereophile (Vol.16 No.12), I ran across an error of fact in Martin Colloms’s report on the recently concluded 1993 Penta Hi-Fi Show. On p.65, in the “Industry Update” section, Mr. Colloms reported on the Audio FREAKS display: “Arguably the most delicately civilized sound at the show was produced by Branco Bozic of Audio Freaks. A Conrad-Johnson Premier Eight fed double tuned sets of the Dutch Audiofreaks speaker sourced by the new digital processor from SME...” In fact, the amplifiers used in this display were the Muse Electronics model Three Hundred monoblocks. However, I gladly accept his assessment of the sound we were able to extract at the Show.

Should you have any questions regarding these or any other components used in the Show system, do not hesitate to ask.

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256 WorldRadioHistory Stereophile, January 1994
THE FINAL WORD

By now you've no doubt realized that Stereophile has changed its size—from 5½" by 8¼" to 7½" by 10¼". (All right—maybe you didn't know the exact dimensions of the change, but that's what they are.) We have Edward Chen, Publisher of Stereophile's Chinese edition, to thank for our new size. It is the same size as the Chinese Stereophile and a common size in the Far East. We've been admiring it in Chinese for the last two-and-a-half years, and we thought it would make sense in English as well.

We're very excited about this change. If you've already read this issue, you'll have seen that very little about the rest of the magazine has changed—we have the same great letter writers, the same great columnists, the same great equipment and music reviewers, the same great editors. Our reasons for this size increase are straightforward: The extra space will allow us to make our graphic presentation more open and approachable; we love the way our covers look on the larger Chinese Stereophile; and our new size will afford us the opportunity to bring our appreciation of excellence in sound reproduction to the wider newsstand audience.

With the new size comes a necessarily increased percentage of space devoted to advertising—our ad sizes are up approximately 60%. But the amount of editorial material remains exactly the same. In fact, this issue carries our largest equipment-report section ever!

Stereophile's last size change was in 1968 with Vol.2 No.8—it went from 8½" by 11" (a size now only rarely printed) to digest size, where it remained through December 1993. J. Gordon Holt's motivations for that size change appear to have been practical: The larger issues were getting mangled in the mail, and the digest-size issues didn't seem to suffer from this problem. Ironically, one of the practical advantages of the new size is that we've been able to abandon the environmentally invidious plastic bags that your Stereophile had been arriving in. Unless Stereophile is treated differently from other full-size magazines, it should arrive in as (relatively) pristine a condition as the other publications you receive.

We work hard to make Stereophile the best magazine about sound reproduction in the world. We're really excited about using the size change as a way of approaching that goal. As you might guess, we're eager to hear your responses to this change.

I've noticed signs in some of the other magazines concerned with sound reproduction that we may have already come too close to our goal of being the best in the world. The editors of two such publications recently explained in print that they feel compelled to spend so much time bitingly attacking Stereophile because of our "excessive" success: Too many people may be corrupted by the evil of Stereophile's editorial views, is the thrust of their argument.

This surprises me—not that our views should be regarded as evil, but that these magazines should choose to attack us for reaching so many people. Not too long ago (1982-86), Stereophile was in a similar position with respect to The Absolute Sound; We felt that they had too much influence in the audio world.

My response to this situation was quite different from the one currently chosen by our contemporaries: Except when I occasionally misbehaved, I deliberately didn't attack TAS or give them any unnecessary publicity. I believed that Stereophile had better things to say about sound reproduction than did TAS, so I set out to make sure our distribution and circulation efforts were such that our reviews reached the maximum number of audiophiles. I felt sure that, in time, this would turn out to be a successful strategy for equalizing the influences of the two magazines. It has.

I would recommend the same strategy to the editors of all audiophile magazines. As president of Stereophile, Inc., I believe that Stereophile offers the most well-researched and authoritative reviews available, and that other magazines are, well, basically unnecessary. As a member of the high-end audio industry, however, I realize that alternative voices and points of view are healthy, and that the high-end consumer benefits most from wide and vigorous debate. However, in order to best serve you, the consumer, that debate needs to focus on music and the equipment used to reproduce it—not on personalities and publications.

Finally, I would like to offer New Year's thanks once again to Stereophile's most valuable asset—you, its readers. And among you, special thanks to those of you who write letters.

To Robert Marino's (of Athena Productions) letter in this issue, I'd like to say that LP has never been "the state-of-the-art storage medium," as any recordist will happily tell you. Master tapes, second- and third-generation copies, and occasionally commercially available reel-to-reel tapes have always been better than LPs. Many digital master tapes fall into this category as well, especially the newly available 20-bit masters which John Atkinson discusses in this month's "As We See It." LP is the best home source available, but only when played back on superior equipment.

To John L. DeCosta, who wonders (in a letter published in this issue) what was going through my mind at the Greenberg-Nudell confrontation at the 1993 SCES: Primarily, I was disappointed by the sound of the very expensive system in that room, regardless of what source was being used; secondarily, I was interested in Corey's persistence at getting what undoubtedly would be a negative response from Arnie Nudell; tertiarily, I took note of Mr. Nudell's sour, perhaps condescending, face directed toward others in the room upon first audition of CG's selection. I moved toward the back and subsequently out of the room after a minute or two of Sly and the Family Stone. I must be an Old Goat, or at least middle-aged.

Larry Archibald

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