The sound of a loudspeaker is ultimately determined by the quality and consistency of its component parts. At Polk Audio, unique drivers and crossovers are used to achieve a coherent, seamless and balanced musical presentation. For an explanation of how we use these parts to make superior sounding products, please contact Mark Suskind.
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JANUARY 1989 VOL. 12 NO. 1

Stereophile, January 1989
Mr. Holt regrets

Some readers may have noticed that my contributions to Stereophile have diminished in recent months. Perhaps you’ve wondered if The Old Man (Guru, Old Fart) is being phased out by the new philistines who value soundstaging and detail over the real reasons for high fidelity. Perhaps you may have wondered if JGH, after 26 years of running off at the type-writer (and the word processor), is running out of steam. Maybe you have speculated that the old creative juices are drying up along with the others. It’s almost certain none of you has guessed what’s really been going on here at Stereophile.

What’s going on here is family problems. My wife left me in 1983 and moved with our two children to Boulder, CO. She is now seriously—probably terminally—ill, and for that and other reasons I won’t go into, I have decided to leave Santa Fe and move to Boulder. The rituals and processes involved in doing this have occupied much of my time, which is why I have been doing relatively little listening and even less writing. Even audio takes a back seat when your family is in trouble.

My work output, and therefore my profile in Stereophile, will probably diminish further before it increases. When I move, there will be a brief period during which I have no listening room, followed by a longer one while I get used to the sound of the new listening room. Then you’ll start seeing more of me again. But how long it will be before I can start cranking out the quantities of inspired hackwork I was doing previously is up to such non-audio unpredictables as T-cells, genetics, and the whims of the Almighty.

Despite my recently launched video newsletter, I am not planning to pull out of Stereophile. My affection for its staffers—the most delightful bunch of kooks I have ever known—goes far beyond such mundaneities as loyalty, habit, and reasonably decent pay. Besides, there is much that I must do before I shuffle off this mortal inductor. I must try and persuade our young whippersnapper editor that fidelity means realism, I must pursue the growing suspicion that today’s sophisticated (pardon the vulgarity) horn loudspeakers may have much of value to offer high-enders, and I must continue beating the drum for my (perverted?) view that if a convincing soundstage is worth striving for, it can be done much more convincingly with four channels than with two. We are getting close enough to the truly realistic reproduction of music that it no longer seems an unattainable ideal. Do you think I would quit when the Holy Grail may be almost within reach? Not likely!

—J.Gordon Holt

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Stereophile, January 1989
There is an old hi-fi joke that goes thus:
First audiophile: "I hear Joe died."
Second audiophile: "I didn't know that. What did he have?"
First audiophile: "Oh, Marantz, Linn, Krell, Vandersteen."

This, was in effect, the information gleaned from *Stereophile*’s readership survey forms returned last summer. Question 18 on the form, which was published last June, asked readers to list their components and rate each one on the following basis: "Yes, I would buy again," "Maybe, I don't have an opinion," and "No, not if you paid me." We had hoped that an analysis of the results, when summed, would give indicators concerning the reliability of each brand. Unfortunately, however, it became apparent that reliability was only one of the factors taken into consideration by readers when deciding upon a rating. The "Reliability Survey" aspect of the analysis, which we had hoped to publish in this issue, therefore had to be aborted.

All was not lost, however, as the statistics concerning how many people owned how many of each brand still proved fascinating. Instead of looking at reliability, we have, in effect, examined in great detail the subject of brand loyalty, a rather different, and all-embracing, aspect of hi-fi ownership.

The table on the next four pages displays the results for the 217 brands to get the most entries, each being owned by 0.6% or more of the magazine’s readers. (Another 89 brands were mentioned between 10 and 24 times, and 444 brands were mentioned between one and 9 times.) Regarding the reliability of the data, we received just over 9000 forms from *Stereophile*’s approximately 45,000 readers. Of those 9000, the answers to Question 18 from 8250 forms, involving 50,168 individual components, were entered into a database by the hardworking team of Laurie Evans, Anne Peacocke, and Wendy Feldman through the months of October and November 1988. (They would have liked to have entered the data from all the forms, but they ran out of time, even given an extended deadline for this article.) However, I am sure that we have included the information from a sufficiently wide sample of the magazine’s readers to be confident about the trustworthiness of the data.

The final column on the right probably requires some comment. The figure quoted is the percentage of those mentioning the brand who said that they would buy it again. You might well ask why I didn’t just subtract the percentage of those who would not buy again from 100%, therefore including those who were noncommital in their reply. The answer is that I felt that counting just those who opted in would be a more rigorous pointer toward brand loyalty. We are talking enthusiasm here. You will see that I only calculated this percent-
With Precise Loudspeakers, noted inventor and recording engineer Keith Johnson has added still another notable achievement to his long list of industry credits.

Precise embodies the finest sonic characteristics of the hand made studio monitors Keith uses at Reference Recordings. They are a testimony to his dedication, persistence and uncompromising ideals.

The design signatures Keith has brought to Precise create a speaker capable of a truly wondrous performance. Indulge yourself today with a listening session at your Precise dealer.
age for those brands mentioned 50 times or more. Less than that figure and my gut feeling is that the sample is not sufficiently large to be reliable. If you disagree, then there is nothing to stop you working it out for yourself, but, of course, I don’t think it will be reliable to better than 2 percentage points.

The results are published for your interest rather than to make any serious points. However, there are one or two aspects to which I would like to draw your attention. The first is that even the widest-owned brand, Sony, was mentioned in only 5% of the total replies. (This does mean, however, that almost one in three Stereophile readers owns some item made by Sony.) On the other hand, 198 brands were mentioned just once, with 444 brands being mentioned nine times or less. The wide distributions of such American companies as Adcom, NAD, AR, Carver, Shure, Hafler, Monster Cable, and Grado are noteworthy, as are the high positions achieved by Audio Research, Linn Products, McIntosh, and Conrad-Johnson, all companies who can hardly be said to be competing in the “affordable” arena. The

The popularity of the MIT interconnect and loudspeaker cable is somewhat surprising, though, considering its high cost.

A clear correlation that can be drawn from the data is that, in the main, Japanese manufacturers feature a lower level of brand loyalty than do the specialist manufacturers. I am sure that this is due to the fact that the oriental products are often more alike than they are different when it comes to sound quality. The figures in this survey also reflect the fact that a significant proportion of the Japanese hardware mentioned were video products, where there is very little to discriminate between one brand and another on quality grounds (in my opinion). It can also be discerned that brands which are marketed through in-depth advertising campaigns do less well in inciting loyalty in their customers than those which are sold through retailers who have a strong commitment to the brand.

A large number of brands achieved a “loyalty index” of 80% or more. I feel, however, that those scoring even higher than that should be picked out for a special mention. This “90%
Precision made connectors for the distinguished user

WBT-0108 coaxial RCA the solderless crimping plug

cutaway view of WBT-0200 coaxial jack, RCA with active spring adaption

WBT – the crucial soundlink for all good equipment

... or would you buy a Mercedes with bicycle wheels?

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Club” consists of B&K, Celestion, Krell, Magnepan, Quicksilver, Rowland Research (now called the Jeff Rowland Design Group), Stax, Spectral, Spendor, Thiel, Threshold, Vandersteen, and Well-Tempered Lab. All had nine out of ten of their owners (or more) sufficiently satisfied that they would buy the same brand again. This, in my opinion, is what buying a “high-end” component should be about.

It will be possible to draw “Top 40”-type lists for individual product categories from the Table. It is obvious, of course, that Nakamichi, even taking into account the popularity of their “Stasis” receivers, leads the field in cassette decks. To conclude, therefore, I’ll extract a list of the top 30 loudspeakers, from companies specializing in that most taxing of disciplines, in order of their popularity among Stereophile’s readers:

1 The very high profile for Acoustic Research in the Table is due to their Legend and its relatives being the most popular turntable among Stereophile’s readers. I felt it fair, therefore, not to include them here. Similarly for Eminent Technology, whose high number of mentions was primarily to their excellent ET2 tonearm, and Quad, we have no idea how the latter’s score should be divided between their electronics and the ESL-63.
<table>
<thead>
<tr>
<th>BRAND</th>
<th>Yes</th>
<th>Maybe</th>
<th>No</th>
<th>Total</th>
<th>Percent would buy again</th>
<th>Owned by readers</th>
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<td>Total</td>
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<td>-----</td>
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ONE LOOK AND YOU'LL KNOW WHY IT COSTS MORE.

There can be but one justification for a more expensive TV monitor. A more life-like picture. That's why Tera conceived and engineered the Model 629a — winner of Video magazine's head-to-head eyes-on comparison test of eight leading monitor/receivers. "The Tera ran way ahead of the field," they wrote, thanks to Non-Linear Compression, Dynamic Aperture, and Double Differential Contour Correction. Tera was judged first in audio with genuine discrete amplifiers, real speakers and wireless stereo headphones. Tera even ranked first for ease of use. Write to us for literature that explains Tera's winning ways. Or experience them for yourself at your Tera dealer, where the difference is plain to see.

Tera Electronica Inc., 209 Wera Central Street, Room 308, M.A. 0111A
Call for name of your nearest Tera dealer, (508) 651-1094.

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Call for name of your nearest Tera dealer, (508) 651-1094.
At this level, beyond mere commercial practicalities, Infinity seeks to find its own: The few for whom music is an obsession, for whom price is no object in attaining the absolute perfect re-creation of sound.

The speaker system we've named the Infinity Reference Standard Beta was really built to prove to ourselves, after building the legendary $50,000 Infinity Reference Standard V, that lightning could strike twice in the same place.

We designed the IRS Beta as a true point source, capable of generating an incredible 15Hz to 45kHz response with effortless (and seamless) musicality.

Four 12-inch injection-molded polypropylene/graphite woofers are servo-controlled for state-of-the-art bass reproduction.

A new lower-midrange driver, the Large-EMIM, was created. This push-pull planar driver reproduces the critical frequencies from 70 to 700Hz—that vital area containing most of the musical fundamentals (an area ill-served by virtually all speaker designs, with attendant loss of the natural warmth of instrumental voices).

Two L-EMIMs optimally cross over to an improved EMIM with new high-gauss neodymium magnets and lighter diaphragm, for impeccable midrange transient response and detail.

And an EMIT and SEMIT (Super EMIT) produce the upper octaves and overtones to 45kHz with a transparency and openness that is airy and “live.”

In total—a speaker of unprecedented overall musical accuracy. The IRS Beta. A speaker whose performance
extremists, and the obsessed.

can leave you breathless.

Its cost is under $11,000.

We also offer the equally incomparable IRS Gamma and IRS Delta, at about $7,000 and $5,500 respectively. Both are two-speaker versions of the Beta, although the Delta does not include a servo-control unit, which can be added later to upgrade the Delta into a Gamma.

We encourage you to audition the remarkable IRS Beta (as well as the Gamma and Delta) at any one of a select group of Infinity dealers catering exclusively to the audiophile.

To the dedicated—even obsessed—lover of music, it is the stuff dreams are made of.
The Mirage M-1 loudspeaker system is being praised by the leading audio critics as one of the biggest breakthroughs in speaker technology available today. This full range Bi-Polar Loudspeaker has set new standards for musicality and home stereo reproduction.

Experience electrostatic transparency, thundering dynamic range and possibly the best sound staging of any speaker system.

Audition the Mirage M-1 and the Mirage 60 series speakers at selected audio specialist stores.

This speaker may change forever the way you think about music.

Mirage – 3641 McNicoll Ave, Scarborough, Ontario, Canada. M1X 1G5
(416) 321-1800
**LETTERS**

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

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**Bathroom reading**

Editor:
I've enclosed a couple of pictures of my daughter (three years old on Oct. 13, 1988) doing some serious *Stereophile* reading while learning to master bathroom training. These were not staged, incidentally. She walks around the house with a couple of issues, along with her own books and toys. She appears to have progressed to a regular toilet, I just noticed as I write this. (I have also collected vintage radios, TVs, and related items for the past 15 years.) She turns the pages and looks for speakers and amps. Some of the more exotic speakers throw her, though.

On the serious note—keep up the good work. *Stereophile* continues to get better each issue. The last four issues have been outstanding!

Attention: bring a high-end *Stereophile* show to Chicago. I realize they hold CES, but I cannot attend it. I would pay $30 admission just to meet your staff.

To your continued growth and good content.

Scott Hagerman
Cary, IL

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**In the groove**

Editor:
I distinctly remember that I had gone through three or four issues, beginning with Vol. 9 No. 1, before I settled into the "groove" of *Stereophile*.

Settled meaning initials-recognition of your writers and reviewers, and understanding, if not completely accepting, their opinions, writing styles, philosophies, and verbosity.

And I was a hard case, delaying renewing after the first year until you sent me at least two free issues. The second year was better, as I became more comfortable with you. I even began to take you for granted. In fact, a couple of issues piled up unread as renewal for my third year passed. But I couldn't cancel! I renewed again because I enjoy the feistiness with which your writers and editors air their differences of opinion. (You're not mellowing in this respect, are you?) That's your second real value: We readers get more than one opinion for the same price, the first value being the reference library your magazines create.

Your real value, of course, is entertainment. And you deliver it in spades in "Letters." And you are most commendable for "Manufacturer's Comments."

But it wasn't until I read a copy of *TAS* that I came to really appreciate you. Theirs must be a twice-the-size rag for about the same price that's published only every two months. (And HP had been forever after JGH to publish regularly?) And for that there seems to be more editorializing and less reviewing, although their covers sure are pretty!

But, please, don't stop changing or I may take you for granted once again and really drop you.

Peter Wurzbach
Dallas, TX

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**Popping the cork**

Editor:
I frequently lose patience with one or another of *Stereophile*'s writers (Dick Olsher heads the list), but this time I pop my cork at the magazine's readers. What has currently ruffled my feathers is their assessment of *Stereophile*’s reviewers as revealed in October (p. 71). The Audio Cheapskate, who writes a column I can barely manage to read, walks off with the accolades, with J. Gordon Holt close behind.

JGH should stick to non-review articles. It
translucent cone speakers I have heard.
...As far as I'm concerned, it redefines the art of miniature speaker design.

This is without doubt a wholly remarkable loudspeaker, and a stunning endorsement of the well developed metal cone bass units.
...on current showing the state of the art miniature, bar none.
...to the author's knowledge, the most awesomely dynamic and articulate miniature ever made.
Alvin Gold, Hi-Fi Choice, Jun 1988

speakers are a revelation. Their dynamic performance is in advance of anything I've heard before.
...And what a product, Few new companies in the hi-fi field can boast a speaker that leapfrogs existing references and sets new standards of technical and musical excellence.
David Prakel, Hi-Fi Answers, Mar 1988.

The AE-1 has an 88dB/W sensitivity, and is designed to handle – and I mean handle – something like 200W. But those are just numbers – the reality is quite extraordinary.
...As astonishing as the dynamics of the AE-1 are, so too is its bass extension, which has depth and fullness quite out of line for a speaker this size.
seems as though every good piece of equipment he gets for review causes his critical abilities to take a vacation. He goes gaga over everything and can't find fault with much. Examples here include the ARC SPII, the Sound-Lab A-3, the Infinity IRS Beta, and now the VTL 300W monoblocks. It seems as though it takes the arrival of a new and comparable piece of equipment to get Gordon to focus on a piece of equipment's shortcomings, but by then the gaga review is already published. Gordon implies as much in his VTL monoblock review, where he states that, for now, he does not find much wrong with them. Sometimes, I think he spent too many years listening to Eagle 2s or the like.

Olsher also mistakenly rates components too highly. Remember his favorable Boulder amplifier review in Vol.9 No.5? Consumers obviously disagreed with his judgment. Now, only by force of will and with resolve has Stereophile managed to put Olsher's speaker cable debacle behind it; however, it would seem to live on in the October issue's "Recommended Components," where the Monster M1 and the MIT are not even mentioned. Although much, if not most, of the rest of the world uses those cables, Stereophile treats them as though they don't exist. Finally, Olsher's ears seem to have taken a dive on his recent Maplenoll review; perhaps his eyes, too. Surely, we should be able to have him tell the difference between plastic parts and metal ones. On the 'table's sonic merits, Olsher once again develops an opinion at variance with the listeners' consensus.

Finally, where you do have a reviewer with good critical facilities who does not have an orgasm over every piece of equipment to land in his hands, your not-so-fine readers put him at the bottom of the heap. I refer, of course, to Steven W. Watkinson, who quite methodically, in each of his reviews, tells the readership what a piece of equipment looks like, how it operates mechanically, and what it sounds like, always including critical commentary on the latter point, but also giving credit where it's due. The Tympani IVa review in Vol.8 No.6 is a good exemplar which accords with, and actually leads, the present consensus.

I think your readers have acquitted themselves poorly on their review of your reviewers. From this experience, they obviously cannot not be your litmus test. Consequently, you should come to grips with the matter yourselves. Ergo, a proposal: Stereophile should develop, stabilize, and implement a careful policy of holding questionable or anticipatedly controversial reviews until other staff reviewers have had a chance to loosely confirm the results. If they can not so do on their own equipment, the review should be withheld. You owe it less to the nineties who read the magazine (myself included) than to the manufacturers of the equipment who can be seriously injured by an irresponsible or witless review.

Stereophile and its readers should all clean up their acts.

Kimball J. Corson
Phoenix, AZ

A one-percenter

Editor:
My god—I am a one-percenter. While I wasn't surprised by the number of non-concertgoers among your readership as revealed by the survey results in October (I am a confirmed pessimist), I expected that the frequent concertgoers would be more numerous. Compared with the price of components, concertgoing is cheap. For the price of a set of Class B speaker cables ($1000), I get floor seats at more than 40 performances (the other 20 or so are free recitals), and a mild tax deduction, as that amount includes donations to some of the sponsoring organizations. (As a music lover, I do contribute, both directly and by providing an audience. Concert playing is a major source of income for most classical performers. Recording is a rare occurrence in the American musician's life, and unlike Glenn Gould, performing for an audience instead of a microphone is a necessary part of paying the rent. If they starve for lack of paying concerts, they won't be there to make new recordings.)

I admit that I live in a city with a very active music community (especially for the renaissance and early baroque music that I favor), but any reasonably urban area should present at least a dozen opportunities each year to attend a concert.

To John Atkinson: I would be curious to see a contour plot of number-of-people times cost-of-system times number-of-concerts-attended. It dismayed me to think that a number of people spend huge amounts to re-create a sound that they have never heard. (Though if the percentage of concertgoing audiophiles significantly changed, it would rob me of one of my greatest weapons against the religious audio
Step beyond a fourth dimension where picture perfect sound is the only reality. Experience the ultimate live performance in your own living room.

Introducing HOLOGRAPHIC SOUND from IMAGE! Your doorway to great musical performances of past, present, and future has finally been opened. From the threshold of Sound Engineering Excellence, IMAGE captivates you with brilliant performances of listening pleasure.

—IMAGE— a product so special that simply owning it says you recognize the utmost in quality. The objective of the IMAGE Acoustical Engineers was to create a line of loudspeakers that would further the integrity of reproduced sound. Our Commitment to Excellence with constant improvement and innovation is the driving force behind IMAGE.

THE HOLOGRAPHIC "IMAGE"

Instead of taking a back seat to the live musical performance, HOLOGRAPHIC SOUND from IMAGE makes you feel like a participant. Music has been given a 4-Dimensional depth and clarity that is unwavering both on and off-axis. True, vibrant sound ‘appears’ in your listening window right out of thin air. HOLOGRAPHIC SOUND from IMAGE - for musical coherence and accuracy the name says it all!

135 Torbay Road, Markham, Ontario, Canada L3R 1G7
fanatic: most give up on me when I ask them how many weeks it has been since they last saw the inside of a concert hall.)  

Jeff Del Papa  
Cambridge, MA

Where the rubber meets the sky
Editor:
I had always assumed, until your Vol. 11 No. 10 survey results, that I was on the outside looking in, getting my vicarious kicks from peeking in your other readers' estate windows. Letters like those from the Riverdale sniffer (Vol. 11 No. 1), et al, which pour about your occasional coverage of reasonably priced components (e.g., $400 speakers) would intimidate me—even though Riverdale, MD is the armpit of Washington, DC and I had previously assumed that people who had to live there bought Radio Shack equipment on convenient monthly terms. I was content, therefore, to just smell the steaks the rest of you were cooking.

Imagine my utter astonishment, then, at discovering that only 11.5% of your readers earn more than I do, and only 2.6% have more expensive systems. [The survey indicated that 2.6% of readers had systems costing more than $24,999—Ed.] Indeed, a full one-half of your readers haven't even spent one-quarter as much as I have on equipment.

This tells me Stereophile is the audio equivalent of People magazine: a vehicle for voyeurs like me who have neither the intention nor the resources to buy $4000 preamps, $10,000 amps, and $20,000 speakers. I knew I couldn't afford them, but now I know that neither can 90% of your readers.

So why do we read you? Because there is not any other magazine we look forward to, and enjoy reading, as much as yours. The format, the wit, the diction, the point/counterpoint exchanges—these overcome the basic uselessness of the content. I mean, seriously, how useful can your assessments be? You are basically a gaggle of dusty farts with withered ears insensitive to anything over 10kHz; your dulcet highs exist only in your imaginations.

Even where you might be able to hear differences, what good does it do me? Consider the following chain: ears/cartridge/arm/record clamp/turntable/turntable support/interconnect/preamp/interconnect/amp/live conditioning cord/speaker cable/speaker/speaker support/room. That's 15 variables! And you want me to believe you can report meaningful, audible differences which I might experience? Give me a break. You are—no more, and no less—reporting on your system. It will be entirely coincidental if the subtle differences you purport to hear are evident on my system. Your construct is a house of cards.

Then there's the Cheapskate. What a lovely connotation: I mean, why don't you tell us what you really think about the 90% of your readers who subsist on his $700 preamps, $1000 amps, and $1800 CD players? How about some reviews of 78 shellacs for those of us on this trailing edge?

Someone once said that Mae West was a plumber's idea of Cleopatra. Well, I think the Cheapskate is your idea of a token black.

Finally, while I'm in such a good mood, let me comment on your implicit endorsement of a reader's suggestion (Vol. 11 No. 6) that, if one's software hasn't cost at least twice as much as his hardware, he is probably a nut case who can't be trusted. Since the equipment you review with enthusiasm would easily total $25–$50 thousand for a system, the "amazingly revealing" Johnston formula dictates there should be $50–$100 thousand worth of software (tapes, records, CDs). Let's see, that's about $150,000 for a system you could endorse. Sounds reasonable to me. You are definitely where the rubber meets the sky.

In closing, I'm sure I'll keep reading you, but I'll be damned if I know why. Neither, I'm sure, do you.

John Vaeth  
Derwood, MD

Why not CD?
Editor:  
Pity the 8000+ CD-less readers of Stereophile—yet another disadvantaged population in desperate need of assistance! Until reading the results of the Stereophile readership survey, I had held out hope that the only persons not yet embracing digital audio as the clearly superior means of music reproduction, at least in private, were a minority of the audio press and hi-fi equipment dealers (both of whom have a clear interest in maintaining the largest possible variety of equipment on the market for review and sale), and perhaps the utmost lunatic fringe of reactionary audiophiles.

A year ago I was in the market for a pair of "reference"-class speakers (ultimately purchasing B&W Matrix 801s), and I took the time to

Stereophile, January 1989
For fifteen years, Threshold technology has been personally fashioned by Nelson Pass and the Threshold appearance styled by Rene Besne. Today, Threshold products are still constructed for serious music listeners under the direction and responsibility of these corporate founders.

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for those who find music an essential part of life

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visit a number of dealers for auditions. I was shocked to find that perhaps half of these establishments did not routinely include a CD player in their best systems. I would humor them for a while, listening to an LP of their choice, and then request that a CD player be installed for additional listening. Invariably this request was greeted with the statement, "We don't find there's much interest in digital among our customers." No doubt this is the party line, but such behavior is awfully cowardly if one is truly convinced of the superiority of analog. (Can we agree that merely connecting a CD player to the preamp does not degrade the sound from the phonostages?)

When at last the player was installed (usually requiring the efforts of two or three salesmen, perhaps because of the unfamiliarity of the device), the obviously superior sound of whatever discs I brought along usually elicited comments such as, "That's a really good-sounding CD! We don't hear many of those [no surprise], what is it?" There are a lot of easily suggestible people in the world, and I am disheartened every time I hear of someone filmflammed into "upgrading" their system with a $3000 turntable when a $300 CD player would have given superior sound, convenience, and reliability.

Robert A. Pascal, Jr.
Princeton, NJ

Good science & testing
Editor:
John Atkinson's comments in "As We See It" (September 1988) aroused my interest as I reflected on the things I like and dislike about Stereophile. While hate/love letters are sometimes good or amusing, other times not, the best do try to come to grips with the experience of music reproduction. The forum that Stereophile presents is by far its best attribute. The methodology for its reviews is inconsistent and therefore provides an ongoing debate about the merits of its process and, indirectly, the components under review. Writers, manufacturers, and readers each get their say. To step in and manage this debate between us, you get my respect. And now I'd like my say.

Good science is based on reproducible results. You tell us about how the equipment is set up, the room acoustics, and the reviewer's choice in music. You add some thoughts about how the music sounds. Subjective reviews are not necessarily bad science. To draw conclusions based upon observations that are reproducible is very good science. But some minor things get in our way.

Perception of music varies based on one's background in music, stereo components, and innate gifts. Understanding acoustical phenomena helps; I'd like to see more coverage about how we perceive sound. The power of suggestion of the manufacturers' hype that makes up equipment ads is real; both readers and writers should beware. I don't think there is much one can do but take the differences into account. Use common sense.

Subjective reviews can make sense. To make their results reproducible, I suggest that writers have guidelines about the goals/criteria by which they judge. Components have sonic attributes and can be judged on soundstaging, tone, clarity, and the like. These all are subjective judgments, and people can widely agree with the results, even debate about the mix of attributes that makes good equipment. Good science. But can manufacturers take that mix and make good components? Good science. Right?

David W. Norton
Seattle, WA

Testing & methodology
Editor:
It would be very interesting if you were to try this: have a neutral party set up a blind listening test between several units without telling you which brands or what prices are involved. Rank all the mystery units from best to worst, telling how each unit sounds and why it earned the ranking it received. Then tell us how much you would pay for each respective unit, considering its performance.

When the neutral party reveals what all the units were, the results may be too shocking and damaging to some companies to be printed! Certainly a pair of Radio Shacks would not stand up to B&W 801s for even a 10s commercial jingle, but what if you compared a $500 pair and a $1500 pair (unaware of the names or prices), and told us you heard a quality difference of maybe $400?!

Kelley J. Myers
Wadsworth, OH

Methodology & conversion
Editor:
You have helped convert yet another to Hi-Fi. I began my love affair with music reproduction the same way many have, buying a $200 con-
sole system and reading Stereo Review. (Am I supposed to admit that?) I graduated to a receiver (45Wpc), homemade speakers, and finally a turntable with a counterbalance. (Stop laughing—to me that was the mark of a high-end turntable. It didn’t even need a quarter taped over the stylus.) Then it happened. About a year ago a friend told me of your review of an Adcom amplifier, and I was jolted to my senses by the auditioning of a good mid-fi setup (GFA-555, GFP-555, KEF 104/2). (Owners of Jadis, etc., may remove the smug smiles or I’ll drool longingly all over your tubes. Me, jealous? You bet!) I was sold; so was the system and a subscription to Stereophile.

I have a question that I hope isn’t offensive. Do you not like blind tests? If not, why not? I haven’t seen any in the seven issues I’ve devoured. I personally don’t rely on this alone, but was happy that I could blindly tell the difference between the Adcom and two other setups. I could tell them apart by name fairly quickly.

No longer a member of the “no difference between amps” crowd, I’m hungry for better sound. I have considered buying another amp and using the two in bridged mode. I have no need for more power, but have heard this sounds better. Is this a viable route for large improvements?

May I ask this: Is there an area that is often the most bang for the buck? Replacing a two-year-old CD player? Buying a turntable (I hear applause)? Interconnects? This simplest answer is to buy Krell, IRS, and Goldmund, but . . .

Thanks, Sam Tellig, for bringing the Sony D-15 to my attention (“Audio Cheapskate,” Vol.11 No.9). I considered, was tempted, bought, and am tickled.

Mark W. Rice
Atlanta, GA

Methodology & Mad magazine

Editor: Regarding blind A/B testing, which apparently “proves” that there is no audible difference between a cheap receiver and a high-quality amplifier (or between CD players, etc.), may I say that while this type of testing may have valid applications, comparing high-fidelity components is not one of them. We tend to describe sound in visual terms (ie, “transparent,” “focused,” “sharp images”), but I think the actual listening experience has more kinship with the sense of taste. Imagine trying to do a blind A/B test on two different wines. Initially you would be able to distinguish between them, but as you switched back and forth, your sense of taste would most certainly become saturated with both wines, and therefore be increasingly confused. The more you A/B’d them, the more you would be unable to distinguish even gross differences!

I believe that comparing high-fidelity components in this manner leads to similar results. One’s auditory “taste buds” are simply rendered useless. This is why the only valid way, in my opinion, to evaluate a component is exactly the method you use: live with it for an extended period of time, then compare it to a reference with which you are fully familiar.

On another topic, I tried solid-core cable after reading Alvin Gold’s article in Vol.10 No.4. He is quite correct. My Sieffert Research Maxim III Hs had been wired with standard Monster Cable. Upon switching to solid core, I found that an ugly graininess (like fingernails on a chalkboard) that had been present at higher volume levels was gone, as was a false sense of etched detail and “tighter” bass. The music took on a delicacy and effortlessness that I had thought impossible with my relatively modest NAD electronics. The solid-core cable I now use is nothing more than Belden 20-gauge coaxial cable! It’s insulated, shielded, easy to work with, and cheap!

Thank you for a very enjoyable reading and learning experience. I haven’t had such a good time with a magazine since I was a kid devouring the latest issue of Mad.

Terrence C. Horton
Sisters, OR

Oops

Editor: Come on, guys, let’s get the facts straight. In JGH’s review in September of the Infinity IRS Beta, he states in the specs section that each panel contains one large EMIM; two are shown in the picture!

In addition, if you choose to give historical data (which I do strongly approve of), it should be accurate or it should be omitted. As you can see in the Servo-Static 1A literature, there were seven electrostatic tweeters, five arranged in a vertical (not horizontal) row, with two at the top placed horizontally, giving the overall shape of a “T”. The tweeters were actually made by RTR Industries in a Jantszen-type design (the first SS-Is did use cut-in-half Jantszens, though).
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High-performance audio by Rotel has arrived. With remarkable sonic quality you've previously associated only with esoteric equipment selling at other-worldly prices. Now, however, at prices you'll find very down-to-earth.

At Rotel, our engineers avoid gimmicks and flashing lights. Instead, they concentrate on audible performance. All critical parts are carefully hand selected on the basis of how they sound when producing music. Direct signal paths – from inputs to outputs – assure highest accuracy and resolution. And our renowned amplifiers, for example, use massive power supplies, along with discrete output transistors rated many times their actual load. As a result, they can produce high-current output continuously – not just for a few milliseconds. Our 50-watt amplifier actually plays louder and sounds better than many with 100-watt specs – and 100-watt prices.

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The tweeters were much more reliable than the midranges, but were prone to breakdowns in the internal connection of the polarizing voltage to the resistively coated diaphragms (no sparks, no explosions, no drama, just silence!).

Alan Rauchwerger
Rochelle Park, NJ

Applause from San Francisco
Editor:
I applaud your decision to hold *Stereophile*'s next High End Hi-Fi Show in San Francisco. It has been years since a substantial hi-fi show has been held in this city. I believe you will find a great deal of enthusiasm and interest in high-end audio from residents in and around the Bay Area.

Last year I attended the show in Los Angeles, which was somewhat of a disappointment due to the small and crowded listening spaces. I would like to see the show presented in more spacious surroundings, perhaps in a convention hall rather than a hotel.

In any case, I look forward to the show and hope it will offer some rewarding listening experiences, which is what it should be all about.

Anthony Marshall
Mountain View, CA

CD Cancer
Editor:
Thank you for your recommendation of the Digital Test CDs from Pierre Verany. I ran right over to Tower Records and purchased a set. Testing the CD players I had on hand was most interesting, and definitely proved that player price had little to do with tracking ability—in fact, as the table below shows, it's almost a reverse relationship!

Bernard A. Engholm
Carlsbad, CA

Music isn't analog
Editor:
I would like to reply to Robert Rowton's "Music isn't analog" letter in the September 1988 issue.

The letter (from Marc Richman) he disagreed with in the May 1988 issue is not incorrect. Music is analog. And music doesn't only exist in the mind. Music is a complex network of many different frequencies and tones, etc., which are all truly analogous. Mr. Rowton was correct in the fact that "The brain, although equipped with analog sensors, is a digital processor." But Mr. Rowton fails to realize that music or a given frequency was not meant to be transferred into the digital domain until after it has reached the brain.

The eardrum itself is an analog device and was meant to receive analog-only signals. And these analog signals are meant to stay analog until they reach the eardrum; they weren't meant to be juggled around in a digital state, then recreated in analog.

After the eardrum, the signals then go to the brain, where they are naturally turned into digital as mother nature intended.

Think about it: there are no "natural" digital sounds created on this earth. Has anyone out there ever been to a "digital" concert? I'm sorry, please forgive me for even thinking such a thing. Praise be to our precious vinyl!!! Mr. Rowton's comment about "the medium is not the message" is correct as far as it goes, but I still prefer to hear mine the way it was intended— analog forever.

I would also like to take a brief moment to thank *Stereophile* and all of its staff for the finest high-end audio magazine ever produced. The magazine is very informative and interesting, and I enjoy each issue from cover to cover. Everything about it is very professional; even

<table>
<thead>
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<th>Table: CD player error-correction performance with Pierre Verany test CD</th>
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<td><strong>Model:</strong></td>
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<td>Intermittent Sound Clicks:</td>
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<td>Relay clicks:</td>
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<td>Hiccups:</td>
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<td>Refused to play: Tracks 31-50</td>
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Stereophile, January 1989
Products recognized for their ability to reproduce music and to advance our perception of high fidelity emerge from unique companies. The community of individuals dedicated to the production of Mark Levinson components has established an unequalled tradition of excellence and accomplishment, while accepting the responsibility for refining the state of the art in music reproduction within the boundaries technology and imagination allow.

The No. 26 Dual Monaural Preamplifier introduces a new level of performance in audio system control. Until now, the most musically accurate preamplifiers have had limited control flexibility due to the sonic advantages of direct signal paths. The new generation of circuitry developed for the No. 26 provides full control flexibility, for six audio sources with two tape loops, and such refinements as absolute phase selection, all with greater sonic purity than even the minimalist preamps of the past.

The No. 26 offers two optional phono input sections for precise matching with any phonograph cartridge. Either of these circuits can be factory installed at the time of purchase, or added later by your dealer.

The No. 26 also offers the option of true differential balanced connection to associated equipment. While this superior interconnection technique has been taken advantage of in professional equipment for many years, only recently have domestic products offered it as an option. The No. 26 will allow you to achieve the maximum performance from Mark Levinson amplifiers and other products offering balanced connection capability.

All Mark Levinson products are handcrafted in limited quantities to ensure their high standards. Visit your Mark Levinson dealer to hear how good music can sound in your home.
its size, which allows it to be kept on a bookshelf, in library fashion, just as it should. I also very much appreciate the plastic wrapping which keeps its covers from getting bent-up and scratched up during shipping.

I've renewed my subscription for three more years. Keep up the excellent work!

Floyd E. Barratt
Browns Valley, MN

The disagreement

Editor:
I'd like to have a say concerning the disagreement between JGH and JA on choice of sources for equipment evaluation. My musical taste is eclectic, but I do critical listening to equipment using familiar folk and classical pieces. I find records of acoustic music easier to compare to their live counterparts than is the grungy (you don't need a 'd'?) rock'n'roll that I actually listen to more often. I know that if a component contributes minimally to the sounds of acoustic instruments, then it will sound fine playing the raunch I listen to for fun. (Who does listen critically to rock? And what's "real" about its sound to be critical about?) Give a 9.9 to JGH on this one!

Doug Stevens
Minneapolis, MN

Perfect reproduction?

Editor:
Concurring with both John Atkinson and J. Gordon Holt in the October '88 editorial, "The Acoustical Standard," I would attempt to further delineate the issue thusly: The design brief for the "perfect" music reproduction system is simple: that which would reproduce exactly any sound, music being a subcategory of all sound. This approach may have amounted to engineering overkill before the advent of electronic music, but synthesizers make increasingly possible the invention of any sound imaginable. So it really comes back to that hoary old chestnut, "the perfectly transparent medium," where any system wholly capable of reproducing any possible sound would of course also be capable of manipulation for the production of any imaginable sound, pleasing or not. In such a perfect scenario, questions of aesthetics and taste would be left to artist and appreciator, without the opacities of inadequate media clouding issues.

As regards an absolute standard for the judgment of music-reproduction systems, I am reminded that Edgar Villchur suggested what seems the singly valid method when he worked out his "live vs recorded" comparisons. The recording must be made anechoically, then a coincident comparison of actual live reproduced sound can be made in either anechoic or reflective environments, audible discrepancies in sound being exactly proportionate to the amount of distortion caused by whatever method of reproduction used.

Dave King
New York, NY

Gordon is absolutely right

Editor:
It seems, judging by the letters I read in your magazine, that many of your readers have not yet grasped the fact that speaker wire and interconnects are components like any other components, and will have as much effect on the overall sound of a system as an amp, source, or the speaker itself.

Consider, for example, the letter by Paul K. Miller, typical of the genre, in the October 1988 issue, in which he states that he "... want[s] good, affordable cable so that [he] can spend more money on better speakers to listen to great music, not to materials." This is a blatantly foolish statement, which is utterly out of line with recent developments in high-end audio technology. From my experience, it would be far wiser to buy high-quality wire to elicit the best performance from mid-priced speakers, than to wire up high-priced speakers with poor wire—unless, of course, quantity is a more important goal than quality, in which case we are no longer talking high fidelity. I personally believe that the cable should be considered part of the speaker, and that one quarter to one third of one's speaker budget should be allocated to the cable.

But it is not only Stereophile's readers who seem to suffer from a lack of understanding of the function of wire. The eminently intelligent J. Gordon Holt, in the August 1988 issue, said, regarding the Synthesis Reference System loudspeaker, that "... the upper range was steely-hard. I have reason to believe this is the intrinsic sound of these speakers." But then, on the following page, he goes on to say, "... the humongous LiveWire Cables really made these speakers shine." This is clearly illogical. A speaker wire cannot make a speaker sound better than its intrinsic sound—unless you like coloration! —
Finally, a CD player that reproduces all of the music, not just bits and bytes of it.

Adcom's new GCD-575 Compact Disc Player has been worth waiting for. Now there's a CD player with analog audio circuits as advanced as its digital stages. Featuring a no-compromise Class "A" audio section, the GCD-575 is the first affordable CD player that delivers the long anticipated technical benefits of digital sound. So visit your authorized Adcom dealer and listen to all of the music...not just bits and bytes of it.
a good wire only lets the intrinsic sound come through better.

So much for wire. Now on to something really controversial: the type of music used for the assessment of stereo equipment.

Gordon is absolutely right when he stated, in his article, "The Acoustical Standard," in the October 1988 issue, that acoustical—specifically classical—music is the only music by which a system's accuracy can be judged. To quote your rather hyperbolic and often incoherent competitor, TAS, in a response to a letter by Brian Stoll in their Early Winter 1987 issue, "The absolute sound is the sound of unamplified instruments playing in real space. Get it right and all other musical sounds will be right." I think that about sums it up.

High fidelity has been, for me, a journey—of the mind, the heart, and the spirit—both musically and technologically, away from that which is limited toward that which is unlimited. Robert Hesson, in his excellent article, "A Matter of Taste," in the June 1988 issue, states quite eloquently, "Now I listen almost exclusively to 'classical' music. Anything else is frivolous by comparison. There are times for frivolity, sure, but in a single lifetime one can listen to only a finite number of compositions. I want the ones that speak with mind and heart." This, it seems, is the essence of what the process called 'growth' should be all about.

To paraphrase the Apostle Paul, when I was a child, I listened as a child—both to the music of children and equipment suited for children—but when I became an adult I put away childish things, and my tastes, as well as my equipment, changed—in other words, grew. I sold, gave away, or discarded my rock and pop records, saved my pennies for some high-end gear, and began to learn what the Art of Music was all about. Therefore, I now regard paragraphs in equipment reviews which refer to how a system sounds with pop or rock material as totally irrelevant, and I pass them over immediately. I have heard many systems which could credibly reproduce such music, but which would fail miserably if they even attempted to reproduce, say, the fine details of a female choir, the transparency of massed violins, the subtle nuances of a string quartet, or the full power of a symphony orchestra. I had a designer in a small audio company tell me recently that his equipment was capable of doing all sorts of wonderful things, but when I asked him what kind of music he used to evaluate his product, he told me "New Age." Obviously, with that type of music there was no real way of telling how the equipment would perform when the rather formidable qualitative and quantitative demands of classical music, in all its range and variety, were imposed upon it.

Yet my system, which has been specifically chosen for its musicality and suitability for the reproduction of classical music of great subtlety and extremely wide dynamics, does extraordinarily well—with its volume capability—with the occasional rock recording I play on it. Thus, Chuck Coronato, in his unintentionally hilarious letter in the June 1988 issue, managed to get it totally backward. I submit that his "perfect" test CD, Hot Love by Twisted Sister, would tell me, or indeed any lover of real acoustic music, absolutely nothing about the way a high-end system would perform on said music. However, if the test were performed in reverse—if I took a well-recorded CD (or, better still, LP) of, say, Stravinsky's Le Sacre, to an audio store, and auditioned various high-end components with it—I could, with reasonable certainty, tell how that equipment would perform on rock material, even though only a fraction of said equipment's finer capabilities would be used reproducing that music. Using Apogee Calipers and a C-J preamp to listen to rock, as Mr. Coronato is doing, is tantamount to hauling lumber in a BMW: it could be done, but it would be much easier, cheaper, and less damaging to the BMW to do it in a pick-up truck.

Perhaps this is Mr. Miller's problem also. Perhaps the music he listens to does not allow him to hear the difference between fine speaker cable and zip cord. And I suppose there is no reason to invest in such cable if that is the case. But then he is not talking about the type of sound to which Stereophile is dedicated, is he?

The job of a magazine such as Stereophile is dual: It must address music from both the spiritual and technological points of view. And when evaluating equipment, it must take into account the most demanding type of music possible, which just happens to be classical. If all a person listens to is New Age, or jazz, or rock, fine—he may be quite content with equipment of very limited ability. But for the prospective buyer who may want to listen to something far more demanding, it is the responsibility of any reputable audio journal...
Over two years ago the staff at Madrigal Audio Laboratories began accumulating convincing evidence that solid conductors of rectangular cross-section would do a better job of carrying musical signals. Years of listening and engineering tests making use of ribbons of specially processed, high-purity copper with teflon insulation and the highest quality terminations, have resulted in the new Madrigal HPC and CPC cables.

Visit your Madrigal dealer and hear what these original designs can do to improve your music system.
to test that equipment using the most stringent criteria possible. And, as TAS said, if it gets that right, it should get the other stuff right too.

Thank you for your attention. I enjoy your magazine very much, and believe that, despite an occasional flaw, it is the finest, sanest, and most readable audio magazine around.

Peter Reichelt
Flushing, NY

Gordon's was the best
Editor:
J. Gordon Holt's editorial on the acoustic standard in October was one of the best in a long time. I also find real sound to be the only comparison to judge by, but I believe you must measure your equipment too, to prevent opinion, whim, or Mercury retrograde from affecting your decisions. Measurements are important in identifying the problems in equipment.

Stereophile, however, seems to emphasize the very subjective preference JGH condemned in his article, and it is subjective preference that has resulted in the current hysteria over cables. Most magazines now claim that this or that magic cable will solve all its user's stereo problems, when in fact most cables sound identical! The interaction of the amplifier and the cables is the cause of any difference in sound.

The fact that no-one can successfully identify their favorite cable should make one wary of this current deception! And that after passing through miles of "inferior professional cables," the golden-ear audiophile claims to hear—when he can also see—a huge change from ordinary 3' cables that cost $10 or less compared with very expensive Calvin Klein designer interconnects, should sound some warning that something is awry.

In the meantime, continue to compare sound to the real thing, not "pleasant" sound, and maybe list the reviewer's alcohol content! (Some may be 100% proof!)

But beware! As Oscar Wilde pointed out, "If you tell the truth, sooner or later you will be found out!"

Donald Bisbee
Columbus, OH

Bravo to Gordon
Hats off to Richard
Editor:
Bravo to J. Gordon Holt for his "As We See It" in the October '88 issue. As a music educator, performer, and music administrator, I could not agree more with his words regarding the loss of direction in high-end audio (I am a professional oboist and teacher/administrator at the University of Delaware). His comments were brought to light for me at a recent "high-end" show held in Cherry Hill, New Jersey.

The presenters shall remain nameless, and the musical examples heard were some of the poorest demonstration examples I believe one would want to use when auditioning fine equipment.

As an orchestral and chamber-music musician, I am constantly having to concentrate on shifting dynamic balances, tonal properties, and pitch levels within the ensembles I perform and work with. The demonstration of these natural acoustical properties of acoustical instruments (that make up the predominance of the criteria for evaluation of fine musicianship, critical listening, and music-performance enjoyment) were sadly absent at this event.

The music played, especially at the demonstration of the most costly components, was virtually all studio-recorded material! And what was worse, most of the people present seemed satisfied to hear these as the musical examples by which to judge components. The few examples that I heard of non-electronic instrumentation sounded unnatural at best when presented on this "highest end" equipment.

I was ready to leave, giving up my hopes for a worthwhile experience, when I finally happened to walk into a room where the Dealer/Rep would play some real, naturally recorded music. He had come prepared to meet all types of listeners, having brought along some symphonic and chamber music. I might add that the recordings he had were not special—just good examples of well-recorded literature.

The system he demoed was fantastic, even in a motel room with little or no acoustical treatment. I was finally able to hear what I came for: detailed inner voices and transients, double-reeds that had the distinctive no-two-sounding-exactly-alike sound that comes from each player having to make his or her own reeds by hand, and string sounds that were not screechy or edgy (as I have found with most CD players). The three-dimensional aspect of the music was also wonderful.

I stayed in this particular room for three hours, talking to the dealer and finding out from him that my requests for musical examples were unusual (although the chamber and
B&W's Model 801 — the recording industry's Reference Standard Monitor — was the inspiration for innovation. Dramatic developments in technology and enclosure design have lit the fuse. B&W's Matrix 801 Series 2 personifies the state-of-the-art ten years on. This magnificent successor sets the new standard for professional and home user alike. With no commercial compromise. Rich in Matrix technology, 801 Series 2 registers accurately even beyond audibility. Phenomenal sound. Clean and utterly uncoloured. Outstanding imagery with tight unbooming bass. An instrument destined to occupy a special place in world esteem.
symphonic music he was playing was from his own collection). His system cost only a little over $6000 (VPI, Ortofon, Mod Squad, Aragon, and Vandersteen components), but nothing else I had heard (including the $40,000 system) even began to approach it if one took into account the musical examples played. He informed me that he assembled this system for the show just to prove that big bucks aren't needed to have accurate sound. And prove it he did. (The dealer, by the way, was from Chestnut Hill Audio in Philadelphia. I had not met him before, but I recommend him to anyone looking for a dealer who understands accurate musical reproduction and a musician's need for it.)

Out of at least 60 people who walked in and stayed during that period, I was one of only three who asked for the type of musical examples I have noted above. The dealer and I both agreed to something that I have come to face for some time: people don't ask for it because they haven't experienced the difference. I find the same thing with the majority of high-school students who wish to major in music. They do not have sufficient experience with acoustical music and literature to distinguish between what is "real" acoustically and what is "processed," let alone "who wrote what, when."

Please do not get me wrong. I have over 4000 recordings in my collection, from rock, blues, and pop, to jazz and classical. I treasure them all. But Gordon and I know that my Szell recording of Mahler's 4th, my Chicago Symphony recording of Nielsen's 4th, and my chamber-music recordings will tell me what I need to know about the components I choose to audition, not Dave Grusin's latest "composed for TV sound experience;" or a hyped and goosed recording made for "demo" purposes.

Sorry to say, but without music education (at its broadest and best), Gordon and those who agree with him are in for some tough times at the audio booths. Like to borrow my earplugs?

Lloyd Shorter
University of Delaware, Newark, DE
PS: Hats off to Richard Lehnert, always at least 98% on the money in his record evaluations.

Gordon's favorite music?
Editor:
I have often heard and read people's arguments for using their favorite music to test music systems. I have never seen such an effort cloaked in such opaque terms as Mr. Holt did in "The Acoustical Standard" (October 1988). Why was he trying to hide the fact that he likes to use his favorite music to test out components?

It is easy to find fault with his analysis. It is well known to anyone who studies acoustics that concert halls have the deadest, and some of the most peculiar balances of any listening chamber. In concert, the reverberant sound-field tends to drown out any high frequencies. The smaller the room, the more likely that the entire sound of an instrument will be heard by the listener. That is why many chamber groups prefer to play small, intimate rooms rather than concert halls. Does Mr. Holt advocate only listening to live chamber music in a large concert hall? I doubt it.

Perhaps he was arguing that orchestral music was the most difficult to reproduce? Others would disagree. I have read several arguments by noted authorities contending variously that the piano, the organ, and even the guitar are the most difficult to reproduce. If that was his point, then why not state it clearly and offer support for the postulate?

If one wants to adopt an absolute standard for testing sound reproduction, why not the piano? Many homes have pianos. It is an instrument with which a very large number of people are familiar. I should be relatively easy to make comparisons between the sound of your piano and the sound of a piano emanating from your test stereo.

But wait, you cry! The piano recording was made in a concert hall. It will sound lifeless compared to the real thing in a living room. One must use a closer recording. And the piano in the living room hasn't been tuned in three months. Must it be a baby grand, not a grand or upright? How do we know that the tone of the recorded piano will be sufficiently close to assure accuracy?

One can expand these arguments to include a wide range of acoustical music played or recorded in a wide variety of places. Isn't the point of high-end audio to allow the listener the pleasure of reproducing all of these scenarios as faithfully as possible?

I, for one, not only can't afford to go to live performances of all types of music, I don't like them all. I doubt Mr. Holt does either. Isn't the real point for listeners to become as familiar as possible with their favorite music and use it to evaluate their purchases? Shouldn't an
Your ears are acute enough to hear the ultimate reproduction that your system is capable of delivering. But does your system deliver? It won't if you overlook one of its most important components, the interconnects.

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equipment reviewer use as broad a range as possible to do the same? I agree that, as acoustical music as a class currently presents more of a challenge to music systems to reproduce, it should be the preferred music of equipment reviewers. But I would not want the reviewer's opinion colored by the fact that he or she thinks all equipment should sound as dead as a concert hall!

Patrick N. Watkins
Troy, MI

Gordon & Frank
Editor:
In 1962 I became a charter subscriber to Stereophile when JGH started to publish from Wallingford, PA. I have never in that time written a letter of commendation for any manufacturer, although I did feel the same about David Hafler and Dynaco as JA describes. JGH was then and still is my favorite reviewer.

I was happy to see the review of the Audio by Van Alstine PAS preamplifier in the October issue. I had felt that an injustice was done AVA in previous issues, before the truth about what happened to the PAS he had submitted for review was found.

I have been dealing with Frank Van Alstine for about four years, and have found him to be most straightforward and helpful in all my dealings with him. I respect the pride he takes in his products, and rightly so. I have built two of his PAS kits, purchased a solid-state preamp, power amp, and tuner of his design, and found the equipment to be of the high quality and reliability that JA found the Super PAS to be when he reviewed it in October.

I honestly feel that AVA offers the audiophile the most for dollars expended.

Albert J. de Gaetano
Landsdowne, PA

The art of the deal
Editor:
Re. the letters of the dealers not willing to go for any type of competitive price on their equipment in Vol.11 No.10—they are just kidding themselves. They have one advantage over mail-order dealers: they are local. If they drop their prices, let's just say from 50% to 40%, they may double their sales, thus increasing their profits by 30%.

I have offered a local dealer to come within $100 of a mail-order quoted price which included shipping charges on a set of speakers. The dealer didn't take it, and I went mail order, waited two months because of some complications, but it was worth the $250 I saved.

Rich Christman
Cincinnati, OH

Counterpoint & Sam
Editor:
I was distressed to read in your recent recommended list (October 1988) of the "early reputation for unreliability" of the Counterpoint SA-3.1 preamp. At some point this reputation must have been considerable, since it's necessary to reassure readers that these problems are now "unfounded." Searching back issues of Stereophile, I could find no mention of problems with the preamp—not one word to aid the hapless consumer who relies, perhaps too heavily, on reports from the audiophile press.

If the editors had known of these reliability problems before Sam Tellig's earlier rave (May 1988), I think a brief caveat or addendum to his review would have been appropriate, as would a follow-up article if breakdowns occurred afterward. In either case, it seems to me that a report warning of such a problem would be of more compelling interest to readers of Stereophile than a notice of its resolution.

Since I already purchased the unit you recommended, I needn't read about the problem—I own the problem. After Tellig's review, I auditioned and purchased a Counterpoint SA-3.1 and SA-12 preamp and amp. Two weeks later, I returned the preamp because of a noisy right channel. I received a new unit, which shortly thereafter blew its phono line. Now, after another trip to the factory, it still has an extremely finicky balance knob and intermittently shorting left channel.

Regardless of whether the reliability problems of the SA-3.1 are solved, my issue is more with those of your magazine. As consumer advocates—or even as unbiased reporters of product reliability—I feel you have been sorely lacking. Neither Counterpoint nor my dealer mentioned similar problems occurring with other units, and I'm cynical enough not to blame them. But I purchase Stereophile for that very information, and I blame you.

Steve Witt
New York, NY

We apologize to Mr. Witt if he feels that he bas
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been let down by Stereophile in this matter. Our comments on the Counterpoint unit in “Recommended Components” were the result of information received after publishing the Cheapskate’s original favorable review. The fact is, however, that it is very hard to come by any hard data on component reliability. We had expected that our 1988 reader survey would show up brands and components that were particularly likely to be unreliable. However, as you can see from the results in this issue (see “As We See It”), as posed the relevant question has really only revealed patterns of ownership, not of unreliability. We hope to carry out some more pertinent research later this year.

—JA

The Audio Advisor

Editor:
Audio Advisor allowed me full credit on a newer model for an unused MC cartridge. I received a personal telephone call from their manager to help me with my choice. Nice people, I would say.

Roland H. Baker, Jr.
Nashville, TN

His second

Editor:
Thank you for printing my very first letter to the editor in the October ’88 issue. Aside from missing a decimal point (which only slightly altered the satirical intent), you very eloquently assembled a collection of readers’ responses to what we felt was a controversial review.

I’d like to bring you up to date on what has transpired as a direct and indirect result of your review(s).

As you may remember, I had a cabling problem due to the awkward listening room in my apartment. This location would necessitate either uneven or very long runs of cable. I solved this problem simply: I moved. My new apartment is ideal for short runs of cable.

About the same time, in one of my several re-readings of Stereophile, I noted a new address for TARA Labs. They had moved to Toluca Lake, a few miles from my new apartment. One phone call later, I had Space & Time cables on order from Merrill Bergs & Associates. Merrill was direct, helpful, and very knowledgeable. His wire was on its way from Australia, and after a few weeks he sent me a note to let me know when to expect it by common carrier. I couldn’t wait, and went to pick it up myself.

You have to understand, I was not being facetious about good cable evaluations. I cannot afford either the time or expense to try everything before making this kind of purchasing decision. The cash deposit outlay to “borrow” various cables simultaneously from several dealers precluded this. In-store evaluation is impossible. I’m in sales and I don’t expect a salesman with one or two lines to sell to offer advice on something he doesn’t sell. I rely on impartial reviews to advise me. But, judging from the quantity and quality of the response, DO’s review has obviously hit a vein among readers and advertisers alike.

Despite DO’s less than satisfactory review methodology, I gleaned that TARA Labs’ cables were good, and they were within the price range I had established. The fact that these cables were in Class A, and my other hardware was Class C (or obsolete) mattered less than the fact that TARA Labs’ cable was less system-dependent than others; they were not cloaked in some obscure, quasi-scientific mystique; and when I called their number, a really nice guy answered.

Well, I brought the cables home, hooked them up, and listened. (Now remember, I had last year’s Class B cable, Kimber 8VS.) The result on my Adcom/Dahlquist DQ-10 system was nothing less than dramatic! I had “lifted more than one of those fabled veils” between me and the music. (Even my fiancee was impressed over the difference; and I didn’t think she cared about hardware! “You spent how much on wires?”)

That’s not the end of the story, however—the vastly improved sound pushed up my priority for new speakers. Per your review by AHC in Vol.9 No.6, a very impressive demo of the big Vandersteen 4As at the Stereophile Santa Monica Show; and the long-term position of Vandersteen 2Cs on your “Recommended Components” list, I went, I listened, I bought a pair of Vandersteen 2Cs to replace my 14-year-old DQs. This means I now should consider a second run of TARA Labs cable (my old Kimber Kable has been put back into duty temporarily for the bass run). (I understand Merrill Kable at TARA has plans for a special Vandersteen version of the Space & Time cable and can upgrade my current set.)

Paul K. Miller
Burbank, CA
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Now that the Finial Technology laser turntable is available through at least a handful of dealers, its designers have explained part of the mystery of how it works. When I first discussed the laser turntable in these pages (Vol.9 No.8, December 1986), I speculated that the detection mechanism must be an optical interferometer, because less complicated optical systems could not resolve details smaller than a wavelength of light. Wide-range LPs contain musically significant groove modulations whose amplitude is considerably smaller than that threshold.

There were rumors that the Finial might operate by detecting the angle at which the laser beam reflects off the groove wall, but that seemed an unlikely hypothesis, for the following reason. If a mirror is tilted at an angle (A) and a ray of light reflects off it, the angle between the arriving and reflected rays is 2A. For a normal groove modulation angle of, say, 15°, the ray reflects at an angle of 30° and can be detected without difficulty. But when the groove modulation angle reaches 45°, the ray reflects at 90° (along the groove) instead of bouncing back to the detector. And when the groove angle exceeds 45°, the reflected ray stays on the opposite side of the groove, perhaps striking the opposite channel’s detector.

This is not a hypothetical situation. When the RIAA standard for LP’s was written 35 years ago, the groove modulation angle was limited to 45°, for two reasons: during cutting, if the
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angle exceeded 45° the just-cut groove wall would be mutilated by the backside of the cutting stylus; and in playback, sharp angles caused spherical-tip styli to produce severe tracing distortion. But since the introduction of bi-radial (elliptical) styli in the 1960s, numerous refinements in both cutter and stylus design have allowed progressively steeper groove angles to be cut and reproduced.

At the Los Angeles AES convention, it was revealed that the rumor was correct: the laser turntable does operate by detecting the angle of the reflection. The optical system for each channel consists of a tiny lens that focuses the laser beam on the groove wall, plus a linear PSD (position-sensitive detector) whose analog output voltage is proportional to the location along the detector where the reflected beam strikes. So when Finial engineers described and demonstrated the turntable at the AES convention, I asked about the problem of large groove-modulation angles. Finial's optical designer responded that the PSD captures reflections only from groove angles up to 38°. Larger angles are handled by a different system that will be revealed in another technical paper, sometime in the future.

**Elite speakers**
Pioneer is a name more associated with video and mass-market audio than with the high end, but that may reflect marketing choices rather than a lack of capability. Pioneer's Elite brand represents the company's appeal to the high end, in the same vein as Sony's ES series and Onkyo's Precise loudspeakers. For example, Pioneer's Elite CD-91 CD player uses a true 18-bit decoder with excellent low-level linearity.

Early in November, Pioneer flew a half-dozen audio journalists to Nashville to hear two new "reference" loudspeakers, the Elite TZ-9 ($4000/pair) and TZ-7 ($1800/pair). Why go to the home of the Grand Ole Opry and the Museum of Country Music to hear loudspeakers? Because Nashville is a major center of studio recording activity; in particular, it is the home of Masterfonics, reputed to be one of the best-sounding studios in the US.

Masterfonics' devotion to clean sound includes re-engineering most of the equipment they use; the studio engineers reworked their English-made SSL 48-track console until it could withstand a bypass test. Unlike most New York and LA studios, which adopted the Sony 1610 digital recording system as soon as it became available (only to discover later that it had sonic flaws), Masterfonics waited until alternatives were available and then staged a showdown. Five different digital recorders were brought to Nashville, identical material was recorded on each, and the one that sounded best (the JVC DAS-900) was chosen—by ear, not by specs. Evidently, although its business is multitrack studio recording rather than high fidelity, Pioneer's Elite speakers have a high degree of appeal to audiophiles at the high end. Depending on your definition of "hifi," they are worth a listen. But "hifi" has a connotation of serious listening, a realness of sound that is more than just a sonic achievement.
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Assembly procedures, solder formulation and termination connectors were all researched to insure exceptional performance as well as reliability. LitzLine, for example, is terminated with proprietary lugs featuring heavy gold plating over a machined oxygen-free copper base designed to allow easier hookup as well as greater sonic purity. You won't find them on any other speaker wire.

In short, every detail of new LitzLink and LitzLine is the outcome of careful listening to music—not preconceived notions about wire design. The result is a difference you'll not only hear, but enjoy. And while LitzLink and LitzLine were developed expressly for Audio Research electronics, other high-quality electronics may benefit as well.

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than purist recording of the soundfield in a concert hall, Masterfonics has an audiophile mentality.

But what has this to do with Pioneer? Technical Audio Devices (TAD), Pioneer’s pro audio division, makes large monitor speakers for recording studios. These are high-efficiency bass-reflex systems with beautiful burnished-wood mid/tweeter horns mounted high in the wall of the control room, aimed down at the engineer's position behind the recording console. The engineer who designed the TAD pro monitors, H. Fukura, also designed the new Elite speakers for home use.

The Elite speakers don’t resemble studio monitors; the cabinets are columns, about 1’ wide by 18” deep. Midranges and tweeters are not horns but direct-radiator domes made of a baked-carbon ceramic material said to surpass titanium in both stiffness and internal damping. Woofers are mounted on the front and back of the cabinet, joined internally by a rigid steel rod.

Normal speakers suffer from Newton’s Third Law: when the woofer cone pushes forward, an equal reaction force pushes the woofer’s frame back, taking the cabinet with it, and this energy produces resonant vibration in cabinet panels. In the Elite speakers the front and rear woofers push against each other, imparting little energy to the cabinet. To further reduce cabinet vibration, the midrange and tweeter are mounted not on the front panel but on a sub-panel an inch behind the front panel, glued to the top and sides. In a hands-on test these speakers exhibited much less cabinet vibration than do most.

Pioneer chose to demonstrate the Elite speakers in a studio rather than in a place with normal living-room acoustics, because the studio has permanent bass traps built into the ceiling and side walls. Like ASC Tube Traps, these absorb bass energy, reducing the room’s reverberation time at low frequencies and preventing the formation of standing waves.

As it turned out, the major weakness of the Elite speakers lies in the bottom octave. Both models use a bass-reflex design that works well down to about 35Hz but produces severe distortion at lower frequencies. So while the TZ-9 sounds good to the ear on most musical material, it lacks weight and “slam” — the feeling of pressure waves in the bottom octave. I believe this compromise arose from a cultural bias: among Japanese designers it is considered bad form to produce a speaker whose input sensitivity for a 1W input is less than 90dB. The TZ-9 is rated at 91dB. Speaker designers are constrained by an inexorable physical relationship between sensitivity, box size, and bass response. British and North American speakers with good deep-bass performance typically have sensitivity ratings in the low to mid 80s.

The strongest virtue of both Elite speakers is their excellent stereo imaging — precise in localization, accurately resolving differences in depth, and spacious in their overall presentation of ambience. The lack of muddy cabinet vibration may contribute to their transparent reproduction of the recorded soundstage. In addition, the TZ-9 is free of obvious colorations and has an attractively neutral tonal balance, admirably free of peakiness in the tweeter, with a very slight emphasis in the lower midrange that enriches the cold sound of CDs. It may not be the very best speaker in its price range, but it is a contender, and deserves a full review!

The TZ-7, however, strikes me as an immature design. Its tonal balance is too lean, as if the output level of the woofer were about 2dB below the level of the midrange and tweeter. Of course, the woofer level can’t be raised, but it might sound good if the mid and tweeter levels were reduced slightly. The second problem with the TZ-7 has to do with its radiation pattern. In both Elite speakers the midrange is placed above the tweeter; this, together with the phasing of the crossover, provides a smooth mid/tweeter blend for a listener who is level with the tweeter axis. Since the TZ-9 is tall enough to place the tweeter axis at ear level for a normally seated listener, it sounds fine; but don’t judge it while standing.

The TZ-7 is shorter, so its tweeter axis is below ear-level unless you slouch in a very low chair or soft sofa. Sitting upright in a chair, my ears were at a height where the midrange and tweeter canceled each other around the 4kHz crossover frequency. The resulting octave-wide dip in response (which I confirmed by measuring with a portable Ivie spectrum analyzer) drastically altered harmonic relationships in the treble, making the strings and brasses in a DG recording sound even more brash than they are already, and transforming Kathleen Battle’s rich

---

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—JA
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soprano into an untrained teenage voice. In a later retest we tipped the speakers back, and they sounded better. The TZ-7 should be sold either with wedges to tip it back or with a stand to raise its tweeter axis to ear level. Even with that fix, the TZ-7 may not be able to stand up to the strong competition at its $1800/pair price—notably the Snell C/II, which is a great loudspeaker.

After listening to the Pioneer Elite speakers, the visiting audio writers were invited to hear familiar recordings in the main Masterfonics control room, using the big TAD pro monitor speakers. Surprisingly, the recordings all sounded uncharacteristically warm and mellow. Masterfonics played some of their own master tapes, which also sounded smooth and mellow. The engineers said, and my analyzer confirmed, that their normal monitoring levels regularly peaked at 115dB. The sound was loud, but it didn't bite.

When I measured the frequency response of the system I discovered why: the response was smooth but had a pronounced overall spectrum tilt, with the highs 15dB lower in level than the lows. Masterfonics' chief engineer said this tilt is deliberate; it allows engineers to work all day at 115dB peak levels without burning out. Surprisingly, he said that they don't try to offset the mellow balance by making recordings brighter; they compensate mentally. This is very different from classical music recording, where most engineers use monitor speakers designed for home use, with an approximately flat response.

**UK: Ken Kessler**

Sony's UK operation, bless its little heart, seems to be doing more research regarding CD than any other company in this market. The other main player, Philips, has been running around in circles throughout 1988 trying to get CD Video (CDV) off the ground; it will be interesting to see whose promotional budget has been better spent.

As I write, CDV has been out for about a month; I caution you that what I am about to write could be rendered as mere paranoia before you receive this issue. In one ear I have little voices telling me that the machines are flying out of the stores, with some shops whacking on premiums to exploit the laws of supply and demand. No haggling, no "what'll ya give me for cash?"; the players are alleged to be leaving the stores at list price or higher.

In the other ear, though, I keep hearing that software is going to be a major problem for the fledgling format. Why? Because none of the other record companies have yet to produce any CDVs. With all due respect to Phonogram/PolyGram or whatever name covers the Philips family of record labels, their catalogue is rather one-dimensional. All of that chart fodder may sell 7" and 12" vinyl singles, CD audio singles, and loads of cassettes, but the scope isn't wide enough to attract many outside of the 14-20-year-old age group. And how many 14-20-year-olds have the £549 ($960) or so for a CD Video player? The record-biz trade weekly *Music Week* ran a complete listing of the launch titles—around 50 or so—and I could only find two that I'd consider purchasing, and then only out of desperation.

I could be wrong, and may learn that—as I write—the EMI's, CBSes, and WEA's of the world are about to ship material from their rich catalogues. EMI's PMI division, for example, produces some of the best prerecorded music videos of all, most being just perfect for the 8" CDV format (40min playing time), but I've yet to see any action from that label even though the company has the facilities to press as many CDVs as the market can swallow. One good reason could be that "sell-through video cassettes" in this country are as cheap as £4 ($7) for 30 minutes or more, and that won't even pay for a CDV single with its mere five minutes' worth of visuals.

Other setbacks include the delayed launches of CDV players from other suppliers, partly because of the greater difficulty in adapting CDV to the European PAL video format, plus a general feeling of ennui. After all, Philips "launched" CDV in March 1987, so by the time the hardware had actually arrived, most of us were simply not interested. True, CDV has the appeal of playing numerous formats, including 3" and 5" audio-only CDs, 5", 8", and 12" CDVs and existing Laser Discs, but the mind-set of the typical UK video purchaser is one of time-shift and tape rental.

The retailers I've talked to have no intention of renting CDV discs the way videotapes are hired out by the night, having learned that CDs suffer from ill handling. The man on the street (as opposed to the hi-fi-magazine-reading minority) still believes that CDs are indestruc-

Stereophile, January 1989
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tible, and would probably return that £20 ($35), rented copy of *Luke Skywalker Meets the Raiders of the Lost Ghostbusters* with more grooves on it than an LP. Besides, one video rental shop owner I spoke to said that “sell-through” was becoming a greater part of his turnover, adding that £9.99 ($17.50) copies of *Ghostbusters* flying out by the crate-load are a lot less bother than earning £2 ($3.50) per copy per night. He'd like to see CDV happen, but cited something that prerecorded-tape purchasers can do which CDV disc purchasers can't: They can reuse the tape if they get bored with the film.

Meanwhile, Sony has been conducting a survey to find out how the British public feels about CD five and a half years after the launch. 500 respondents were contacted by telephone (through an independent agency), and the results make very interesting reading. Of course, statistics are interpreted to create the effect desired by the translator, but Sony is pretty even-handed about such things. For instance, they didn't register too much shock when it emerged that 5% of owners of CD players didn't own a single disc.

The reason why Sony wasn't surprised is straightforward enough in the context of the UK market. I don't know how Europe and the US satisfy the extreme low end, but in the UK the practice is to provide all-singing-all-dancing systems, usually “midi” sized, which sell for less than a meter of high-end speaker cable. British companies like Amstrad, Binatone, and even Goodmans, can give you the whole lot, with remote control and twin-cassette deck, for about the price of 20 discs. It's the purchasers of these rote-gut midis, now also fitted with absolutely basic CD players, who don't own the discs; the only reason they have the players is because the players came as part of the package.

(I'm not really shocked anymore when I'm told tales of the mass-market, cocooned from it as I am in my little high-end world. A recent study suggested that 95–98% of all home audio equipment sold in the UK consists of way-down-market midi-systems, which means that “quality separates” only account for 2–5%, and of that, how much can be serious high-end? Kind of makes me glad I'm not a realist.)

Taking a closer look at the figures which emerged from questions covering everything from attitudes toward DAT (40% think it will supersede CD) to LP vs CD, the single most overwhelming realization is that the price of discs must fall. Before I dazzle you with statistics, keep in mind that new releases cost around £10.99 ($19.25) in the UK, with back catalogue (reissues) clocking in at £7.99–£8.99 ($14–$15.75). And what the British public wants are new titles selling for £7.99 ($14), with 81% of non-owners saying that they'd buy a player if discs were cheaper.

Skipping over the subtly pro-CD tone of the press release, we find that half the sample purchased their players in the past 12 months, and 63% owned less than 20 CDs. Why? Because 60% felt that the discs were too expensive, while 49% complained about the availability of titles. What's so bizarre about the latter complaint is that the majority (figure not supplied) were more interested in new releases than back catalog. When you consider that most major releases are now enjoying simultaneous CD/LP/cassette release, how can they then complain about the lack of availability of the titles they want? If anything is in need of transfer to CD, it's vast amounts of back catalog.

Anyway, 49% said they'd buy more CDs if the prices would drop to £7.99 ($14), while 39% said that they would buy “a lot more.” Credit goes to Sony for revealing that 63% of the CD owners still bought vinyl LPs or cassettes after they purchased their players, and most had replaced none of their previous record collection. About 30% replaced “one
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or two."

In light of the CDV debacle, I'm certain that Sony was pleased to discover that their pet project, 3" CDs, appealed to 52%, who favor them at around £3 ($5.25) per disc.

The most amusing responses concerned sound quality, which you can interpret as either "CD is perfect" or "the man on the street is deaf," according to your politics/prejudices. 26%, for example, felt that there was no difference between CD and LP, although 63% said that they could hear the difference. Fully 97% thought that the sound was "excellent," only 2% disagreeing, with 96% of those surveyed putting sound quality as the number one reason for buying a player.

Again to Sony's relief, the whole issue of CD rot appears to have had little impact. Over a third of those surveyed had heard about the newspaper and TV coverage, with only 13% saying that it made them less likely to adopt CD. 23% said it made no difference at all, and a hearty 1% said it made them more likely to buy. (These are probably the people who own Nimslo 3-D cameras, 8-track tape players, and Edsels.)

As far as Sony is concerned, the survey confirmed what most of believed anyway. Yes, software prices in the UK are criminal, especially when it's widely known that CDs in their jewel boxes can be produced for well under £1 ($1.75). No, CD rot is not about to kill the format by scaring away owners or would-be owners. Yes, 3" CDs have appeal for enough members of the public to make them viable.

What's been down-played is the continuing popularity of other formats—even if they're only surviving because of software costs—and the failure of CD-player owners to invest in reasonable numbers of discs. With half the sample owning just 20 CDs, I'd hardly look to them as active supporters. I know, I know: hi-fi magazine readers buy disproportionately large amounts of software, and I can't imagine a month (let alone a year) in which I didn't buy at least 20 pieces. But I find it strange that someone can purchase a "machine" of any type, costing a minimum of £100 ($175), without wishing to feed it what's required to make it of use.

Then again, maybe the most useful facility for some of the respondents is the "repeat" button. And I wouldn't trust anybody who listened to Love Over Gold more than once.

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USA: J. Gordon Holt

**dbx Price Reductions**

Wonder of wonders, three high-end audio products have recently gone down in price, rather than up. Following its takeover last summer by Carillon Industries, dbx Inc. has drastically reduced the prices of the CX1 preamp/surround decoder, BX1 four-channel power amplifier, and TX1 FM tuner reviewed in our September '88 issue. The CX1, formerly $2500, is now $1500, the $3700 BX1 is now $2800, while the $800 TX1 is now $500! These components are all now worth more than a second serious look.

dbx explained that the reductions were possible because of "economies resulting from the recent dbx reorganization, with manufacturing for all Carillon Technology companies consolidated in facilities on the West Coast." This is an unusual response to cost reductions at the manufacturing level; usually, they are just welcomed as a means for reaping higher profits.

**DAT Unbound**

Officially, consumer digital audio tape recorders are still prevented from entering the US by a threatened music-industry lawsuit against any manufacturer that imports them. In fact, they are available in US stores now, and are becoming increasingly so. The source is a thriving "gray market," and the machines are on open display in specialty musical-instrument stores in most major cities. Some mail-order stores, notably American International Audio/Video, are also doing a brisk trade in both DAT recorders and in-car DAT players. Prices are steep, typically in the $1500 to $2000 range, but the machines are here at last, for those who can pay the price.

**Colossus Exposed**

Martin Colloms's item in the November '88 issue, relating Tony Faulkner's assertion that Colossus consists of two Sony PCM-F1 units, could be the best news in years for present F1 owners (such as myself). If Tony Faulkner's assertion were true, it is obvious that Colossus's F1s incorporate some modifications—they don't sound remotely like a stock F1. The obvious next question is, What are those mods, and how difficult might they be for an F1 owner to do?
Panasonic/RAMSA's desirable portable R- DAT recorder

USA: John Atkinson

November saw the holding of the 85th Convention of the Audio Engineering Society, floridly entitled "A Century of Technology in the Service of Artistry." The convention site, as it was two years ago, was downtown Los Angeles, close to the center of the film-industry world. It was not surprising, therefore, that a great deal of the attendees' attention was drawn to matters audiovisual, with workshops on sound for film, electronic news gathering, TV, location sound recording, and the disparity between the audio and visual perspectives. But, disenchanted with the standard of filmic sound—my one and only experience of a THX-specified and-equipped cinema was profoundly disappointing in that it sounded like a very loud, very bright boombox—I shall ignore all of that and report only what occurred at the convention that I felt to be of interest to the audiophile.

The Finial LP player

For me, the highlight of the convention was the presentation of a paper by Robert Goddard and Robert Stark, two of the developers of the Finial LT-1 laser LP player, in which all (well, nearly all; see Peter Mitchell's "Update" column in this issue) was explained. Of primary interest to Stereophile readers, I am sure, will be the price—$3786—and the launch date—early 1989, although shipments were due to have been made to selected markets, including Denver and San Francisco, by the first week of December 1988.

As explained by Peter Mitchell, the basic detection method consists of measuring the angle at which a laser beam is reflected from the groove wall, which will be proportional to twice the angle the groove wall makes with the direction along the axis of the groove. As the sensor will be immune to the varying effects of velocity errors between the record and the sensor, it should not be affected by rumble, vibrations, and warps (up to 0.2" excursion, apparently), although its output will still be affected by off-center pressings, unfortunately. The laser beam (split into two to provide a separate beam for each channel) is focused to a 6um-wide by 20um-high spot riding 15um below the position of the land/groove interface; the reflected beam is picked up by a solid-state position sensor which outputs a hefty signal (up to 10V p-p) proportional to the groove angle. The signal velocity is extracted from this signal by multiplying it by the instantaneous groove velocity, and is then RIAA de-emphasized and attenuated to a standard 1V output suitable for feeding to an ordinary line-level input. As mentioned by Peter Mitchell in Vol.11 No.10 (p.45), an impulse noise-reduction system is used to eliminate the effects of large dust particles which would otherwise be read as audio data.

The high-frequency extension is said to be proportional to the spot size; this needs to be big enough to integrate over a large enough area to minimize noise pick-up. The LT-1 was said to be down 1dB at 20kHz; in addition, there is a second-order, low-pass filter acting at 30kHz, the need for which will become apparent. The low-frequency response, I assume, could be taken down to DC (though an invariant groove angle cannot exist, of course); in practice, a second-order, Bessel high-pass filter cuts off the response below 10Hz in order to control the signal's DC energy. This was one of the points that had puzzled me over the Finial's principle of operation: the fact that any servo track-following system, which has to have a positional error in order to work at all, will introduce low-frequency noise into the signal output as the servo "hunts." The Finial engineers have got around this problem in an ingenious manner. The data laser plays no role in keeping the sensor following the groove spiral path. Instead, a secondary laser is focused on the groove/land interface, and its output is picked up by a second pair of position sensors.

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which keep the sensor head both the correct height above the LP and following the mean path of the groove. To keep the data sensors from picking up the tracking information and the tracking sensors from picking up the groove-angle modulations, the tracking laser is switched off when the data laser is operative, and vice versa. In this manner, the servos are inoperative when the groove angle is being measured, and there is no output from the data sensors when the tracking and height servos are doing their work.

"But," I hear you say, "doesn't this mean that the analog output is no longer continuous?" That's correct. But as Finial has chosen to, in effect, time-sample the audio signal at a frequency over two octaves higher than the highest audio frequency of interest, at a 100kHz rate, the effect on the music should be minimal when averaged by the 30kHz low-pass filter. We shall see if this is indeed the case when J. Gordon Holt receives a sample of the player for review.

Other aspects of the product seem well thought out. Upon first being plugged into the wall, the LT-1 calibrates itself, after which it is ready for use. The user is advised to clean the record, which is then placed in the motorized drawer. Upon touching Play, the drawer closes and the sensor head tracks from the innermost to the outermost groove, counting them as it goes—yes, I know that in reality there is only one groove, but you know what I mean—and noting where the tracks begin and start. The music then starts playing, while a front-panel display notes track numbers, playing times, elapsed time, etc. In fact, all the functions we are now used to from CD, including pause, repeat play, etc., are possible. The speed is adjustable in 0.1rpm steps from 30Hz to 50Hz, the onboard microprocessor keeping the preset speed constant.

The Finial LT-1 was demonstrated under somewhat adverse circumstances, but I have to admit to being impressed. It sounded like a "real" record was playing, not a CD.

**Digits**

A cynic would have been amused at the developments at the sharp end of recording revealed at the convention, a decade after the introduction of the original Sony PCM-1 digital processor. For only now, with CD a commercial reality for six years, are A/D converters being launched that sample at a high enough rate that the initial brickwall anti-aliasing filter, which butchers the analog signal to get rid of all frequencies above 22kHz, can be eliminated. No matter what the advances in replay technology, all digital recordings are contaminated with that filter's phase and amplitude aberrations. Peter Mitchell and I looked at the ways in which so-called oversampling A/D converters work last May: basically, a sigma-delta converter with only a limited bit resolution, but which can be made very accurate, runs at a large multiple of the conventional sampling frequency; a digital filter then low-pass filters and "decimates" the data, outputting data words with 16 or more bits at the normal 48 or 44.1kHz rate. Because of the initial high sampling rate, only a gentle, subjectively well-behaved analog low-pass filter need be used to precondition the analog signal.

[Image: Three chips; $128; better sound?]

The development of such a system was outlined at the convention in a fascinating paper presented by a student of an old friend of mine from HFNR days, Dr. Malcolm Hawksford, while two companies were offering production oversampling A/D chip sets at the convention: dbx's F410/D20C10/A1520 is based on the paper presented by Robert Adams at the 1985 Hamburg convention and reprinted in the *Journal of the Audio Engineering Society*; it oversamples at a frequency of 6MHz and out-

2 "Oversampled Analog-to-Digital Conversion for Digital Audio Systems," Timothy F. Darling and Malcolm J. Hawksford, AES Preprint 2740: Preprints are available from the Audio Engineering Society, 60 East 42nd Street, New York, NY 10165, and cost $5 each to nonmembers, including postage and handling.

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Audio 6-88
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Stereo Review 1-88
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New York Times 3-88
"... the various frequencies emerge in their natural phase relationship—more than in conventional designs. To what extent this accounts for the speakers fine sound may be debatable, yet there is no question that the Ohm Sound Cylinders represent an excellent bargain, with a clarity and richness of sound rarely found in a speaker of this size and price."

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For Those Who Care to Listen
puts 18-, 19-, or even 20-bit data words at a 48kHz rate. A new name to me, Crystal Semiconductor of Austin, Texas, introduced their CS5326 chip which contains a complete, self-contained stereo A/D system, oversampling at a 64x rate; i.e., at 3.072MHz. (Fig.1 shows the IC pin-out and the block diagram for both channels.) Designed by a team led by an ex-dbx engineer, David Welland, who presented a paper on its theory of operation, the 28-pin IC contains two silicon dice, one for the analog circuitry and ADCs, the other for the digital decimating filter. It outputs alternate left and right 16-bit serial data at a 48kHz rate. The digital filter is said to have passband ripple of just 0.01dB, and stop-band rejection of 86dB from 26kHz to 3.046MHz. Despite having both channels present on each die, the separation at 20kHz was said to be still an astonishing 105dB! No price was given for the Crystal IC, but the dbx chip set, which includes a separate precision resistor array for the 4-bit flash A/D converter incorporated in the front end, is said to cost just $128 in quantity. Expect to see retrofit A/D cards for all the popular professional digital recorders on the market real soon. The sonic lead set by Lou Dorren’s Colossus machine in 1988 may be overtaken in the near future.

Lest it be thought that the USA is making all the running in this field, Mitsubishi, whose digital multitrack recorder is the only alternative to the Sony-Studer open-reel DASH format, introduced the X86-HS, a two-track digital recorder that features 2x-oversampling on its inputs. Sony, the manufacturer of the other popular multitrack, the DASH-standard PCM-3324, introduced a 48-track version in Los Angeles. Sales of analog recorders, however, seemed very healthy, perhaps not surprising when you consider that these multitrack digital recorders cost an arm and a leg: Tascam’s new 24-track DASH machine, for example, retails for a cool $99,000. (Manny’s in New York apparently will have them in stock by the time you read this.)

And what of DAT? Consumers may have been prevented from easily buying this spawn of the devil, but ironically (in view of the record companies’ opposition), it has been wholeheartedly embraced by musicians and professional recordists, particularly for film work. Both Sony and Panasonic/Ramsa heavily featured their portable DAT recorders at the convention, the latter featuring 64x oversampling digital filters, while Tascam and Fostex showed rack models. The two main concerns among professional engineers were the fact that it is still not possible for these machines to handle the industry-standard SMPTE timecode—Fostex being so far the only company to build this into their machine as a matter of course—and, of more general interest, how robust are the data on the DAT cassettes? Panasonic set up a system at the show to investigate the latter,

\[4 \text{ "A Stereo 16-Bit Delta-Sigma A/D Converter for Digital Audio," D.R. Welland et al., AES Preprint 2724.}\]

Stereophile, January 1989
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noting that after 700 play cycles, a cassette featured 32 bits of correction, "in effect no degradation. It would have to be up to 5000 bits of correction to even notice the decay."

While on the subject of recording, I saw a familiar face on the Stellavox stand, Goldmund's Michel Reverchon. Goldmund, of course, bought the Swiss analog recorder manufacturer last summer, and Michel was showing the flag. The first fruit of the collaboration is to be a replacement headblock and electronics for the large population of Stellavoci (apart from the portable), enabling the existing transport to be used as the basis of a parallel-track digital recorder without incurring a huge cost penalty by having to replace the complete machine.

In theory, it looks like we will all be getting better-sounding records to play on our systems. One thing remains, however, which is that the engineers have to know why and what they're doing if the results are to be musically valid. That this is not the case even now can be verified by taking a day off work to listen to any non-PBS FM station. What you hear, time and time again, is a philosophy commonplace among engineers, and described by The Absolute Sound's Michael Fremer: using real musicians and singers only "as voltage sources for their effects boxes." Yes, technological progress has the potential for better sound, but only if the engineers cease this increasing trend toward the "dehumanization" of popular music.

Signal Processing

Deeply related to the whole subject of digital audio is the fact that, once the signal is in the digital domain, all manner of arithmetical operations can be performed on it with, if correctly implemented, no degradation at all. For those of us without mainframe computers at hand, it helps, of course, to have suitable hardware available, and the last year or so have seen the introduction of two main families of off-the-shelf integrated circuits suitable for digital signal processing: Texas Instruments' TMS32010 series and Motorola's DSP56000 series. Members of the latter family were the darlings of the show, mainly because they offer 24-bit coefficients compared with TI's 16 when used to implement FIR (Finite Impulse Response) digital filters. They were the basis of papers on how to implement a programmable oscillator, how to design an intrinsically linear-phase loudspeaker crossover using FIR filters, and how two DSP chips can be used to make a linear-phase, 25-band, digital graphic equalizer with no interaction between any of the bands being boosted or cut. For those willing to test the digital-signal-processing waters, a company called Ariel, of 433 River Road, Highland Park, NJ 08904, was offering a DSP56001 development system on a short card to fit a PC expansion slot. The price? A mere $595.

A pair of Matsushita engineers also presented a paper on this whole area, in this case concerning an automatic equalizer. This ingenious engine—a photo of the prototype showed an apparently finished product with a Technics label—uses digital processing techniques, including working out the speaker's amplitude and phase response from the measured impulse response, in order to correct both the amplitude response (but with a linear phase characteristic) and its departure from a flat phase response without affecting the amplitude response. Once the necessary coefficients for the FIR digital filters have been calculated by performing a Fast Fourier Transform on the impulse response, then the equalizer performs all the necessary calculations on the digitized audio bandwidth signal in real time. Now this is the kind of equalizer I can really get behind.

Loudspeakers

I wasn't sure how to categorize the next paper—while it describes a loudspeaker, it is more about the design of a loudspeaker that automatically assesses its own performance and then corrects it to give a flat response. Two engineers from the Toa Electric Company in Japan have used 16-bit A/D and D/A converters and two Motorola DSP56200 ICs (see fig.2) to implement an adaptive digital filter which modifies the signal fed to a particular loud-


6 "Implementing Table Lookup Oscillators for Music with the Motorola DSP56000 Family," John Strawn, AES Preprint 2716.

7 "Digital FIR Filters for Loudspeaker Crossover Networks," Peter L. Schuck and Greg Klowak, AES Preprint 2702.

8 "A Low Complexity, Linear Phase Graphic Equalizer," Ragnar Herlum, AES Preprint 2734.

9 "Amplitude and Group Delay Control Using a Digital Equalizing Processor," Masaharu Matsumoto et al., AES Preprint 2692.

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Speaker so that the speaker's own aberrations are canceled. A microphone placed in front of the woofer feeds a signal to the processor so that it can calculate the necessary FIR filter response to produce flat amplitude and phase responses. The beauty of the system is that it does not appear to require any special test signal. All that is required is that noise, or even music, be played; the filter automatically adapts itself as necessary, the process taking a minute or so to give a flat response up to 5kHz for a woofer. At present, correcting the performance of a full-range, three-way speaker design requires that the sampling frequency be limited to 32kHz, but the potential for future “intelligent” loudspeakers is obvious.

A question from the floor at the paper's presentation asked if it would not be possible to place the measuring microphone at the listener position, thus allowing the adaptive filter to compensate for the effect of room acoustics at that point. The answer, unfortunately, was that the modifications of the impulse response from the room being so much more complex, and taking so much longer to dissipate, it would require a digital filter operating on the whole of the audio band to have such a large number of coefficients that at present it would not be practicable. It would also take a very long time for the adaptation to take place.

Most of the papers on loudspeakers presented at the convention concerned methods of predicting the far-field response from mathematical models of the cone behavior when mounted in a baffle. Two, however, were of interest, because they concerned modifications or improvements, or even just plain reinventions of existing ideas. A paper from a staff engineer for Pioneer presented the research into a vibration-canceling enclosure, whereby a second drive-unit, minus its cone but with a replacement mass, and with its chassis connected to that of the woofer on the front panel by a steel rod, is positioned on the rear wall of the cabinet. KEF, of course, does just this with their R104/2 and R107 models, but as Pioneer's Bart Locan set it at delivering the paper, "Since 1935, many companies have tried this [but] to the best of my knowledge, this is the first time anyone has attempted to quantify their efforts." The technique as used by Pioneer is said to reduce output from the cabinet in the upper-bass region by 10–15dB compared with a conventional cabinet; the commercial result is the pair of Elite loudspeakers described by Peter Mitchell elsewhere in this month's "Update" section.

A pair of engineers from Mitsubishi also presented a paper that appeared to go over old ground but in greater mathematical depth. They investigated Harry Olson's idea of the "compound" woofer, in which a second drive-

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11 "A New Loudspeaker System with Reduced Radiation of Sound Pressure from Parasitic Enclosure Vibration," Takashi Oyabu, AES Preprint 2739.

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unit is placed behind the first with a sealed chamber between the two cones. The math was impeccable; the conclusions inescapable that this technique, when properly implemented, either reduces the size of enclosure needed for the same low-frequency extension, or lowers the LF extension for the same cabinet size, the penalties being a doubling of the drive-current required and increased cone excursion. But, it must be pointed out to the Japanese, a Scottish company called Linn Products has a patent on products based on this “Isobarik” idea, and has been making them since the mid '70s.

Miscellaneous

Other papers presented included one from a BBC engineer on improving the quality of sound from diving helmets (AES Preprint 2718), not a subject that had struck me as being particularly hot; one on Denon's recording of a symphony orchestra in a huge but temporary anechoic chamber (AES Preprint 2733) in order to produce a CD (Denon PG-6006) for use as a reference; a paper from Deane Jensen on an interesting new measurement technique for amplifiers; and a pair of papers presented by Lexicon's David Griesinger that will be of particular interest to those interested in the design of the Lexicon CP-1 ambience synthesizer reviewed by Bill Sommerwerck in this issue.

Listening Tests

Yes, listening tests. The Los Angeles AES conventions have always featured a degree of visitor participation, previous projects including seeing how detectable the degradation from a digital processor was under blind conditions, and carrying out an audiometric survey to determine the spread of hearing defects among recording engineers. This year, Stereo Review contributor David Clark, the inventor of the ABX box, with the help of Michael Fremer of The Absolute Sound, Peter Suthem of Occidental College and Radio KPFK's “In-Fidelity” program, and recording engineer Ian Eales, had set up three different double-blind listening tests for the delection of visitors. One, using the ABX box, was to repeat experiments on the audibility of such aberrations as different degrees of even-order distortion, the presence of a peak of constant Q but varying height at 3kHz, signal polarity inversion, and level differences down to 0.2dB. The system used for these tests consisted of Celestion SL6ses driven by B&K amplification, with an NAD 5100 CD player as the signal source. The second test enabled listeners to compare two “audiophile” amplifiers, a pair of VTL 500s and a Threshold stereo amp with a recording industry standard, a Crown PSA amplifier, driving Infinity IRS Gammas; signal source was copy master tapes played on a Studer machine. The third asked listeners to distinguish by ear between 25' lengths of Monster Cable M1 and Belden 10-gauge industrial cable when inserted between a Perreaux amplifier and a pair of Tannoy Monitors.

Needless to say, levels were closely matched for the cable and amplifier comparisons. There was some argument between David Clark and Michael Fremer, however, about the amplifier tests—Mr. Clark had wanted to equalize all three amplifiers to be flat in frequency response. The Infinities used had very low impedance dips at some frequencies, which would interact with the driving amplifier's output impedance to produce slight differences in response, particularly with the VTL, which had an output impedance on the order of 1 ohm. Ultimately, no equalization was used, which would be expected to ease differentiation of the amplifiers by ear. To eliminate switches from the signal path, the cable comparison was performed by having an operator—behind a screen and out of sight of the auditioners—change both sets of cable every time. Each group of listeners was asked to say whether there had been any change at all in the cable for each pair of tests. Similarly with amplifiers, the listeners were presented repetitions of music and asked to say whether A and B were different or the same.

Some commentators said that it would have been preferable to have asked the listeners to indicate whether they preferred A to B or vice versa. This, I'm glad to say, was rejected on the grounds that this would be an individual choice and would thus add an additional variable which could well cancel any identification. (You and I may both be able to detect a difference, but might disagree over whether it


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represented an improvement or not. Our results would therefore cancel each other, indicating a false null identification.)

Preliminary results of the amplifier and cable tests were presented at a workshop on the morning of the last day of the show, though we shall have to wait for forthcoming issues of Stereo Review and the JAES for in-depth analysis. To set the stage for my discussion of the workshop's findings, I point out that in response to a question from the floor, it appeared from a show of hands that about two-thirds of the audience at the workshop believed, with varying degrees of commitment, that audible differences between such components as amplifiers and cables did exist, while 10% passionately didn't.

Briefly, analyzing the results as a whole, there were 332 attempts at identifying whether a pair of amplifiers were the same (both Crown) or different (Crown or Threshold), of which 152, or 45%, were correct. There were 329 attempts when the test concerned the VTLS and the Crown, of which 175 correct identifications were made, or 53%. Both these results are indistinguishable from what would be achieved by chance, suggesting that the visitors to the show en masse could not distinguish between any of the amplifiers by ear alone. As David Clark put it at the workshop, it was "not proven" that either of these two amplifiers sounded any different from the reference.

Similarly with the cables, where out of 435 attempts at identification of "same or different," just 210 were correct, again what would be achieved by tossing a coin.

However, before you race to the conclusion that these results "prove" that the kind of differences discussed by this magazine's reviewers do not exist, hang on a moment. It was revealed at the workshop that this only appeared to be the case when all the results were lumped together. When looking at some of the results on an individual basis, it emerged that some listeners bad possibly achieved a statistically significant number of identifications. It was reported that Michael Fremer, for example, had scored 5 out of 5 on the amplifier tests, while Ian Eales, Noel Lee, and Rodney Herman had apparently correctly identified by ear to a significant degree of confidence whether the speaker cable used was Monster or Belden. (For those of a morbid disposition who want to know how I did in the test, I got 4 out of 5 identifications correct on the blind amplifier test, and 5 out of 7 correct on the blind cable test. Close, but no cigar, I am afraid. While certainly better than chance, these results are not enough better in this short a run of tests to convince anyone other than my mother that I could hear differences.)

A loose consensus emerged at the workshop, therefore, that it might be possible for some listeners to be better able to hear differences between components than others. As Peter Sutheim said, "Certain people, innately or by training, become very sensitive in certain areas. Differences that don't matter to most of us . . . are very important to these people . . . It would be very interesting to retest those who did well." I don't regard this as surprising. In every other field of human endeavor, it is accepted that people can vary enormously both in their God-given gifts and in their ability to refine their talents by repeated usage. The range of both is probably largest in the related disciplines of mathematics and music, where people can be irretrievably innumerate or tone-deaf, idiots-savants or geniuses, and all stops in between. Is it surprising, therefore, that someone like J. Gordon Holt, who has been rigorously listening to the differences between nominally identical components for almost 30 years, has become pretty good at it? Maybe that is one reason why JGH has survived for so long: he has proved with his track record that he has the ability to be consistently correct in his value judgments.

Gene Pitts, the well-respected Editor of Audio, stated that he too had a problem with the summed analysis, and said that he would like to "fine-tune" the test: "These are very small differences, if they exist . . .one of the things that is lost in these [tests] is the relative size [of the differences]." My point exactly. I am not so much interested in determining whether the population at large can or cannot detect such differences—as Peter Sutheim said at the workshop, this kind of reasoning leads to the obvious conclusion that everyone is of average height—but in trying to determine the size, audibility, and reliance of these differences. If a difference is so small that only one person

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15 It was pointed out, however, that even if it was accepted that some listeners could distinguish the amplifiers by ear, this would be explained by the different interactions between their output impedances and the speaker load and thus would be trivial.
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in a thousand can reliably detect it, then it is not as important in the broad scheme of things as one which can be detected by one in a hundred, which in turn is less important than one that everyone can hear. This is a very different matter from saying that differences that cannot be detected reliably by 100% of the population do not exist, the ipso facto position disseminated by Stereo Review.

If this is accepted, then it leads to a contentious and double-pronged subject, one which resulted in hot debate at the AES workshop: First, should those who talk about these differences prove to everyone's satisfaction that they exist by conducting rigorous listening tests? According to Peter Sutheim, "The burden of proof has to be on the underground reviewers," they being the ones who are trying to convince their readers that these differences are real. And Gene Pitts affirmed that if such a difference is not demonstrable to someone else, then it can't be said to exist. According to Stanley Lipshitz, 1989 AES President, "A lot of the things here are at cross purposes. The disagreement is over the nature of the perceptions...There is no conflict between objectivity and subjectivity.

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Subjective tests *can* be done in an objective manner." Second, having accepted the burden of proof, should subjective reviewers then refrain from talking about such demonstrable differences until they have determined the objective reasons for them to exist?

There was a strong feeling among the skeptical 10% that none of the differences discussed in magazines like *Stereophile* have any real existence. As Floyd Toole put it, "What we perceive is *more* than just the sounds arriving at the ears . . . the waveform may not change but the perception can," echoed by John Vanderkooy of the University of Waterloo, who said that "Many of us [objectivists] have gone through the experience of hearing differences," implying that he then found them to disappear when exposed to the light of rational investigation. And there was a general feeling among the "objectivists" that the listening carried out by reviewers other than for the "glossy" hi-fi magazines was "casual," poorly executed, and generally sloppy.

That got me on my feet at the workshop, as the last adjective I would use to describe *Stereophile* listening tests is "casual." Critical listening, as performed by this magazine's reviewers, is hard work, and it takes both self-honesty and a considerable degree of discipline both to be able to identify differences on a consistent basis and be able to describe them so another listener can appreciate them. Yes, of course, perception depends on more than just the sound waves impinging on the ear, but it is part of the duty of the reviewer to hear through his preconceptions. Time and time again, I find myself working harder and harder to try to hear what I think I "ought" to be hearing, only to be forced by awareness of this cognitive conflict that the component is doing something rather different from what I expected. This experiential threshold will be familiar to all those who listen for a living, and it is galling to be then told by those not immediately involved in this business that we only hear what we want to hear. Would that were true, as life would then be considerably easier for the magazine's staff.

But maybe I overreacted, as it turned out that by "casual," the skeptical 10% meant any listening that was *not* performed under double-blind conditions. This is the big sticking point for me. Having partaken in a number of such tests, I am not convinced that they are the best way of identifying differences with music as a test signal.

Let me give you an example: In order of difficulty of hearing differences on music signal in the convention's blind tests, those I found to be the most difficult were the ones involving the "traditional" degradations of distortion: signal polarity, level difference, and coloration. Under my own conditions in my listening room, the effects of these departures from neutrality are obvious, though small, even under sighted conditions. Yet in the double-blind tests at the convention involving the ABX box, it was almost impossible to identify such things as a 1dB level difference, the presence of 2% of even-order harmonic distortion, or extreme (0.01V/μs) slew-rate limiting.

Why should this be so? The ostensible advantage of the ABX box is that it allows the listener continually to check his or her identification with either of the two possibilities, thus "learning" the sound of the difference. In my experience, this works beautifully on non-musical signals such as pink noise or asymmetrical pulse signals, both of which are invariant with time. With such non-musical signals, I have scored 10 out of 10 with the ABX box in identifying a 0.2dB level difference and the reversal of signal polarity. In the Los Angeles tests, however, there was just too much methodological "noise" interfering with the perception. Particularly in a test involving more than one listener, it is just not possible to switch in an efficient manner between the two choices and the unknown with a music signal. The essence of music is that it changes with time. What happens is that the listener is faced with A playing a violin, B playing a cello, and is then asked to identify X when it is playing a human voice. And you wonder why so many times the results of this kind of testing are random! And when the listener can control the switch, he or she ends up by A/B'ing so rapidly, in order to try to remove the varying nature of music, that the main subjective differences observed are just due to differences in tonal balance.

As I have said before, the test itself reduces what is measured to just what it is *possible* to measure. Yet *this* is the only kind of subjective testing approved of by so many in the "objective" community! We are dealing with beliefs, not truth here.

Which brings me to the second point: should reviewers say anything at all until they
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can reveal the reasons underlying audible differences? Obviously, as the appearance of Stereophile on the stands every month will testify, I believe that the answer to this question must be "yes." The reviewers' and magazine's responsibility is to publish descriptions of sonic quality that are verifiable and repeatable in order to help their readers make purchasing decisions. I believe that these descriptions must be supported by objective tests in the fundamental regions of behavior, both in order to ensure that the test components are working correctly, and to see if there is any trivial reason that correlates with the listening impression. Other than that, it is the business of research establishments and the universities to find the underlying reasons. As a friend of mine from JPL in Pasadena, James Stoneburner, put it, "The scientist has to listen to the community of perceivers and then find out why."

Unfortunately, the scientific community is apparently not willing to participate in this process, at least as far as cables and amplifiers are concerned. (Floyd Toole's team at the Canadian NRC has produced a steady stream of valuable research into the performance of loudspeakers in rooms.) As Stanley Lipshitz said in his closing remarks at the workshop, "I am not inter-

16 The latest from Dr. Toole's team, "The Detection of Reflections in Typical Rooms," AES Preprint 2719, was presented at the convention by his co-worker Sean Olive. It is too complicated to briefly précis in this report, but is necessary reading for all those interested in the speaker/room interface.

AUDIOPHILE QUIZ:

Q: How many manufacturers have had products concurrently listed in every major category (sources, preamplifiers, amplifiers, speakers) of Stereophile Magazine's RECOMMENDED COMPONENTS list?

A: Only one.

Q: What manufacturer consistently produces musically accurate components to suit a wide range of applications and budgets?

A: Conrad-johnson design, inc., engineering and producing conrad-johnson vacuum tube electronics, Motif solid-state electronics, Sonographe audio systems, and Synthesis dynamic loudspeakers.

Stereophile, January 1989
ested in what you perceive; I am only interested in what you can convince me I can perceive." And if, for whatever reason, the subjectivists cannot convince the Stanley Lipshitzes of this world that their observations are valid and repeatable, then the latter are not going to put any effort into what they regard as wasting their time investigating further.

The series of listening tests at the convention may have generated more heat than light concerning the specifics ostensibly under test, but the workshop itself may have catalyzed a useful dialog between the various factions: A result of the workshop was that the AES is to establish a Technical Committee on Listening Tests, to be chaired by Floyd Toole.

Finally
The least and most enjoyable parts of the convention coincidentally involved live music. The least was a concert sponsored by B&K’s microphone division featuring that audiophile favorite band, Flim & the BB’s. There was so little tension in the music produced by this group of virtuoso musicians, and it was so quiet, that I fell asleep. The best was hearing Mahler’s 7th Symphony conducted by young Simon Rattle in the vastness of LA’s Dorothy Chandler Pavilion in the company of Radio KPFK’s Will Hammond. That alone made the trip West worthwhile.

UK: Martin Colloms
Ken Kessler covered the 1988 Heathrow Penta Show, which took place in September, last month, but as a technical contributor to Stereophile, I felt a number of products and trends were worth covering in rather greater depth. Genuinely new technology was thin on the ground, as trends build slowly over a number of years. At this show, the resurgence of tube designs was quite marked: I enjoyed the premiere of the Audio Research SP15 preamplifier, partnered by the exceptional DI25 power amplifier. Jadis released a new, lower-cost (£3000, $5000) 100W power amplifier, the “Defy,” Yugoslavia was represented by the Oakley “Image” tube preamp (£435, $760), the established UK company Audio Innovations showed prototypes of their new tube power amplifiers which use directly heated, bright-emitter triodes, this device still enjoying occasional batch manufacture, while Croft showed a pair of 40W output-transformer-less monoblocks using four PL519 tubes per channel to sell for around £1000/pair ($1750). Stax launched the tube-driven SR-Lambda Pro Signature headphones, reviewed last August in Stereophile, and announced a new power amplifier, the DM4X1, which unfortunately was neither to be seen nor heard. Weighing in at a massive 95kg per channel and fitted with wheels (!), this 300W monoblock is a contender for the “world’s best” crown.

In all, 22 new tube amplifier products were shown or announced at the 1988 Penta Show, this figure not including tubed CD players such as the latest CAL models. It can be fairly said, therefore, that this represents a genuine revival in tube design, which is perhaps a surprising one in view of the hi-tech image of the modern audio market. One may well ask where all these specialist manufacturers of tubed products will find their customers.

The second major trend was the increasing importance of separate digital processors to use with CD players equipped with a digital output. Arcam’s inexpensive Black Box (review next month) is now well-established, while Cambridge Audio (said to have been recently bought by retail chain Hi-Fi Markets) had two introductions: the CDA2 and CDA3, at £450 and £299 (£780, $520) respectively. The more expensive model is a 16x16-bit unit derived from the CD2 player, while the CDA3 uses 8x16-bit technology. Both are said not to require any analog low-pass filtering. New-technology features for these processor include the use of a second phase-lock loop for the digital input clock acquisition to reduce jitter. Clock-jitter noise is a subject on many digital engineer’s minds at present. Having considered the problem and identified it as a factor that influences sound quality, worsening both high-frequency and low-level distortion, a number of designers are now taking steps to control it.

There were also rumors of a still more advanced processor from Cambridge called the DAC1, described as a stereo digital control center, to sell for a projected £1800 ($3100). The DAC1 will include an analog/digital section for recording, complete with an analog disc input with the RIAA equalization performed by a preprogrammed digital filter after A/D conversion. A high oversampling rate is planned for both sections of this digital encoder and
decoder unit. It will also be able to recognize the presence of input signals, analog or digital, including the sampling rate, and automatically switch to them while setting the appropriate format requirements.

Exhibitors at British shows have traditionally hung on to analog decks for demonstration, and although many were still in evidence, CD was at last starting to make an impact in many systems. A major exception was Oxford Acoustics, whose respected heavyweight Crystal Reference turntable was joined by the technically innovative, lower-cost Crystelle (£1200, $2100).

Beautifully styled as furniture, complete with a hinged lid, the turntable has an integral, floor-coupled pillar base which contains a weighted mass attached to the primary subchassis in order to act as a gravity stabilizer. The subchassis is suspended on precision coil springs such that the assembly has a high excursion capability coupled with a stable low-frequency filter resonance at around 4Hz. The total suspended mass is around 25kg (55 lbs), and provision is made for trimming the balance for different arms.

The key aspect of the Crystelle, however, is the use of a second subchassis—the same as is used for the Crystal. This is a higher-frequency, highly stable system on which the motor and platter—a massive, 5.2kg affair of acrylic and slab aluminum—are mounted, so that this belt-driven deck does not suffer from speed- and pitch-related effects due to differential movement between the motor and the platter. Tripoint contact systems are used for the upper and lower interfaces of the second subchassis, to minimize the amplitude of resonances, as well as to provide a stable base contact free from rocking. The arm mounting is also three-point and provides for full geometric adjustment of even such intractable designs as the Rega RB300.

The rumored introduction of a new Linn turntable proved to be a red herring, but a new tonearm from the Scottish company was seen at the show. A derivative of the Ittok called the Ekos, it will sell for £895 ($1600). Although the Ittok is manufactured in Japan, the Ekos is made in Scotland with very high-accuracy, lum-tolerance bearing shafts and a headshell machined from solid stock. A new, high-performance bonding system is used to lock the headshell to the arm, and the tracking-force spring and signal cables have been upgraded.

A review of the full Linn Sondek/Ekos/Troika LP player is planned to appear in Stereophile in the Spring.

It may well turn out to be a temporary phenomenon, but quite a few metal-coned speakers were being demonstrated at the show: three from Acoustic Energy, several from Studio Power (budget, PA-derived models), and the Townshend "Glastonbury" (using a 7"-cone woofer designed by veteran speaker builder Ted Jordan). However, many big names have embraced metal-dome tweeters (with varying degree of success). With UK manufacturers like B&W, Celestion, Wharfedale, Monitor Audio, Musical (British) Fidelity, Mordaunt Short, and, most recently, Heybrook, as well as Ariston, Diesis, Rogers, Proac, Harbeth, and TDL (whose parent company Elac actually manufactures metal-dome tweeters), it would be fair to say that the metal-dome tweeter seems to have completed its takeover in the UK.

The Canadian bipolar panel speaker from Highwood was a highlight of the show and will be marketed worldwide as the Sumo Aria. A full-sized, handsomely crafted, floorstanding panel, the Aria uses a vertically oriented, rectangular diaphragm of tough, tightly stretched, 36um-thick Mylar, driven by a single 32mm voice-coil of low inductance and low mass (0.08mH, 1.8gm). Described as a kind of mechanical analog of the Quad ESL-63, its radiating area smoothly reduces with increasing frequency. When the output from the Mylar sheet begins to roll off above 8kHz, the inverted aluminum dust cap at the voice-coil center takes over smoothly, acting as a pure piston to above 20kHz.

The speaker is an easy amplifier load and promises to achieve that elusive goal of high transparency by virtue of very close coupling between the transducer element and the amplifier. The 45Hz resonance is nicely tuned by effective, resistive low-frequency damping at the rear. Good extension, to 30Hz, is present, while the latest samples claim an improved sensitivity (86dB/W, 8 ohm watt, 4 ohm speaker) over that originally offered. Despite the large diaphragm, the magnet gap is held to 45 thousandths of an inch, energized by a powerful motor system developed by Bill Perkins. The voice-coil is stabilized by a custom grade of ferrofluid. Major problems seem to have been addressed by designer Paul Barton, and a range of models is planned for the future.
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Unforgettable writing is not only the province of great novelists; it sometimes appears in technical magazines. Case in point—Larry Klein's article about "The Audio System of the Future" in the December 1963 issue of Stereo Review, which described such marvels as stick-on-the-wall electrostatic speakers. I enthusiastically read and re-read it.

Larry's most significant prediction was of optical recording. He thought that a 35mm frame's worth of film could hold a symphony or a Beatles album. Each newly acquired work would be spliced to a reel of film in a special player—punch a few buttons and the player would locate and play the selected frame. (This prediction comes remarkably close to anticipating a CD changer with FTS.)

I never thought that, 25 years later, I'd be writing an article on the future of hi-fi, but here it is. "I have seen the future, and it works!" No, not the Soviet Union of Stalin, but Lexicon's CP-1 digital processor which I review in this issue. This product is the first of many that will totally revolutionize the way we listen to music, as well as what we expect our hi-fi systems to do. I state this as fact, and aver that it is not a matter of "if" or "when," but merely "how soon."

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—Arnis Balgavis, Stereophile, Vol. 11, No. 11

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over analog. Although converting sound to numbers may indeed damage the sound (analog recording is also guilty), the damage is only done once. As explained by Keith Yates in his article on audio vertie in November '88, no amount of digital processing (if properly applied) can cause additional loss of quality.

This is not true of analog processing, where we have reached the point that we even worry about the sound quality of volume controls and interconnects. It is the potential of analog for unlimited degradation which, in part, explains the reluctance of many listeners to use signal processors. Not only do analog processors often fail to produce musically pleasing effects or enhancements, but the circuitry itself can degrade the sound even further.

This "one-time-only" loss of quality means that digital recording opens the door to applying as much signal processing as desired. I'm not talking about arbitrary manipulation that twists the original to suit the user's "taste" (such processing is an unfortunate reality, especially at the studio end of the chain). Rather, I'm thinking of highly complex processing that is impractical with analog circuitry—processing that can correct for errors or distortions in the recording process, and, by synthesizing or extracting ambience, enhance the illusion that you're hearing "the real thing."

Many readers are already familiar with the latter type of processing. Ever since the Audio/Pulse Model One appeared in 1975, consumers have been able to buy digital "room simulators"—devices that, by delaying and recirculating the signal, create the illusion that one is sitting in a room with different (and more musically appropriate) acoustics than one's living room.

Simple delays and feedback loops do not require complex circuitry; the Audio/Pulse One and similar products of its era were assembled with commonplace integrated circuits (ICs). Of course, mucho chips were needed, especially for the sophisticated professional reverberation systems that Lexicon and other firms began making in the early '70s. The introduction of large-scale integration (LSI) made it possible to place most of the circuitry required for a consumer product on a single chip.

A large chip can also be complex enough to permit "generic" processing—that is, the chip is a programmable device that can perform ambience synthesis, frequency or phase contouring, notch filtering, waveform modification, dynamic compression or expansion—or any combination of these. (The NeXT computer contains a chip of this type—the Motorola DSP-56001—and NeXT supplies a sample program to implement a 10-band stereo equalizer.) It is this kind of sophisticated processing, through which the user can correct aberrations in the playback system, or the recording itself, that finally justifies digital recording.

The Yamaha DSP-1 was probably the first consumer product to use LSI digital-signal-processing chips. (Yamaha is one of the largest manufacturers of LSI in Japan, so they were able inexpensively to incorporate a custom design into their own products.) However, the DSP-1 and the later -3000 don't go far enough. They only synthesize ambience, which can be done—at a higher price—without custom LSI.

The DSP-1 and -3000 are disappointing because they do not take advantage of digital processing's ability to create a gamut of functions.

This is why the Lexicon CP-1 is such a breakthrough; it does other things than "just" synthesize ambience. One of these is interaural crosstalk cancellation, which the CP-1 applies in varying degrees to extract ambience, to give a "holographic" effect, or to allow binaural recordings to be heard properly over speakers.

The CP-1 also has programs that distinguish between speech and music, which permits it to synthesize stereo from the music component of mono sources, while sending the unaltered speech components to the center-front speaker. Most amazing of all, the CP-1 performs all logic steering, signal cancellation, and noise reduction in the digital domain when decoding Dolby MP sources. It's the first product to do so.

"Placido Domingo"

Imagine it's five years from now, and you're about to spend a quiet Sunday afternoon listening to your favorite music. The heart of your system is not a preamp, but a personal computer, roughly comparable in speed and processing power to a present-day 16MHz AT-

1 Digital recording is not necessarily an improvement on analog; it is just a more durable and convenient way to distribute and listen to music.
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class machine. Two of its plug-in boards are powerful digital signal-processing systems, with about 10 times the processing power available in today's professional systems. A third board provides the electrical interface to operate all the system components; the computer controls literally everything in your system.

Although you are the proud owner of Audio Research's very first CD player (with 128x oversampling and true 24-bit conversion), you decide instead to listen to an LP. Your LP laser player is the Daewoo "LP2," which you got for $500 from a gray-market dealer. Although you felt guilty about buying a cheap Korean knockoff, at least you ripped out the shoddy analog electronics and replaced them with custom circuitry from Vendetta Research.

The LP is your all-time favorite recording: Volume VI of M&K's "Digital Masterpiece" series, with Zoltan Rozsnyai conducting the Philharmonia Hungarica in Baroque favorites. You insert it in the LP2 and press the remote control's Play button.

The computer springs to action. Its infrared sensor notes that you are about to play an LP on the Daewoo. First, it mutes the outputs of the system's digital processor, then checks that all system electronics are turned on. Then switches the output of the Daewoo to the system's own 22-bit, 8x oversampling analog-to-digital converter.

By this time the record is playing, but there's no hurry; the processor contains 16 seconds of digital delay, so there's plenty of time to do all the things it has to do — and there are a lot of them. The computer examines the first few seconds of music, and, using some fancy autocorrelation algorithms, figures out which LP in your collection is playing! It then searches the files on its hard disk to find the one with information about M&K RT-206.

This file contains everything you ever told the computer about how you want this record to be played back. One item of information is the vertical tracking angle; the computer can alter it, over a wide range, with digital processing. (The computer also needs information about tracing-error correction and the impulse response of the phono system. However, these are constants for all LPs, so they are stored in a separate file.) Another piece of information is the volume level you prefer; the computer sets system gain accordingly. The file also tells the computer that this recording is dbx-encoded, so the processor applies the necessary equalization and dynamic-range expansion.

This recording has always sounded good to you without response tailoring, so there is no information in the file about EQ. However, the file contains copious data about the kind of acoustical space in which you prefer to hear the music. There are 12 ambience speakers (above, below, and to the sides); the computer generates the signals needed to accurately simulate that space.

After breaking into tears over Rozsnyai's performance of Pachelbel's "Canon," you decide you want to hear something equally moving. Last week, you found some old Columbia in a used-record store; one of them was Ormandy's classic performance of Beethoven's "Pastoral." After carefully cleaning it, you place it in the laser player.

This time, the computer doesn't recognize the recording, and tells you so: a speech synthesizer says, "I'm sorry, Dave, I don't recognize that recording" in Douglas Rain's voice. (You also have a choice of Majel Barrett, Martin Miller, or Eve Arden.) The processor transmits an infrared signal to the LP2 that puts it in Pause, as you reach under the sofa for a combination LCD/Graphics tablet. The computer recognizes that you have picked it up, and turns on the LCD.

Across the top of the screen are a dozen menu titles: Record Label, Design Room, Hall, Stylus Correction, Room Parameters, Surround Decoding, Filters, and so forth. You pull an electronic stylus from the side of the pad, touch Record Label, and a menu of record companies drops down. You point to Columbia and click a switch on the side of the stylus. The computer recognizes your selection, and applies a group of corrections that have been found effective for Masterworks of that era: a mild cut in the brightness region, moderate bass-boost and synthesis, and some modified tracing-error correction, to compensate for the poor pressing. You then touch the stylus to Play, to hear the effects of the processing.

After listening a few minutes, you decide the sound is a bit dull and lacking detail. You select Record Label again, then Modify. The LCD switches to a "control-panel" display of the default settings for Columbia, plus a number of related parameters.

Moving the stylus across the bargraph that shows the amount of upper-midrange com-
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A difficult choice to be sure, you can buy the world’s best cable for $6.95 per foot, or with the TFA Return for a little more!
pensation, you raise the level a bit; that sounds too harsh, so you restore the default setting. You then move the Detail "knob" to add a touch of second- and third-order harmonic distortion. That sounds more like it, but the sound is still grungier than you like. Returning to the main group of menus, you select Filters, and choose a sharp (but transient-corrected) cutoff at 12kHz. That's more like it!

The computer keeps track of all your selections, saving them in a unique file on the hard disk; the next time you play this record, the file is automatically retrieved. Any future changes are saved automatically, too, unless you tell the processor not to.

Now it's time to add some ambience. Activating the Hall menu, you select default settings from over 100 well-known concert halls. In this case, however, the Academy of Music was not the locale, but rather Memorial Hall in another part of Philadelphia. Making your choice, you lean back to consider the effect.

You are not totally pleased. There is not enough warmth for such bucolic music, and the close miking does nothing for the fabled lushness of the Philadelphia strings. Switching to the Room Parameters menu, you select the frequency vs reverb time display, and sketch in a graph that lengthens reverb time in the upper midrange and the frequencies below 200Hz. The result is a bit muddy, so you start the enhancement at 150Hz. Now you have it!

By now you have reached the "Scene by the Brook," and you suddenly want some livelier music. One of your record-store acquisitions was the 1973 revival of Candide, in SQ! A quick listen shows the basic sound to be quite good, surprising for a Columbia of that era. You eschew any enhancements, opting simply for omnidirectional SQ decoding. The processor's digital delay allows it to apply the necessary logic action after it has analyzed the signal, producing extremely smooth decoding with virtually no artifacts.

After "Glitter and Be Gay," you're bored again. You dig through the record-store stack, uncovering a real treasure. It's Audiofon's two-disc set of Earl Wild's concert, The Art of the Transcription. You don't think much of the performance ("If these are such great virtuoso pieces, why doesn't he play them loud and fast?") but the recording is exemplary, made with two mikes.

Although you could select your own ambience parameters, this time you decide to have the processor perform one of its most amazing feats. It will analyze the recording's ambience. You select Hall, then Analyze, then Solo Piano (there are a number of "performer options," to tell the computer what it's analyzing), then Play.

The processor analyzes the music for about two minutes, then displays something amazing on the LCD—a perspective view of what it thinks the performance hall looks like! The position of the piano is shown, as well as the apparent listener's position.

The computer also lists a group of recommendations. With a "good" recording, they are always the same: processing will add only "side" reflections to the reproduction; medium and long delays will be suppressed in the main channels, with the long moved to the rear speakers. You accept these recommendations, since you can always alter them. The computer sends infrared commands to the player to start over again.

The effect is convincing. However, you feel you are sitting too close to the piano. You point to the listener icon with the stylus, then "click and drag" it to a position farther back in the hall. The computer pauses the player for several seconds while it recomputes the ambience-synthesis and extraction parameters, then you hear the altered ambience.

That's better. However, the space around the piano seems too reverberant, and the overall ambience is a bit bland. To correct the former, you drag the stylus across bargraph displays that control the level of frontal and side reflections, lowering them. To correct the latter, you click and drag the listener icon toward the side of the "hall" to make the reflections more asymmetrical. That does it.

What happens if the computer doesn't care much for the recording's acoustics? There are several options. You can tell the computer to just do its best, and to hell with the rest. You can select from a wide range of pre-programmed acoustic spaces supplied with the computer, and those you have designed yourself. If none of these please you, just create a new one from scratch!

2 "Click and drag" is not a reference to tap-dancing transvestites. It's computerese for the following sequence of actions: Point to something on the screen with the pointing device (usually a mouse). Press (click) the switch on the pointing device. Drag the pointing device across the desktop to move the icon or extend the selection.
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To make a new environment, choose the Design Room menu, then select from Concert Hall, Cathedral, Night Club, Recital, and so forth. The computer displays a "basic" room configuration for each of these spaces on the LCD, which you can then modify. For example, you can "click and drag" any of the walls (or even the ceiling) to change the size and shape of the room. You can call up sub-menus to add acoustical "clouds" or to alter the texture and reflective quality of the walls. You can include the acoustical influence from the clothes and bodies of an audience, or you move to the other extreme and rip out all the seats! You can change the position of the orchestra or the listener. You are Bolt, Beranek, and Newman, all in one!

As each change is entered, the computer mutes the system for a moment to recompute the new acoustics, then presents the modified ambience. If you wish, you can save several designs as you go, and ask the computer to switch among them automatically. When you finally have a room you like, the computer saves it to disk and notes that it is to be used from then on for that particular recording.

Little audiophile, you've had a busy day. Before going to bed, you put the Ormandy "Pastorale" back in the Daewoo, and a blank cassette in the DAT. You then instruct the computer to make a digitally noise-reduced recording of the record for future playback. Such processing takes 20 times as long as real-time processing, so it is best done overnight.

**Farfetched?**

Not at all. Nothing I've suggested is at present impossible (though I doubt anyone has written auto-correlation programs that figure out which record is playing, or software that can remove ambience). Software to create specific room characteristics already exists. I didn't even touch on the possibility of a palette of euphonic colorations which will tailor the sound to one's tastes of the moment. It is at this point that the most hardened digiphobes will embrace digital signal processing without reservation; it is, after all, what they wanted all along—to insert their favorite colorations any time they like!

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Brian Cheney offers a review of reviewing

Alright already, quit shoving. I know I don’t belong here. This magazine already has a place for manufacturers— in the back, where those large egos are squeezed into small column inches so they can’t hurt you. Not that I’m exactly proud of my job. On social occasions, if pressed as to my profession, I will usually admit to some honest toil such as mortician or hodcarrier. Speaker design is downright devious work. As proof, examine the specifications for the 1376 models in Audio’s 1988 equipment directory. Much of this data, when compared with each described system’s real-world performance, looks like Joe Isuzu wrote it on a bad day.

Of course, there are no standards for loudspeaker measurements, just a few conventions for recording perhaps an aggregate of amplitude responses or an occasional modulus of impedance. Hell, there aren’t even standards for listening to loudspeakers. Which is why I’m heard on that occasion with accurate perception and in clear detail.

Wherein lies the rub. To illustrate, I submit for your attention the three amplitude response curves in fig.1

Speaker A sounds pretty rough. With discon-

Biographical Note: author Brian Cheney, when not making his VMPS loudspeakers somewhere in Northern California, fancies himself a journalist.
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tunities in the lower treble, a rising top, and sharp notches here and there, Speaker A could fairly be described as an earstrain. Speaker B, on the other hand, sounds distinctly dull, with relatively smooth, restricted output of excessively warm character. Now Speaker C is a champ. The reviewer of this system enjoys humpfree bass, uncolored midrange, an extended, clear, but unfatiguing treble, and says so.

Of course, all three curves were made with the same measurement techniques on the same speaker system; only the environments differed. This revelation is no surprise to any experienced audio journalist; the curves mirror those taken by the estimable Harry F. Olson over 35 years ago. So, as I am to take up the reviewer’s task, I would make life easier, and more repeatable (“If you can’t repeat it, it ain’t physics”), by adhering to the following guidelines:

1) **Listen in a good environment.** The best, most helpful listening environment known to me is the full live-end/dead-end treatment where the speaker end is as acoustically dead as possible, covers perhaps the first third of the room, then gives way to a very reflective live end equipped with diffusors and virtually no absorptive components. This means damping walls, floors, and ceiling with 3" to 4" of linearly absorptive material such as Sonex. In a pinch, a heavy rug will do for floor damping, but elsewhere, make it thick, and make it dead! And no furniture or equipment racks between, behind, beside, or close in front of the speakers—all this stuff goes in the live end. Among reviewers of my acquaintance, Audio’s longtime Associate Editors Bert Whyte and Barney Pisha share the prize for best listening room. Bert’s was one of the first residential LEDE rooms in the country (constructed in 1980), a good 25’-long rectangular space on a concrete slab (concrete on mother earth is best for floors; anything less rigid becomes a sounding board for the music). Barney’s listening room, much smaller than the pictures published recently in Audio would suggest, is a calibrated LEDE environment complete with elaborate diffusors in the live end. Worst reviewing environment in my experience belongs to a regular contributor to that other big-circulation underground, whose room forces one to place speakers in front of a stone fireplace, complete with brass poker/shovel set singing sympathetic accompaniment to the high notes. Ugh.

2) **Listen with real music.** A reviewer who bases his opinions of a speaker’s performance on Jazz at the Pawnshop, the JVC Audio Symphony, or the Sheffield sampler CD should be tossed on the pyre incinerating all extant copies of said material. Aren’t you, dear reader, more interested in how the device under review handles Mahler’s 5th, “Vissi d’Arte,” Woody Herman, Furtwangler, Ella, the Schumann E-flat Quintet, or Muddy Waters? I’ll allow Marni Nixon, but not Amanda McBroom. You can have two Telarc bass drums and one slam of the garage door. That’s it.

3) **Worry about ends, not means.** After a while, reviewers begin to give credence to whatever manufacturers are promoting this year. A current craze is the metal-dome tweeter, a device which, due to its rigidity and low moving mass, scores well on the kind of waterfall FFTs we all know how to perform. This is a case of a material tailored to a measurement, forgetting two cardinal rules for speaker transducers: their diaphragms exhibit a high degree of self-damping, and generate low amounts of diaphragm noise (the eigentones made by the material when set in motion). Metals of all sorts are lousy in both respects. True, the best metal-domes sound better than the worst soft-domes. Still, I would never have a metal tweeter in my speaker system as I cannot abide the tinfoil colorations. Damping the metal with soft-dome materials such as polyamide seems to give the worst of both worlds.

4) **Know your software.** In particular, know how the recording was made. Distantly miked recordings done with omnis are forgiving and sound great on speakers having a forward tonal balance, as well as many minimonitors. Close-miked cardioid and other directional mics yield recordings which are often harder to reproduce accurately and pleasingly, and this is not necessarily the fault of the recording. If a speaker only sounds good on the distantly miked stuff, or on xylophone solos, that doesn’t necessarily mean it’s a winner.

5) **Have a reference system.** This is a toughie; you actually need two—preferably three—preamps and power amps, and remember the differences between them. Most frequently, differences in amplifier tonal balance show up at the frequency extremes. A good speaker sounds less warm on the high-damping solid-state amp with the undersized supply, quite full on the tube gear, and in the middle on the good (I hesitate to say “neutral”) electronics. The gear
I'M SORRY
I DIDN'T CATCH
YOUR NAIVM
should stay constant for quite a while, maybe a year or so. Costly and inconvenient.

6) Don't be a closet designer. Which is why I'm unsuited for this work. Designers invariably hate gear not designed to their prejudices. I dislike dipoles, for example, and always find fault with them regardless of their sound. Of course, promoters like the guy who claims a -3dB point of 18Hz for bis dipole are only grist for my mill. Yes, I can conceive of a measurement condition under which such a result might be obtained. No, that is no guarantee you will actually hear anything like true, extended, linear low bass from that speaker. Praising a dipole for its bass is like loving a Ferrari for its fuel economy.

7) Make useful measurements. The standard pressure-amplitude response curve which infests speaker reviews around the planet is often worse than useless, particularly when made "on axis" (where, oh where, is the "axis" of a planar or multidriver array system?). If you want to make measurements, make four simultaneously, and display the results one above the other: amplitude ("frequency response" and good luck), phase change with frequency, modulus of impedance, and THD with constant drive yielding 90dB/SPL at one meter for all audio frequencies. As far as I'm concerned, you can stop the test when THD surpasses 3%, a point at which the sinewave is quite visibly distorted. Abrupt phase-angle changes and phase change not linear with frequency indicate a disregard for phase coherency. Impedance humps more than double the mean value; or, appearing at more than one, max two, frequencies, show the designer didn't do his homework.

I suppose there is more I could go into: the reviewer should have an ability to differentiate high-Q behavior (such as engineered-in panel resonances) from real bottom end, or sense enough to operate with program sources of correct absolute polarity, or think to place speakers at the correct vertical height for listening (assuming the manufacturer knows what that is), etc. However, I hear my faithful ethnic sidekick/employee, Kato, yelling that he's run out of speaker-cone copolymer. Since we like to do everything here In-House, I must now hightail it out to the company oil well and get er, cracking. "Kato, did you park Black Beauty under the gusher again?!"

---

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The Silver Seven's polished granite anti-vibration base floats on four Simms vibration dampers. The separate power supply's power transformers and belt are mounted on a solid block of high density aluminum. Capable of an astonishing 390 joules energy storage, the Silver Seven delivers a conservatively rated 375 watts into 8 ohms from 20Hz to 20kHz with no more than 0.5% distortion. On the f-amp, peak current is in excess of 35 amps!

Before you meet the new M-4.0L, Bob Carver wants you to meet its inspiration, the money is no object Silver Seven.

The Politics of Denial, by Bob Carver

A discussion of the controversy surrounding my work, a few clarifications about Transfer Functions, and some straightforward information on two major new power amplifiers.

Few audio controversies have spilled more ink, ignited more angry letters and raised more blood pressure levels than my insistence that I can duplicate the transfer function of power amplifier designs. By returning to these pages, I'm not attempting to upset the uneasy cease-fire which has finally settled over this issue. Rather, I'd like to examine with you, gentle reader, two important mechanisms which have invisibly underlain the ongoing conflict.

The first of these is the tremendous pressure which I've somewhat innocently unleashed on the audiophile press.

The second is simply a clarification of the t-mod process, which I frankly admit to have passed over in favor of more controversial statements.

"The Carver Challenges were a horrible blight on the audiophile reviewing magazines of this world" — direct quote in an audiophile reviewing magazine, by its editor. (The Audiophile-File, Mar/Apr 1988, Vol. 1 Issue 2, Printed Edition). Any time a publication entertains radical views — whether they be editorial or on an advertiser's page — there is a substantial and often negative reaction. (Read Larry Archibald's Final Word in Stereophile Vol. II, No. 7 for an excellent account of what can befall a magazine over just a single review.)
"Because I wanted to share its magnificent sound with you we built the new Carver M-4.0t."

The essence of my work on the M-1.5t and M-1.0t power amplifiers is how integral to virtually every amplifier manufacturer. I've not dared to claim my designs to be the equals of more expensive competing brands, but I've somewhat innocently managed to embroil at least two magazines in the validation of these assertions or that I apologize. Beyond that, the action has been sadly predictable.

Let's face it, radical scientific methods have always produced radical counterattacks, magical solutions that are more in — certainly no one likes something to appear too easy. And few are really comfortable confronting a design which may have the potential of solving a problem at a fraction of the current cost. Even if the prospect is exciting! Thus any editorial staff — be it an engineering journal or a literary digest — is faced with the same dilemma: the inverse result of editorially endorsing (or even fairly examining) such radical methods will inevitably be seen as questioning more conventional approaches.

To sense the potential strength of the ensuing reaction, simply count the number of power amplifier ads in this publication. Then factor in the owners of competing brands. And multiply by the editorial position of each magazine as to which power amplifiers are currently the best. No wonder some may consider me to be a "horrible blight," but think of it, What's so horrible about trying to offer music lovers a great amplifier at a good price? From my first amplifier design onward, I've worked long and hard to develop a powerful scientific method for achieving this. If my invention of the Magnetic Field power supply (the patent lasts 11 more years) and the ability to sort out a transfer function has furthered that goal, then it's for the better in spite of reactions ranging from outright denial to bitter innuendo.

Where does this leave me on the eve of introducing two major new power amplifier designs? Certainly the ideological underdog should further conflicts break out.

And what about you, dear reader and music lover, the very person who must ultimately come up with the money to buy an amp. What about you?

The question more rightfully should be "where does this leave the audiophile editorial press?" Are they shuddering over a new "Carver blight," considering getting unlisted phone numbers to avoid the flood of angry calls from other power amplifier advertisers and either hoping to indefinitely postpone Carver product reviews or crucify both designs quickly to get it over with? To print anecdotal zingers from staff and readers alike in issue after issue without balance?
Honesty, I'm not that paranoid, but I can't help wondering. If my belief in the validity of my design approach hasn't been shaken by past years of sometimes nearly unfounded editorial attack, neither has my faith been eroded that those same writers have the potential to be fair and objective.

I ask only what has long been professed. That favorites not be played, whether those manufacturers be (as Larry Archibald put it) advertisers, friend, "enemies" or simply the accepted leaders in the field. In my opinion, future coverage and examination of the new Silver Seven and M-4.0t amplifiers will be a significant test of whether or not what benefits you as readers and listeners does indeed remain of paramount concern.

While it may appear that I thrive on controversy, I'd really rather simply be judged by my results. And that means being familiar with my methods. In the past, I've been very remiss in clarifying several fundamental points about the transfer function t-mod methods and philosophy.

The Silk Purse-Out-Of-A-Sow's-Ear myth debunked. As Larry Archibald, Gordon Holt, and Peter Azcel will admit, I am capable of reproducing the transfer function of one amplifier in a dissimilar design. (Archibald and Holt disagree with the contention that my production version of the t-mod reproduced the sound of the referenced amp [Sterophile, Vol. 10, No. 3]. Azcel agrees with my contention that my production version of the t-mod does reproduce the sound of the referenced amp. The Audio Critic, Winter, Spring 1988, Issue No. 11). This has led to the collective sound of minds snapping shut. "Ridiculous!" goes their thinking, "Bob actually claims to be able to take a disgustedly made, cheap power amplifier and make it emulate a world class reference amplifier? Impossible!"

We agree. Nothing could be further from the truth. As mentioned earlier, I have been remiss in not stressing an important point about the t-mod process. The success of transfer function replication is totally dependent on the intrinsic capabilities of the amplifier being t-mod-ed.

In other words, I've never claimed the ability to make a bad design into a good one. The generic amplifier being modified must, in many ways, be better than the design whose transfer function is being replicated. It must, as a minimum, have more output current and more output voltage than the reference amplifier. Its frequency response, slew rate, noise floor, and intrinsic input impedance specs must always equal or far exceed those of the reference amplifier. Its instantaneous current rise-time speed must beat the reference. And of course, it must always have at least as much power. Only under these circumstances can one then begin layering in the specific sonic signature that the t-mod transfer function characterizes.

A brief description of my new t-mod and t-mod-ee. An interesting and frustrating phenomenon occurred during production of my last t-mod design. The reference amplifier used for QCs comparison proved to be unstable -- or rather, un-constant -- as M-1.0t manufacturing continued. For that and many other reasons (including temporary vacuum tube madness, the sheer challenge of it, and the overwhelming desire to give my customers something very special), I set out to create the ultimate reference power amplifier. A design with the world's greatest transfer function. And a design that was mine to start with.

Because my heartfelt belief is that great sound should not cost $ millions, I've replicated the Silver Seven's transfer function in a new solid-state design, the M-4.0t. Now it should be obvious that to be successful the M-4.0t had to start out with basic parameters as good as those of the Silver Seven. BEFORE t-modification. This was, for me in many ways, a much more difficult engineering challenge than creating a money-is-no-object world's-finest-reference power amplifier. I'm not saying the M-4.0t and Silver Seven are identical. An M-4.0t weighs 277 pounds less than a pair of Silver Sevens. And you don't get the warm glow of silver-tipped vacuum tubes reflecting in polished black lacquer.

But be assured, the M-4.0t's transfer function is identical to that of the Silver Seven. And the sound it makes is the same, exactly the same.

Please understand that I didn't buy this ad to stir things up again. My hope is that it might open a few minds enough to judge my new solid state design on its merits, rather than on presuppositions, anecdotal statements, and hearsay. No matter what your opinion has been concerning my t-mod process, whether you are among those who believe in the scientific validity of the process (as evidenced by the thousands and thousands of positive comments I've received) or are among those who still can't quite believe because it seems just too good to be true, I urge you to seriously audition the M-4.0t. And the Silver Seven, although their distribution is understandably more limited.

We at Carver think you'll be impressed. Because, to mangle a phrase, "the intrinsic quality of the M-4.0t was there before the 't' in the t-mod went in."

Thank you for reading my ad. Warmest regards,

Bob Carver

P.S. We spent close to a quarter million dollars creating the Silver Seven, but that's okay, because potentially, I, you, all of us, can benefit.

CARVER
First, congratulations on your new president. I hope you're all very happy together.

Next, someone on the KEF payroll recently reminded me that I damned them with faint praise by remarking that their powerful computer-driven research base did at least enable them to produce a truly consistent product. Actually, he took it as a straight compliment, which I think reinforced my point. KEF gets the last laugh, of course: their recent success is legendary, a fact of which Stereophile's readers will be well aware. Or perhaps not.

Another fact you'll certainly be aware of is that KEF invented a new wheeze for 1988—the coincident-source loudspeaker. This is something quite new, at least in the form that they have tackled it. Keeping it relatively brief, the specifics are that KEF developed a novel, if not unique, full-range drive-unit which they have dubbed the Uni-Q. Uni-Q (just roll it around the tongue) is all about controlled directivity.

KEF tells me the loudspeakers based on the new drive-unit are massively back-ordered in the States (and in other countries too), the inference being that they have already been launched, that you know all about them, and that nothing more need be said. But journalism is all about never keeping quiet no matter what; it's the only thing I admit to sharing with those shady folk who brought you religion... Well, never mind about that.

Of course, living in the country of KEF's establishment, I'm in a unique position to tell you about the launch of the concept. Well, I would have been, but unfortunately I didn't make it to the hall. What I can tell you about are my experiences with one of the results of their efforts.

In a traditional multi-way design, there are a number of endemic problems that cannot be readily addressed (if they can be addressed at all), and which have profound influences on the final sound. These problems arise as a result of having different acoustic centers for the different drivers, and non-matching polar responses (directivity patterns) in the crossover region. Off the design listening axis, the spectral balance will be skewed by the variations in directivity and phasing, the latter becoming much worse when listened to from above or below the normal plane for vertical in-line designs.

You may reasonably object that you're not interested in listening from off-axis, but the character of the ambient soundfield in the listening room is determined by the reflections from nearby walls, the floor, and ceiling; plenty of psycho-acoustic data exists to show how important this is for realistic music reproduction. Incidentally, KEF scarcely refers to this in their literature on Uni-Q, but no matter.

The solution is obvious. Plonk the tweeter in the center of the bass unit, deeply enough recessed to be in the radiating plane at the crossover frequency—the acoustic center, in fact. Then match their polar responses.

This is easier said than done. The traditional problem is that a decent tweeter, one with sufficient sensitivity and overload performance, will simply be too large to fit within the pole-piece area of the bass unit, which is where it would need to go. Nevertheless, there have been a number of honorable attempts—Tannoy is the best-known existing practitioner of the art, with their well-respected Dual Concentric range—but invariably the tweeter is either in front of or behind the bass unit's acoustic center. Either way, the path lengths to the listener's ear will vary over the crossover band, and the effect may become noticeable, and have a significant effect on stereo imaging.

KEF's very elegant solution is to use sintered neodymium/iron/boron magnets, which (says KEF) have about ten times the magnetic flux density of ferrite; and about twice that of other damn stuff—you know—oh yes, samarium/cobalt. The magnet is small enough that it can be shrunk into the space at the center of the bass driver's 1.25" voice-coil. The tweeter itself, to complete the story, has a mesh-covered polymer dome and is 19mm in diameter.

Uni-Q allows the two drive-units to radiate from approximately a point source; that is, the acoustic center varies smoothly over a fairly
What do Apogee, Duntech, Martin-Logan, Monster Cable and VPI have in common?

These are some of the state of the art audio companies that have purchased Aragon amplifiers for their research and development work.

Read Thomas J. Norton's review of Aragon in the December 1987 issue of Stereophile Magazine, or call us for a copy.

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short distance with frequency, but the variation will be small over the mid- to high-frequency range, where it is of most interest. The next trick that KEF performs is to control the directivity of the tweeter so that it matches the bass unit in this region. This they’ve done, in part, by using the flare of the bass cone to provide acoustic loading to the tweeter. Elegant, no?

One of the reasons KEF got into trouble with this launch (this is my version, not KEF’s) is that they have gone about things in a way fundamentally different from before. It has been KEF’s practice over the years to introduce new technology at the top of the product range, and let it filter back down as the technology matures. That very sensible way of doing business (think of coupled-cavity bass loading, and the KUBE) allows designers the freedom to develop their ideas without the restrictions imposed by being asked to meet a very tight price point, initially being able to spend as much money as necessary to get it right.

But not this time. For reasons unknown, KEF decided to pull their latest technological stroke on their budget range, almost every member of which incorporates their Uni-Q driver. The trap that KEF was obviously in danger of, therefore, was having to under-engineer the speakers before they had a chance to learn exactly what compromises were acceptable and which weren’t.

Like I said, this is my version, not KEF’s. Definitely not KEF’s. I think they’ve botched the launch. I have experience of only one model, so I’m on shaky ground talking about the entire range, but the reactions of other observers whose opinions I trust are not far from my own.

The model I laid hands on was the C55, from the middle of the range of Uni-Qs and a model KEF describes as bookshelf/freestanding. It is neither. It likes the wide open spaces away from walls and on the usual open stands. From a distance it appears to be all drive-unit, but closer examination shows that the Uni-Q driver is matched by a second, bass-only unit of similar dimensions. In this case, however, it’s a passive radiator—the classic flapping baffle of yore.

The 20-liter enclosure measures approximately 19" by 10" by 10". There’s some pretty nifty engineering in the form of diecast chassis components and expensive-looking terminals, but there are some less satisfactory factors too. The main points I identified by visual examination were that the enclosure was surprisingly lively—quite a lot of acoustic rubbish is radiated, especially by the sides and back—and the crossover is fastened near the back of the bass-unit magnet, apparently to expedite service should this be required. I’ve been in correspondence with KEF’s Technical Director Laurie Fincham on this point (and others). He claims that any coupling between magnet and crossover is a) benign, and b) accounted for and therefore beneficial. His version, not mine.

The one benefit Uni-Q ought to provide is good stereo imaging. With the tweeter and the bass unit having coincident acoustic centers, and with a carefully stage-managed hand-over of polar responses between the two drivers, the speaker ought to be the next best thing to a perfect point source, and ought to image like a dream. But it isn’t like that.

Stereo imaging is a rare and precious commodity, one much prized by audiophiles. It is also elusive, hard to track down, and harder still to ascribe to a single cause, or even group of causes. The search is often confused by the fact that most recorded material doesn’t have the integrity to image properly anyway. As you may know, there are those who claim that imaging doesn’t even exist, and there’s a certain veracity in this statement if you take a narrow mechanistic view of the ways in which images are formed in space. There are, nevertheless, many loudspeakers capable of a real stab at conjuring up something approaching a solid, dimensional soundstage from decent recordings.

The broad generalization I would draw—it’s scarcely revolutionary or even surprising—is that traditional multi-way box loudspeakers that image in a solid, believable way tend to do so over a relatively restricted listening area. This certainly has a lot to do with the infatuation all but the most adventurous designers have for two-way loudspeakers (in the UK especially), where the bass driver beams quite severely at the point of hand-over to the tweeter, which at this point radiates to all the points of the compass. The result? If imaging is perceivable from out front, it tends to collapse when viewed from the side. A good point-source loudspeaker, on the other hand, will—or at least can, under favorable circumstances—give a kind of imagery that has remarkable homogeneity without loss of focus. It can be
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viewed from many different angles, but the illusion of a soundstage in some kind of coherent acoustic space remains.

There aren't many point-source loudspeakers, of course. In fact, if we're being accurate there aren't any, though some do provide a kind of rectangular window onto a virtual point source. If you recognize the description of the Quad ESL-63 in this statement, then you're right. More than any other, this loudspeaker triggered the points I have set down here, yet the Quads need pretty drastic measures before you can actually wring this kind of image-forming ability from them. They need to be lifted up very high, and they like to be used near the centers of lively, irregular rooms. Altogether, they are far too adept at making bloody nuisances of themselves, but that, I suppose, is the price of stardom.

There may be such a price for the KEFs, too, but if there is I've been unable to find it. All I know is that it's a surprisingly sweet, gentle performer, and this in itself gives the sound a kind of false depth of the kind that more brittle, up-front loudspeakers never display. The sweetness makes the C55 kind to CD, kind to female voice, and kind to the sometimes brutal sound of today's budget audio. It's the perfect antidote to audio-induced migraine, but has nothing to do with the kind of audio holography I was (however unfairly) looking for.

Instead, what I heard was nice, but vaguely, well, muddled. I don't want to put too strong an emphasis on this. I doubt if the slow-acting flapping baffle was helping a great deal over the lower frequencies where it was producing useful output. But the muddling extends higher, and can be detected easily with early (classical) music which has little to stress the bass of most loudspeakers. The top end was nice, but slightly colored, lacking the clean, incisive quality of many of today's better tweeters, especially the one-piece metal domes. The KEF was also inconsistent with level, sounding rather muddled at high SPLs within the compass of other, similarly priced loudspeakers. Curiously, it was also surprisingly fussy about lateral orientation. The level of treble, and therefore the balance of the system as a whole, varies significantly over quite limited incident angles.

I'm curious to know how the Uni-Q works at very low frequencies. Below 50Hz or so, a large system will be called on to move a lot of air, and this in turn means that the bass cone will move forward and backward over a very considerable distance—perhaps an inch or more—at very low frequencies. Imagine making cone shapes with your hands over your mouth, then oscillating your hand forward and back 20 times a second. Would the sound of your voice change due to the different acoustic loading? Sure it would. Could this be the reason why Uni-Q didn't first see the light of day on a truly exacting up-market loudspeaker with extended bass? Could this even explain the treble coloration, or the lack of consistency at high levels I detected in the C55?

There's another factor here too, one put to me by another loudspeaker designer. (I should add that he had every reason to grind axes, since he worked for a key competitor, so bear this in mind.) He said that his company had already tried what KEF has done, and gave it up. "Whatever you do, it always sounds like someone talking through cupped hands. It's always going to sound colored."

I think that this and the other arguments have a lot of force, but they're not the whole story; they merely define some of the challenges. And that, really, is the message of this little piece. The coincident-source loudspeaker is not the final solution to anything, and in the form in which I've heard it running, it has yet to make a good case for itself. However, the basic idea is so elegant, simple, and somehow "right," that it hardly seems possible that KEF has got it wrong. My gut reaction is that KEF is singing the right song, but that the singer needs a little training.

Coincidentally, I've just stumbled across a press release from Tannoy (again, not exactly a disinterested party) concerning two new dual-concentric models which they claim have coincident-source driver technology. The models concerned are the DC-1000 and DC-2000. The release claims that Tannoy considered the KEF approach about three years ago, and rejected it on the grounds of inherent coloration in the HF energy (sic) because of the lack of phase-coherent information. "There's plenty of prior art dating back to 1935 [regarding] putting the direct radiating treble unit in the middle of a bass cone," the release continues. They conclude by noting that they own the patent on the "next stage from the KEF unit, where the bass cone is inverted so that the HF unit does not suffer from the cavity effects down in the apex of the cone." Gee!


Common to all three loudspeakers: Approximate number of dealers: 52. Manufacturer: Thiel Audio Products Co., 1042 Nandino Boulevard, Lexington, KY 40511. Tel: (606) 254-9427.

Thiel Audio, headed up by Jim Thiel (President and chief designer) and Kathy Gornik (Marketing Director), sets itself apart from other speaker manufacturers not only by making what I feel to be almost uniformly excellent products, but also by serving as a kind of hallmark for the good dealer: Although not all good dealers sell Thiel, just about every Thiel dealer is a good one. This comes about because, in spite of just about uniformly positive reviews and excellent customer relations, Thiel (primarily in the person of Ms. Gornik) has insisted on limited distribution through retailers they know will give their product a good demonstration. There are a few other such companies performing this hallmark function, though only Levinson readily comes to mind. Most other successful companies prefer as wide a geographical distribution as possible, in spite of the occasional necessary compromises in dealer quality.

Franckly . . .

... it's a bit nutty for me to be doing this review. First, as Publisher of this esteemed journal, my primary duties involve financial and personnel management, as well as a good bit of public relations; I don't need and am not required to perform the exacting tedium of product reviews. Second, the Jim and Kathy referred to above are friends of mine. So what, you ask? Well, if this were going to be a uniformly positive review, I would therefore be ruled out as the reviewer; if it's to be wholly or partially negative, it will surely put a strain on one of my best audio friendships.

But wait—that's where I disagree. Although it's rarely seen as such by product designers—and even less often by those in charge of sales—the critical reviewer performs a dual function: For the magazine's reader, he or she evaluates, informs, and aids in the buying decision; for the product's creator, he offers insight into the response of the typical buyer and possibly saves the embarrassment of a flawed product design. This last benefit, of course, presumes that the reviewer is better able to perceive the product in a typical use situation than is the designer. It is on the correctness of just this presumption that we hang our hat(s).

Wait a minute yourself, I can hear you saying, "The alleged achievement of objectivity aside, why should we pay any attention to what you say, LA? You haven't appeared in print (aside from your monthly 'Final Word' column
— which we hear, by the way, arrives at the printer just before plate meets paper) since Vol.7 No.3, way back in 1984." Recognizing the justice of this question, and in place of a more comprehensive "Matter of Taste" (to appear in a future issue), I herein plead my case.

My musical and equipment tastes have already received some attention from time to time in these pages, in both my own comments and in those of others (primarily JA). My musical tastes are catholic in the extreme: raised on the classics, I fell in love with folk music at an early age, became enamored of what's now called soul while still in my teens (in the best place for it—the Mississippi Delta), was forced to accept Romantic sonorities by JGH, listen to C&W sometimes, like Gospel, look back nostalgically on musicians as completely in synch with their times as the Beatles, have been acclimated to hard rock (from the '70s primarily) by JA—and even have had to say a good word about Wagner, at RL's prompting.

I listen in an unusual room, 20' by 35' with an 11' ceiling—almost 8000 cubic feet. Although heavily carpeted and furnished, the room is not at all dead—not nearly dead enough for JGH, who is, for my tastes, too accustomed to his Tube Traps. Amplification for this review was provided by Mark Levinson, in the form of the Nos. 26 and 20. Source material was analog LP (no digital-to-analogs, thank you) played on a Well-Tempered Turntable (the best value ever in a $1000–2000 'table-plus-tonearm, in my opinion) with a variety of cartridges, none of them spectacular. Interconnects varied, but tended toward the "lean and clean" school, as exemplified by Straight Wire, Discrete Technology, and Audioquest. Speaker cabling was the super-exotic Kimber 4AG recommended by DO in Vol.11 No.7. (That's about right, wouldn't you say? $3000 worth of cable to drive a $1090 speaker? Such are the luxuries of review samples.) Also included was CD listening, on both the Denon DCD-3300/DAP-5500 combo and the CAL Tempest II.

Attuned readers know that I fall into the digiphobe category, though not unreasonably I hope. Well, the Tempest II is almost enough to get me out. It adds to the convenience inherent to CD—and I don't care what machine you use, they're all a helluva lot easier than even a B&O record player—an ease of listening that's very tempting. Only when ultimate transparency and that "see-into" quality are necessary, or the ultimate performances which in my experience are found only on LP, is LP the only answer. Still, that's most of the time, especially when you're reviewing equipment.

My currency with the field requires some defense as well, I would think. While no one can truly remain current in loudspeakers, certainly JA is doing one of the best jobs in the US today, particularly in the price category of the Thiel CS1.2. I can claim neither his breadth of experience nor his technical thoroughness and qualification. I have, however, spent a good deal of time listening at his house. I have spent an even larger amount of time listening at JGH's, and am intimately familiar with his Sound Lab A-3S, both their good and bad points. More important, I've spent a bit of time with two speakers I see as directly competitive with the CS1.2: the Magnepan MG2.5/R (which still, I think, competes in the same class even though it costs 40% more) and the Spica Angelus, a design with most competitive values at the same price (though my impression is that its commercial success does not put it in the same camp with Thiel).

In the end I must win you over with the cogency of my argument and the correctness of my observations; you alone will be the judge. After this much hot air, on with the reviews.

Thiel CS2: $1650/pair

Although my original intention was to review the CS1.2, I have chosen to cover the entire Thiel line for two reasons: I've listened to the CS2 and CS3.5 for a long time and have a bit to say about them; our original reviews on these products date back to October '85 and January '87, respectively, and I feel that an update is in order from that standpoint alone. In addition, the Thiel line of speakers, particularly the CS2, has generated the most controversy among our staff, mostly based on informal audition at Consumer Electronics Shows or at dealers. A remark like "Thiel! How could you possibly stay in the room with it?" is not untypical. Because of the informality of the observations, these exclamations have not been committed to type, but I suspect that similar comments have been repeated by consumers as well. (This suspicion was confirmed reading over the "ballots" from our most recent Santa Monica Hi-Fi Show, in which the Thiel demonstration was quite widely decried.)
Phase coherence

Phase coherence is a subject every bit as complex as loudspeaker waveform radiation. Purists such as Thiel maintain that their 6dB/octave slopes are the only way to truly maintain phase coherence; John Bau of Spica can show you on his Tecron analyzer that the Bessel 4th-order low-pass filter he uses to cross his tweeter down to the woofer on his TC-50 and Angelus, when used with the particular drivers he chooses, is also phase coherent.

Not mentioned by any of these designers, but surely important, is that the loudspeaker radiation is phase coherent and thus aligned in time (the term "Time-aligned" is a trademark of Ed Long and thus cannot be used by others; the idea cannot be patented) only with respect to one listener's seating position (and only one listening height, something that is always proving a problem for JGH, who is notably shorter than average). And that the off-axis radiation of the speaker, which can provide up to about 35% of the acoustic energy at your ears (depending on the deadness of your room), cannot possibly be phase coherent and time-aligned. Contrast this to a French horn, for instance. Although far from an omnidirectional radiator — why do you think horn players vary the direction of their bell depending on the importance of their part? — the French horn is optimally coherent in a way that no multiple-driver loudspeaker can ever be. This is one reason why planar loudspeakers, particularly those with no crossovers, have retained their popularity over the years. Planar loudspeakers are nevertheless plagued by many problems, and cannot, in my opinion, make any claims for inherent phase coherence.

For me, the proof is in the pudding. The hallmarks of phase coherence, whether we're talking about speakers where 'Coherent Source' is a copyrighted trademark, as with the Thiels, or simply an important design factor, are solidity of image, correctness of timbre even with significant movement within the listening position, and a general sense of everything within the soundstage hanging together. —LA

Frankly, it's not hard to make the Thiel CS2 sound bad. I've heard it sound bad at Shows, at dealers, in other people's homes, and at my own home. Nevertheless, it's the speaker I've had hooked up at home for the second longest period of time over the last three years — second only to its larger brother, the CS3.5. But I precede myself.

The CS2 demonstrates, along with its Thiel brethren, a Scandinavian appreciation for the finer qualities of wood; the shape of the speakers, too, evokes a Scandinavian air. It would be hard to overemphasize how much care goes into their appearance. Teak is standard, hand-somely finished and, unless my samples have been handpicked, pair-matched veneers are mandatory. My most recent pair was Rosewood, which costs an extra $300 ($250 on the '1.2 and $350 on the '3.5). If you've got the bucks, and value both wood and the enhancement of your listening space, it's more than worth it. (The only speaker I've run into whose wood is more sensuous is the IRS Beta in Padua.)

The CS2 is a three-way design, with the 8" bass woofer port-loaded. Shallow, 6dB/octave crossover slopes are used at 800Hz and 3kHz, the first-order crossover being the easiest with which to maintain phase coherence (see Sidebar). A 3" cone midrange and 1" Dynaudio soft-dome tweeter fill out the driver complement. Crossovers boast air-core chokes and polystyrene capacitors — a not insignificant inclusion for a product in this price range.

The CS2 is quite a good-sized speaker, at 39" high and a solid 62 lbs. each, but feels small in the listening room due to its sloped-back front baffle and, probably, its attractive looks. You might be confused by Thiel's literature, which appears to show a speaker with grille and without grille, though in the latter case there is a lot of sculpting visible on the front of the speaker to provide anti-diffraactive effects. The "un-grilled" speaker shown actually does have the grille installed, but without its cloth. The cloth is not in fact readily removable, so don't be surprised if you never see a Thiel CS2 in this unclothed condition (except at a Thiel dealer equipped with a special naked grille for demonstrating the anti-diffraactive sculpting). The speaker is definitely intended to be used with the grille on.

I discovered this in two ways: First, upon receipt of the CS1.2s, I noted that the grille
could not be readily removed, as was the case with my almost-original sample of CS2s (now two years old); second, I read in the '1.2 instruction manual that they were intended to be heard with the grille on. I do not remember this caution from the original CS2 manual, but upon receipt of a fresh pair of CS2s last week I found that they, too, had not-easily-removable grilles and the same instruction. (Since then I've found that the instruction was contained in the original Thiel manual, albeit in an easy-to-ignore location; it is also repeated in light print on the interior of the base of the speaker where the cables are attached—a location where I admit I don't do much reading.)

In any case, you may rest assured that the grille is an important element of the CS2's sound, as noted later. I regret that, either through my quasi-invincible ignorance or through lack of clear instruction on Thiel's part, I spent the bet-
ter part of two years listening to the CS2s without grilles. Don't make the same mistake. (It's much harder now that the name strip at the bottom of the grille screws it in place.)

The CS2, as all Thiel speakers, comes supplied with ferocious spikes to overcome the insecure base provided by a carpet or wood floor. Valuing the wood in my floors just as much as that on the surface of the speakers, I approached use of these spikes with real trepidation. Upon finally overcoming my fears, I found that the spikes yielded real, if not overwhelming, advantages. As generally noted elsewhere in these pages, and to varying degrees, the improvements were primarily in image specificity, lower midrange, and a general increase in the "security" of the sound. These are not areas where the unspiked CS2 is weak, however, and I would be the last to laugh at an audiophile whose love of his or her floors led him to just plop the speakers sans spikes down on the carpet. And, if you use them, settle on a correct speaker positioning before installing the spikes! None of their benefits made me want to jump up and shift the speakers ever so slightly, you can be sure.

AHC found that the CS2s benefited from "inch by inch experimentation" in room positioning. While I would agree that such experimentation yields audible benefits, it would be wrong to infer that the CS2s are tricky to set up. In my unusually large rectangular room, I had little trouble finding a good position for them. In fact, I could adjust the apparent room size from which the performance came simply by moving the speakers closer together or farther apart (with appropriate compensation in toe-in). My preference is for a relatively close seat, with my ears some 10½' from each speaker. The speakers were located 11' from the wall in back of them, and my room offers the luxury of an even greater distance in back of my listening seat. This large amount of room tends to give all speakers a similarly spacious character (JGH objects to this quality of my room), but the various Thiels have been the best at taking advantage of it. In addition, the size of the room makes a fairly close seat mandatory, as other locations in the room have almost an echo, which in the listening seat is diminished by the dominance of the early-arrival sounds. I have found that listening positions as close as 5' (which feels like you're right on top of the speakers) are perfectly satisfactory, with appropriate additional toe-in of the cabinets. It does give a "large headphone" type of effect (which some may like), but I would definitely prefer that to restricting the space behind the speakers, which I find a necessity in the creation of an "involving" acoustic. (For my preferences in this area, see "Final Word" in the December '88 issue.)

Thiel's general advice is to position the speakers facing straight ahead, though they also recommend experimentation. I would switch the recommendation around: start with the speakers anywhere from facing right at the listening position (CS2) to only mildly toed-in (CS3.5). If the soundstage seems too small (on a recording with generous hall sound), move them a bit farther apart and toe them in a bit more. You should be able to get an almost-optimum position with 30 minutes of experimentation using various recordings; a few days more of listening will give you the feedback necessary for the final tweaks. (Then install the spikes.) In my listening situation, straight ahead left a noticeable hole in the middle of the soundstage, but Thiel is correct in pointing out that this characteristic will vary with every listening room. The off-axis frequency response of the speaker, particularly the tweeter, also affects the degree of toe-in you will want. Thiel speakers benefit on occasion from a bit of high-frequency rolloff, which sitting off-axis from the tweeter provides to a small degree; this has to be compromised depending on the soundstage recommendation noted above.

Spectral Balance: This is the area in which Thiel speakers in general, and the CS2s in particular, arouse controversy. Although Thiel is not a declamatory company, Jim Thiel has all along been adamant in his insistence that a speaker be amplifier-like in its neutrality, with no "pleasant" rolloffs to make up for errors elsewhere in the system. I admire this stance, if only for the purity of its idealism, but it presents at least two problems. The first is simply a market problem: If you're up against a "forgiving" speaker, and very many of your potential customers have systems that require such forgiveness (Why does religious language keep creeping into these engineering realms?), then you won't sell too many speakers. For the idealist, particularly one as successful at selling speakers as Jim Thiel, this is not a philosophical problem; if you sell enough to stay in business,
or expand by 35–50% for every year of your existence, as Thiel has done, who needs more?

For the ultimate speaker designer—he or she who would start from the ground up to create a new order of speakers—this philosophy has another problem, one that has actually been at the root of many flawed (and unpleasant-sounding) audio designs: One's insistence on accuracy masks the real, and aggravating, errors (inevitably) contained within one's own products by one's insistence that the product is "ruthlessly revealing"—the source of any problems heard must be searched for elsewhere. (How many times have you heard that one in the pages of subjective review magazines?)

With the instance at hand, the problem noted by the Stereophile reviewers referred to earlier has been an overly forward, aggressive sound attributed to Thiel's insistence on flat high-frequency response. This is strange: extended high frequencies—say, flat from 10kHz to 22kHz—do not yield an aggressive, forward sound. At their worst they give you accentuated surface noise and sibilants, and possible long-term listening fatigue. This can happen even with superb designs, for two reasons: Recordings are made close up, and thus contain much more high-frequency energy than either live music or any other "natural" sonic experience (cymbal players and airline travelers excluded); and, all forms of analog distortion add energy that is higher in frequency than the fundamental, thus tilting all reproduced music toward the high frequencies by the time it gets to you, even when recorded with utmost naturalness. (One of the reasons for digital's "unnaturalness" is that what can be the predominant distortion, aliasing, appears lower in frequency than the stimulus for that distortion.)

On to how I think the speakers sound. Here I must review at least two speakers. I have actually auditioned three samples of the CS2. The first arrived soon after AHC's review in 1985, but was almost immediately replaced because, as I remember, the midrange drivers had something wrong with them. Then came serial numbers 2975 & 2976, the lovely rosewood speakers I've had for over two years (the ones with the readily removable grilles). They are the pair that have most formed my impression of the CS2. Then, just last Friday, arrived serial numbers 8083 & 8084, sent when Thiel heard that I was going to discuss the '2 along with the '1.2—just so I'd have an up-to-date sample.

AHC's original description of the CS2 is accurate, as far as it goes: neutral tonal balance, very deep bass considering size and price (~6dB at 43Hz in JA's measurement), an intimate, tactile midrange, a flat and smooth high-frequency response. I would agree wholly with this assessment; the highs themselves have only been a problem when the source material or driving amplifiers have been flawed.

But I have to add that there is, in my rosewood samples, an aberration in the 1–6kHz range—where, as you probably know, our hearing is most sensitive. The most expressive way of describing this problem was coined by JGH, who visiting my old house (where the CS2s were set up): "From in here, they sound live." The speakers were playing in the living room, we were sitting in the dining room and separated from the speakers by a 16' thick adobe wall with a door in it. The unfortunate part was that in the listening room the sound generally was too aggressive; it did not sound live. This same response has occurred in my current house, except that the dining room has a 6' opening into the living room; the degree of discomfort with the CS2s has been correspondingly greater.

I'm certain this is the problem referred to by our reviewers, but let me emphasize that this is extremely equipment-dependent, and also has a lot to do with your actual listening position. I have had many different kinds of electronics, speakers, turntables, and CD players in my houses over the years that I've listened to the CS2s. Any product with an aggravating upper-midrange or high-frequency characteristic (the highs are smooth, but they are flat; the speakers will not tolerate problems in this region) made for an immediately unfavorable match. Frequently, even products that came out neutral in other listening situations would not show well with the Thiel's. The best components I've found for use with the Thiel's are those listed at the beginning of this review. Even so, I found that LP listening could be excellent, with very well recorded music, and tolerable with that which was less well recorded. CD, however—even CDs that I regard as excellent, such as the Chesky Sibelius 2—ranged from discomfiting to unbearable. This characteristic was alleviated significantly with the CAL Tempest II, but I think it's hardly fair to recommend a speaker on which CD can be auditioned only with a $2200 CD player which,
even given CAL's success, can be owned by only a tiny number of prospective speaker purchasers. The Denon combination (DCD-3300/\ DAP-5500) is much more representative of what's out there, and it is actually superior to a large majority of the machines. On it, I simply didn't want to listen to the CS2s (and, though it's inferior to the CAL, the Denon was quite acceptable with the Magnepan MG2.5/Rs or Spica Angeluses).

What was the problem? Basically, if you take the characteristic brightness of most CDs, and act as if these older CS2s had a special sensitivity to that brightness, you've got it. It was as if the speaker "took off" at those frequencies, making even excellent CDs unpleasant if not played back on the best, most forgiving machines.

After long and careful audition, without knowing that current production was in any way different, I concluded that the Thiel CS2, in terms of its tonal balance, could be recommended, but only in quite specific circumstances: with forgiving electronics (the Levinsons are as good as any I know of in this area, railed by the VTL amps) playing LPs, particularly using a moving-coil cartridge with the ubiquitous upper-midrange suckout (but not the ubiquitous rising high treble). I was disappointed to come to this conclusion, given the speaker's other virtues; it is not a recommendation that could have survived weeding-out for the next "Recommended Components."

Fortunately, this problem with the CS2 must not have been unknown to the people at Thiel, though they have never mentioned to me that ongoing production changes, which occur with all manufacturers, would have been aimed at it. Nor would I say that the changes wrought with my newest samples (finished in a black plastic laminate—similar to high-quality Formica—that is a dead ringer for black lacquer) could justify a different model number or "point 2" (though I've heard that might be in the offering for the CS2, probably sometime late in 1989 or early 1990).

Rather, the change that has been made—which somehow fails to change the overall character of the speaker while at the same time making it much easier to live with—converts my judgment of the CS2 from a reluctant thumbs down to a cautious thumbs up. It is still necessary to use electronics that fall into the forgiving camp, though you can probably now spend much less money. I haven't tried it, but I suspect even a lowly (though highly recommendable) B&K ST-140 would do. I still recommend using the best CD player you can buy, and high-frequency grunde must be avoided at all costs. But now, the best CDs can sound fabulous, with no penalty on LP. The speaker's other virtues (see below) now predominate. One is aware that the upper midrange is not to be abused or trifled with—sort of like a placid lion in the wild—but it can be overlooked and the music enjoyed. I will be interested to know what was done to accomplish this subtle but very important improvement.

I should also mention listening position. Most often, just the right listening position has its primary importance with respect to soundstage and image correctness. With the CS2, the correct listening position also has a dramatic impact on spectral balance. For two reasons, I think: first, the Thiel's off-axis high-frequency response is almost as flat as the on-axis,\(^1\) resulting, in any reasonably live listening environment—such as mine—in a lot of reflected high frequency in the room. Being in other than the correct listening position, where direct radiation from the loudspeaker dominates, results in a notably brighter sound. Second, the Thiel's, more than other speakers, depend on their whole package of virtues to make their case. The Thiel tonal balance, sans the Thiel achievements in imaging specificity and soundstage coherence, fails to convince.

I also found the grille important for ameliorating the CS2's tonal balance "problem"; it may be that part of my difficult reception for the rosewood CS2s was due to their predominant lack of grilles. As an experiment, I did some listening to the newest sample without their grilles. Sure enough, back came that extra sharpness and, to some degree, the intolerance. But only halfway—the old CS2s still had substantially more of the characteristic. With the best recordings, the lack of a grille actually improves the sound (though I'm sure the people at Thiel will not agree with this): There's less between you and the music, the speaker is more there, the sound more vivid. Considering your whole record collection, though, you will definitely

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\(^1\) This is a design decision I disagree with—though I'm hardly the one to offer my credentials as even in the same universe as Jim Thiel's. I feel that smoothness of off-axis response is crucial, but I prefer it gently rolled-off—say, at 6dB/octave. This results in an overall in-room tonal balance that is both easier to live with and more characteristic of live music.
want to leave the grilles on. Overall, their presence is so positive that I don't even recommend you experiment.

I'm afraid this discussion has focused overlong on only one characteristic of the Thiel tonal balance. There are many other virtues to be heard here. The bass, though bass reflex, is well controlled and extends to satisfyingly low frequencies, only when severely strained giving a hint of looseness, say, in comparison with the Thiel CS3.5, which is non-pareil in this area. On organ, kick drum, synthesizer, and the deepest orchestral fundamentals, you will certainly notice a lack of immense power and underpinning, but this will not show up as a lack of fullness on bass guitar, male voice, tympani, or other than quite low orchestral fundamentals. The bass will play reasonably loud, with a lesser sense of strain than the competitors I surveyed. The Spica Angelus is not unsatisfying, but conveys less rollicking enthusiasm; the Magnepan '2.5 is big-sounding but does not go as deep, and compresses a bit at high levels. Still, with the CS2 you do well to pay attention if you begin to sense strain, particularly if you listen in a large room such as mine. The woofers can give out, but even more sensitive, particularly to upper-bass and lower-midrange transients, is the midrange driver, probably due to the 6dB/octave crossover slopes. I managed to do in a number of midranges (though this was partially due to a problem Thiel had with the production they received from their supplier; this problem has been solved for some time now).

More important than this indviduation of tonal-balance areas—bass, midrange, upper midrange, highs—is the fact that the CS2 integrates the sounds it produces extremely well, as noted by AHC in his original review. All speaker designers face the problem that achieving excellence with one driver can frequently make the speaker sound worse overall due to dissimilarities between inherent driver sound or radiation patterns. I feel that Jim Thiel is right at the top of a small group of designers—I would include John Bau, Richard Vandersteen, Jim Winey, and Robin Marshall in this group—at getting his products, all of them, to sonically cohere. It takes hard work, perseverance, and a bit of genius.

**Soundstage and Ambience:** This is where the CS2 really shines. Except for a somewhat inferior capability at defining the overall size and character of the listening hall, it is every bit the equal of its larger brother, the CS3.5—which is itself as good as the best I've heard (with the exception of much, much more expensive products like the IRS Beta and WAMM, which, again, excel in their definition of the space in which the performance takes place). In the very important area of individual instrumental ambience—the "pools" of space within which each instrument performs, and which is audible on good recordings reproduced well—the CS2 excels. It may be the best I've heard in this respect, bettering its smaller brother, the CS1.2, as well as another speaker whose preservation of instrumental specificity is extraordinary: the Spica Angelus.

Some day Stereophile will have instruments other than our ears that can measure phase coherence; until then we will have to rely on those ears. To mine, the Thiel CS2 is astonishingly good in this respect. Both individual instruments and the performing group as a whole hang together with remarkable conviction. As pointed out above, other speakers better portray the hall in which the group is playing—I suspect because of deeper bass response which lacks the phase disruption near resonance of a bass reflex design—but the CS2 is damned good. There are not too many speakers at any price which surpass it.

In fact, I would say that, now that the newer CS2s have largely conquered their insensitivity to impure midrange phenomena in the preceding chain, one is freed to simply pay attention to the instruments and singers that are playing—almost as if they were right there in the room! (Somewhere back when I became enthusiastic about hi-fi around 1961, I remember thinking that was what this hobby was all about.)

**Dynamics:** The dynamics of live music is the singular area where generally little progress has been made in high end, outside of heroic—and vastly expensive—efforts like the Wilson WAMMS, the Dunitech Sovereigns, and the various IRSes, all of which are able to easily deliver SPLs that, if not literally reproducing orchestral sensations, begin to overwhelm you in the same way. In fact, a convincing case could be made that the huge woofers of the '50s and the greater prevalence of horn-loaded systems in those days made that time a better one in

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terms of imitating the dynamics of live music. I am certain this is why the Klipschorn maintains such loyalty, even among readers of this magazine.

What has changed is the amount of coloration that must be suffered at lesser levels of dynamic performance. The Thiel CS2 doesn't break any new barriers in this area, but is able to preserve its sound character almost unaltered within a significant dynamic range. Many speakers change significantly in clarity (usually improves up to a point) and tonal balance (gets steadily brighter with increasing SPL) in the output area of 60–95dB. Within these relatively conservative limits, live music does not. (Above 95dB, it's common for your ears to experience both compression, ringing, and a kind of splattering effect that begins to increase your level of tension with increasing SPL.) The CS2 is one of the best I've heard at maintaining its character within these limits. It will play louder than 95dB, but then you are aware of both compression and some disorder in the sound; your usual response is to turn down the volume. The range I've specified, though, makes it almost ideal for chamber groups, small numbers of voices, most jazz, and pop or rock if not played at loud party levels. It's fine on orchestra, kick drum, and loud rock, but you have to settle for sub-live music levels. This is no insignificant accomplishment; in my experience you have to go to a substantially larger speaker to do better.

Summary: Overall, my evaluation of the CS2 has changed substantially on listening to their new samples. I used to see it as a model with many attractions but flawed by the difficulty of making it sound easily natural. Now it is a speaker whose attractions—primarily a neutral and very well-integrated tonal balance and very precise retention of image size and individual ambience—can be realized quite readily, but only if you're willing to take care in setup and selection of associated components, and have the interest to really pay attention while listening.

Thiel CS3.5: $2450/pair
You'll be relieved to hear that my discussion of the CS3.5 will be shorter—primarily because most of what needs to be said has already been said, and more recently too.

Were I to say that the '3.5 is simply a bigger version of the '2, I wouldn't be too far off. It weighs 15 lbs more per speaker, goes significantly deeper in the bass, and will play louder. Were you to see a pair of '3.5s in one store and '2s a few weeks later in another store, you could be forgiven for thinking they were the same product. (Thiel has kindly put different finishes on my different pairs so I don't fall into the...
same confusion.) The typical Thiel attention to finish quality is present here to the same degree, and the gently tapering front panel as well.

With the '3.5 (which followed the CS2 by nearly a year and a half) Thiel has incorporated the anti-diffraactive front-panel effects, which appear to me to be more through-going than on the CS2, into the baffle itself, rather than relying on the grille. You may therefore use them without grilles, as I have, particularly if you find the front-panel contouring attractive.

The '3.5 and '2 have similar tweeters, and their upper-range behavior is, not surprisingly, just about identical. The midrange drivers are different, though, with the one on the '3.5 appearing to me to be much the heavier-duty, with a substantially larger magnet. Although their power-handling capabilities have been in my experience about the same—both were plagued by failure in response to upper-bass and lower-midrange transients—I suspect that on the '3.5 I was led to play the speaker louder because of its overall greater loudness capability.

More important, though, the CS3.5 has never suffered from the upper-midrange problem of the CS2. While preserving the general forward character typical of all Thiels, and their extended high frequencies, the '3.5 is more "generous" than the '2; it lets you get away with more. I should emphasize that I have still never heard it sound good with anything but superbly clean electronics, but it has not demonstrated the same lack of affection for CD that I found with the earlier '2s. (I've demonstrated that lack, but not the speaker.)

The biggest difference between the '3.5 and the '2, however, is in the bass. The '3.5 is a sealed box, has a woofer with 65% more radiating area, and uses a custom equalizer, made for insertion between pre- and power amp or in a tape loop, to modify the low-frequency response. This is claimed to yield flat response down to 22Hz, which JA and I confirmed when we were attempting to deal with Bud Fried's accusations about our supposedly screwed-up measuring techniques when reviewing the Fried G/3.2 (It turned out we had been right; in my listening room, the G/3 rolled off below 40Hz, being 9dB down at 31.5Hz and -18dB at 20Hz, while the Thiel was flat to 22Hz.) But from a measurement standpoint, the '3.5 has not pulled a rabbit out of a hat; we observed significantly high distortion from the Thiel's woofer when reproducing the range below 35Hz at 90dB.

**Tonal Balance**: As in physical size, with the '3.5 you get a bigger sound than from the CS2. This is true even without the equalizer; with the equalizer, you get an overall sound that suffers, as far as size is concerned, in comparison only with live music (which can be so much bigger than anything heard reproduced that I wonder we make the comparison) and much bigger, more expensive speakers. (The Vandersteen 4As, the Apogee Divas, the Sound Labs, the Dunelts, IRS Betas and Vs, and WAMMs come to mind. Interestingly, JA's Celestion SL700s, under the right circumstances and in his room, can just about match the Thiel.)

This is due to bass extension, loudness capability, and the generosity I referred to above. At the same time, the blending of drivers is just as good as with the CS2, and with greater difficulty since a significantly larger range is being covered.

Perhaps my focus on the "problem" in the CS2, now essentially cured, led me to pay inadequate attention to the high-frequency behavior of this tweeter. Its response is essentially flat out to 35kHz (according to information from Thiel), and sounds that way. The upper harmonics of triangle and cymbals are preserved with excellent detail. If I could make a criticism, it would be that as a listener you are made too aware of high-frequency information. This is certainly equipment-dependent. Use anything in the neighborhood of a typically transistory amplifier and you will be driven from the room.

Use an old-fashioned tube amp and you will essentially be throwing away the upper range of the tweeter; something in between—a forgiving transistor product, such as the Levinson 20, or an extended tube product, such as the VTL—is called for here.

But the situation—I don't know whether to go so far as to call it a problem—is not simply a matter of level or of accurate reproduction of an inaccurate input signal. Although I don't hear from this tweeter what JA refers to as typical soft-dome spittiness, I do feel there is a mild amount of "splash," where high-frequency transients are spread out in time just a bit, which makes them more apparent than they should be. They don't disappear quite quickly enough, as they do, for instance, on Gordon's Sound.

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2 See *Stereo phile* Vol.9 No.7 and Vol.10 No.1.

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Labs or with the Magnepan ribbon. I am not as much of an enthusiast about metal-dome tweeters as some, though the best of them offer very clear advantages over all but the best alternatives in soft-dome tweeters. I'm unconvinced that simple substitution of the metal-dome unit that Monitor uses, for instance, would better the performance of the '3.5, but I do know that it could be improved in this area. I offer this criticism partially to you as users of the '3.5s, so you can carefully match your associated equipment; I also offer it to Jim Thiel as my idea of where his future designs can go.

As would be implied by the flat-to-22Hz spec, the '3.5s are truly impressive at the low end. I would tend to characterize this advantage, though, as one of ease rather than range, and it is true only within some limitations. By ease, I mean that program material without much very low information—which characterizes most orchestral music—doesn't really sound different in terms of tonal balance, but it happens more easily. On the odd occasion that something low turns up, you experience no anxiety and no sense of loss. The limitations have to do with volume. If you want to hear a really loud bass drum, say at 100dB, or a tremendous orchestral crash, the '3.5 runs up against its stops. You will hear it, but there will be strain. Much larger speakers are necessary for this kind of performance with ease.

As far as low end is concerned, the advantage conferred by the equalizer (outside of certain organ and kick-drum fundamentals, which simply aren't there without it) is much more information about the hall character—a kind of "rounding out" of the performing space—and more body to low-sounding instruments: tympani, for instance, or low orchestral strings. There is a significant amount of music, particularly that recorded in a dry acoustic, where inserting the equalizer makes little low-end difference.

Ambience and Soundstage Retrieval: I mentioned above that defining the size and character of the soundstage was one of the places where the CS3.5 betters the '2; it also betters most other speakers in this regard. I think this is due both to better low-frequency extension and to the increased phase coherence of the sealed-box design. If the low-frequency rolloff of the "natural" '3.5 woofer is minimum-phase, which it theoretically is (though I don't believe that complex electromechanical devices ever respond this simply), then the equalizer's effect should be both flat frequency and phase response. In any case, the '3.5's soundstage integrity is excellent.

With respect to the preservation of individual ambiances, direct comparison between the '3.5 and the latest '2s now tells me that perhaps Thiel has done something with the '2 that he would do well to transfer to the '3.5, if possible. The '2 may now be better, though the difference is small, and it would definitely not be sufficient reason to choose the '2 over the '3.5. The '2 practically commands you to pay attention to the space around the performers; with the '3.5, it's just there.

Dynamics: I'm feeling like a broken record, but with the '3.5 you can take my comments about the '2, and simply increase the range by 4–5dB. This is not an insignificant change, however. Now you can listen to orchestral climaxes at levels I would call quite loud; now there are far fewer selections where you feel any limitation. At the same time, Thiel is able to preserve the sonic character of the speaker over the dynamic range. Perhaps you begin to feel a bit of anxiety in the 96–100dB output range, but not much.

This is not to say that dynamics are an area where Jim Thiel can afford to relax in his top-of-the-line product, nor is he. For more than the last year he has been working on the CS5, the "see God" speaker I referred to in a Show report back in 1986. (This odd expression derives from Jim's encounter with one of his dealers who, though happy to sell the '3.5, demanded that Jim work on a product which would "enable me to see God." ) One of the CS5's features will be, I think, four woofers of the same approximate size as the '3.5's, but of custom design. I see two challenges for Thiel: manage to retain the phase and tonal balance coherence of his current designs in a speaker that features both multiple drivers and very high output capability (approx. 115dB); and take advantage of this design effort by bringing down to at least the '3.5 the fruits of his efforts, to give it still greater dynamic capability.

This may sound like I'm happy with the '3.5, but can't be pleased entirely—which is true. I think the '3.5 can become a better speaker; a more relaxed dynamic (together with an ultimate tweeter) is the place I'd start.

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The Equalizer: Putting a line-level equalizer in a high-end speaker is like waving a red flag in front of the audiophile crowd, both press and consumer alike. My response is a bit complicated.

Overall, I have to say that I wish the '3.5 didn't have an equalizer, but retained the satisfying low end the equalizer provides. Part of this certainly stems from prejudice, part from rationality (after all, if I'm unhappy with phono-only preamps that cost less than $1500—half of which are simply equalizers—how can Jim Thiel do one for what must be only a few hundred dollars?), but part of it is a subtle feeling that all is not as well as without the equalizer. Initial listening tests of the equalizer in-circuit and out-of-circuit using the Levinson 26's tape loop led to a null result. I still retained my subtle residual dissatisfaction with the equalizer, but would have been loath to outright condemn it. Further listening on the eve of this writing, though, made it a bit clearer.

Using fairly high-frequency sinewaves (up to 10kHz), I heard some minor alteration of pitch with the equalizer in-circuit, usually a sharpening of pitch, but this would vary with the test tone, and even seemed to vary with whether I was listening on- or off-axis to the tweeter. (Lower test tones made the equalizer easy to hear, because of the bass boost; pink noise was the easiest.) My guess is that 2–10kHz squarewaves would be the best test signal for "hearing" the equalizer, but I didn't have them. On music, the difference could be heard, on occasion, as a slight sharpening of high-frequency tones, almost as if there was a little additional spike added to the spikier sounds. Much music is inappropriate for detecting this difference—which means that the equalizer is innocuous in its HF performance on much music. With other pieces, though, you had to choose between optimum high-frequency naturalness (no equalizer) and optimum hall sound or orchestral fullness (equalizer in).

What should you make of my vague preference for the non-equalized state? Well, choose one of three reasons given above, or listen for yourself. My resolution is to put the equalizer in a tape loop and experiment. In your system or to your ears the equalizer may be completely tame; if so, use it without reservation. Otherwise, use it where it makes the music better. I should add that certainly some of the difference I hear is due to interconnects and the tape loop of the No.26; nevertheless, everyone will have to use interconnects with this device, and mine weren't bad (Levinson and Magnan).

Overall, I have to conclude that the '3.5 is better with the equalizer. I just wish the equalizer itself were a bit cleaner, would let more of the music through; I think it needs to be as good as the electronics probably used in the system: Levinson, Threshold, Krell, Audio Research.

Summary: The Thiel CS3.5 is clearly Thiel's best product to date. It is also their best seller, in spite of costing 50% more than the next closest model. If you value the Thiel attention to finish quality and customer satisfaction, and are in sympathy with the Thiel general philosophy about sonic values—neutral, flat frequency response, excellent preservation of soundstage and ambience—the '3.5 is an easy choice.

Thiel CS1.2: $1090/pair
What is it now, 12 pages of intro? That's about right—reminds of the appropriateness of $3000 speaker cables. If all reviews in Stereophile ran this long, we'd have a hard time covering the field.

Until now we've been going up in price, even concerning ourselves with the upcoming CS5, which should cost in the $7000–8000 range. Now we will move down in price, which, especially for someone with the high ideals of Jim Thiel, is hard to do. It is true that the basic model Thiel started out with in this size speaker cost $640 back in 1983. That was the 04, the first Thiel speaker reviewed by Stereophile. (JGH really liked the sound of the speaker, but gave Thiel a hard time about the unpacking instructions.) So from their standpoint, "this speaker" has been steadily rising in price. First the 04A went up to $750, then the CS1 (reviewed by JA in Vol.10 No.5) came in at $950, now there's the CS1.2 at $1090.

This might imply that these speakers are basically updates of each other, in order, but that's far from the truth. Even the '1.2, which shares the cabinet dimensions of the '1, is substantially different from its predecessor. Had Thiel given it a new name, rather than a "point two" designation, they would not have been going overboard. Though possessing the same dimensions, the '1.2 weighs 18% more than the '1, due to additional internal bracing and a grille that's twice as thick (to improve the anti-diffractive
grille design it shares with the CS2). Like the Spica Angelus, the '1.2 sports really a lot of weight for a speaker in this price range, particularly if you factor in the expensive crossover components used in each case, and the expensive drivers in the '1.2. High end is a good deal!

In addition, a new woofer from Vifa is used in the '1.2, as well as Thiel's first metal-dome tweeter (an aluminum-dome unit from SEAS with a 28kHz “oil-can” resonance). The crossover has been modified to suit the new drivers, but is not in itself an advance over the '1.0. It does not, as do some crossovers used with metal-dome tweeters, use any form of electrical damping or notch-filtering to deal with the tweeter's peak at resonance. Metal-dome tweeters all come with high-Q resonances; depending on the location of the resonance—the original Celestion SL6 and '600 rang at 22kHz, which bad to be suppressed—and the designer's preference, the resonance will be dealt with mechanically, electrically, or simply allowed to ring away. I was not surprised to find that Jim Thiel had chosen to use the tweeter in its “natural” form. In the past he has refused to include even gentle high-frequency rolloffs in his products, in spite of the criticisms directed his way, simply because he didn't like the sound of the filters. I can't imagine him liking the sound of the more drastic filters needed to suppress the fairly high resonant peaks found in metal domes.

In exterior appearance the '1.2 is identical to the CS1, and in that is simply a smaller version of the basic Thiel shape. Finish quality is the same—excellent. I was supplied with the black-plastic-laminate version, which I have found most handsome. (Until January 1 1989, black plastic cost nothing extra, but from that date a surcharge applies—ca $100, I'm told—due to high rejection rates.) In fact, my samples of black plastic and rosewood (which costs $250 extra on the '1.2) Thiels have made me less tolerant of their standard teak. Part of this is due to my general lack of affection for teak—cherry, rosewood, old walnut are my favorites—but it's also that I've now been spoiled by Thiel themselves. If you're seriously in the market for any of the Thiel models, I recommend exploring their more exotic finishes. Believe me, they'll welcome it—Tom Thiel, in charge of production, is a wood fanatic, as are they all.

I haven't commented on it, but the packing of all Thiel speakers is extremely good. This may be more important to a reviewer than a consumer—after all, your dealer will have had to deal with whatever shipping problems have been experienced—but it is typical of Thiel's attention to detail. And, it could be important to you if the product has to be shipped back to Thiel or to a new address. All the Thiel speakers come double-boxed, with appropriate padding to support the non-rectangular cabinet. In the instance of my recently-arrived CS2s, it was a good thing: the trucking company had thoughtfully crunched the top and ripped the side. The
speakers came through unblemished.

**Tonal Balance:** The CSI.2, as have been all the two-ways (the 04 and CS1 are the others), possesses a tonal balance more forgiving than Thiel's more expensive products. It is inevitably a bit compromised at the low end, quite noticeably in comparison with the CS2. The rest of the range is quite neutral, though, with no obvious colorations or annoyances. I feel that the metal-dome tweeter is superbly handled, particularly for a product in this price range. Products such as the Monitor Audio R952/MD, which have an admirable metal-dome tweeter, have excellent high highs, but I'm uncomfortable with their lower treble balance, which to my ear portrays an artificially detailed sound that can turn hard with not too much provocation. (I admit that my auditioning of the Monitor Audio has been informal, in JA's listening room. It is also true that only a portion of the '952's detail is due to tonal balance; the rest is real.)

One of the advances claimed by Thiel in the '1.2 comes from a redesign of the woofer to include a copper ring around the pole-piece, a practice Thiel originally used for the '3.5 woofer. This is said to maintain stability in the flux of the permanent magnet which is a part of all moving-coil drivers. This flux density has a tendency to "sag" in response to the work needed to move the woofer cone, and the copper ring—through a complicated electromagnetic interaction I couldn't quite understand and certainly can't verify—compensates for this sag. Impressively flat resulting flux-density curves are presented by Thiel, accompanied by an equally impressive curve of distortion reduction. In listening, the new woofer conveys a sense of low-frequency space better than the one in the CSI, but the low-frequency behavior of the '1 was already exemplary for a speaker this size (see the review in Vol.10 No.5). The '1.2 continues in this tradition, with a somewhat restricted extension (compared to larger speakers) but excellent definition—if anything, a bit more precise than the CS1.

JA was actually quite impressed by the CSI, and I was a little surprised to hear of a whole new model relatively soon after the '1's introduction. JA did notice what he felt to be an objectionable brightness in the CSI, and this is where I feel Thiel has done their most effective work. The range from 2–8kHz, for instance, sounds essentially flat to me. The very present, forward sound that Thiel favors is just as much there as on all the other models, but the CSI had a bit of gratuitous zing on strings, and an accentuation of tape hiss, which the CSI.2 lacks. I am almost willing to declare that the metal-dome tweeter in the '1.2 is better than the Dynaudio they're using in their most expensive models; it is definitely very smooth, but I want to listen even more to decide whether it delivers better high-frequency performance than the CS2 and '3.5. One indication that this might be the case, which I found fascinating, was that I could hear, on the CSI.2s, the gentle rain on the roof of the performing site where Mike Skeet and Martin Colloms recorded Ivor Humphreys' flute for track 12 on the HFN/RR test CD. As soon as JA told me this could be heard on some speaker he was auditioning I started listening for it, but until the CSI.2s came along I never could distinguish the raindrops. With the '1.2s, you can! This makes those raindrops an absolutely fabulous test—they're either there or they're not.

The off-axis high-frequency radiation of the '1.2 is just as flat as the other Thiels, and it was at the feet of this off-axis radiation that JA laid some of the blame for the CSI's brightness. How sensitive you are to this "room" brightness will depend on your room and your listening position; when sitting in the nearfield of the speaker, the problem goes away.

As I said before, I feel the CSI.2 is now Thiel's most all-purpose speaker, the one that is easiest to recommend not knowing what else is in the system. I still auditioned the '1.2 using my $16,000 worth of electronics, but at no point did cautions appear with respect to source material. This is not to say the speaker lacks discrimination. As with all Thiels, you are immediately aware of the widely varying tonal balance present on different records, but with the CSI.2 none were particularly objectionable (I don't listen to DGs from the '70s). My completely hacked-up Junior Wells classic, *Hoodoo Man Blues* (Delmark DS-9612), for instance, which is not your basic audiophile purist recording, sounded great on the '1.2s. It's really easy for the surface noise and general corruption on this record to overwhelm the spirit of the music—which is extraordinary. A speaker that rules out *Hoodoo Man Blues* doesn't stand a chance in my house; the CSI.2 passed with flying colors.
Ambience and Soundstage Preservation: I found the CS1.2 to be substantially more flexible in positioning than the earlier CS1. It admitted almost as high a degree of distance between the speakers as the CS2 and '3.5 without sacrificing image coherence. The CS1s in my room yielded a soundstage a bit too cramped. The character of the soundstage—that is, the dimensions of the hall or stage, and their character—is inevitably less well revealed on the '1.2 than on the '2 or '3.5 due to a lack of low-frequency extension, but it is noticeably better than the CS1.

This should not be confused with image width and depth. In my experience, image width is determined by dispersion, low diffraction, and lack of peakiness in frequency response from the upper midrange on up—but it is affected more than anything by the recording you use, your listening room, and the speaker's position within the room. Even poor speakers can be mightily improved in this respect by correct setup.

I am of uncertain mind about image depth. Frequency response is definitely important here. Speakers designed to be really flat, such as the Thiel, tend to yield less average depth than a speaker with a presence-range dip; the Thiel sound more forward. On the other hand, it would seem that the key to good performance here is the ability to discriminate among recordings, where image depth varies considerably. Here, low-frequency response is important, but, that aside, the CS1.2s are quite respectable, even remarkable. Their ability to define the layers of the orchestra, for instance, seemed on a par with the CS3.5, perhaps even a little better, though it's difficult to say definitively since the '3.5 is so much better at the low end. The '1.2s are quite a ways ahead of the CS1 in their precision at establishing depth within the soundstage.

The preservation of individual instrumental ambience is the area where the '1.2 most suffers in respect to the CS2. The "pools" of ambience I mentioned above are suggested rather than portrayed. In some instances, the ambience simply isn't there, where it was with the CS2. My guess is that this problem is related to the woofer having to operate so much higher than in the CS2 (different woofer, too). All drivers have a naturally comfortable range, and one of the problems of two-way systems is that virtually no drivers have the four-plus octave range necessary for two drivers to span the audible range. With woofers, they tend to break up or simply get a bit out of control at the top of their range; I think this lack of control in the woofer is what obscures the ambience preservation on the '1.2.

Dynamics: Dynamics are quite good on the '1.2 when compared with the speaker in this price range I'm most familiar with, the Spica Angelus, but suffer in comparison with the CS2. (As I write this review I become more aware of what a good package the CS2 is; Thiel has really packed a lot in there.) I was nevertheless surprised that a room my size could be well-filled by a speaker of these diminutive dimensions.

The preservation of sonic integrity over a significant dynamic range is just about as good as the other Thiel's, but the range is smaller—say, a maximum of 90dB output before you begin to hear things go wrong. This is not to say that's the speaker's maximum output, only its maximum uncorrupted output. From 90dB up to about 98dB, you experience a progressive reluctance to listen louder. This, actually, is what almost all moving-coil loudspeakers do, and most listeners have come to depend on this gradually increasing sense of strain to know when to turn the volume down.

Comparisons: This review has suffered somewhat in that the comparisons so far have almost all been internal within one family of speakers. It is time, therefore, to bring on the Spica Angelus and Magnepan MG2.5/R.

John Bau of Spica and Jim Thiel share their reverence for phase coherence and time-alignment, but their products both appear and sound quite different. In the case of the Angelus, Bau has chosen to sacrifice low-end "whump" for greater control, and has chosen to stay with his faithful Audax soft-dome tweeter. Although this tweeter is now showing its age, in my opinion (it's also the one that best exemplifies what JA dislikes in soft domes), Bau uses it off-axis to make these problems less noticeable. The overall presentation of the Angelus is satisfyingly full at the low end without sounding quite full-range, and notably soft at the high end. Although the Spica will display the virtues of even very-high-end gear like that which I used for these reviews, it will also work fine with much more modest equipment.
Where the Spica really shines is image specificity. I have literally never heard anything as good. Images are so clearly defined, in both width and depth (and internally, an image characteristic rarely mentioned, which refers to the believability of that which the image portrays), they practically jump out at you—all in a completely natural manner. It’s as if with other speakers there’s a kind of thickness between the performers that disappears with the Spicas. On the other hand, the Spica is not nearly as good at preserving individual instrumental ambience, the space outside of the performer, as are any of the Thiels, including the CS1.2.

I would feel quite comfortable recommending either the Angeluses or the CS1.2s, but they will appeal to somewhat different people and work well in different systems. If you love highly specific imaging, the Angelus was designed for you. The Thiel also images extremely well, has a more extended and, to me, more natural high end, bass that’s more adequate, and plays loud with less anxiety. If you listen to the two I think it will be clear which you prefer.

The Magnepan MG2.5/R is in quite a different category. First, it’s a dipole with attendant problems in setup, as well detailed by both JGH and JA in Vol.11 No.6, which are much less of a problem with the CS1.2. In my listening room, though, both speakers set up with no problems. If you’re in that category, the ’2.5 offers a taste of very-high-end sound reproduction which you just don’t find in the under-$2000 price range. I refer, of course, to its ribbon tweeter. This may not be the best high-frequency reproducer ever, but it’s certainly close. It’s also the only one you can come close to buying at this price. In addition, the MG2.5 offers good, but different, soundstage reproduction. I say different because it has a character all of its own, with lots of size but a certain homogeneity from one recording to another. I assume this is because, more than non-dipoles, the soundstage is created in partnership between the speaker and your room. I also find the imaging somewhat less believable than with a Thiel CS1.2 or Spica Angelus, but not to the point where it is distracting. I love the MG2.5s because they work so well in my listening room, and I love clean and easy high frequencies. I still would have a hard time choosing them definitively over the CS1.2s. I suspect that, given their entirely different characters, you will have an easy time deciding if given a high-quality demonstration of each.

Summary: With the CS1.2, Thiel has brought nearly all the virtues of their more expensive speakers down to the level of the readily affordable, in a significantly better fashion than with the CS1. The changes from the CS1—a much better tweeter, more heavily braced cabinet, better diffraction control, a lower distortion woofer—are all positive, and at low increased cost. The ’1.2s image very well, play reasonably loud easily, have satisfying low-end extension, and possess a very neutral tonal balance with no significant aberrations. It’s most unusual to get this much sonic precision at this low a price. In addition, Thiel has created the first of their products to which it’s easy to match electronics. Although not a perfect speaker, I found its problems easy to live with. After noticing the shortcomings and omissions, I went on to enjoy the music. I suspect a lot of people will.

Measurements
To give a point of comparison with other recent reviews of loudspeakers in Stereophile, I asked JA to carry out his room-averaged response measurement on the three Thiel models, as well as measuring their impedance moduli, etc.

JA digresses
Figs.1 through 3 show the plots of impedance with frequency for the three Thiel loudspeakers. All agree with the appropriate specified impedances in the review heading, but it is noteworthy how little change there is for each speaker. Obvious features can be distinguished, such as the port tunings for the CS1.2 and CS2, and the box resonance for the CS3.5 at 33Hz, but I would conjecture that Jim Thiel has used some form of conjugate load system in his crossover designs to give such flat curves with frequency. (This is where elements are added to the crossover to compensate for phase and impedance changes to result in a simple resistive load.) I would suggest, therefore, that all three Thiel models should be easy to drive, even given the CS1.2’s and CS3.5’s 4-ohm rating.

Moving on to the in-room, spatially averaged responses (see my review of four loudspeakers elsewhere in this issue for the details concerning how and why this test is performed), fig.4 shows that obtained for the pair of CS1.2s with
their grilles on. (The CS2 was also measured with its grille in place.) The steep roll-off and relatively limited extension—the nearfield -6dB point lay at 50Hz, not counting the contribution from the port—are typical of the enclosure size, but from then on up the in-room response is one of the flatterst I have measured. The broad depression in the lower midrange is common to all speakers measured in my room, though it is normally a little deeper, while the moderate rise in the presence region I would suggest is a function of the wide dispersion of the tweeter in its first two octaves. There is less extra energy than usual in the room here, however, suggesting that the grille sculpting used by Thiel does offer a degree of diffraction control. Looking at the off-axis performance in detail reinforces this idea, as the high frequencies gently roll off to the sides without strong discontinuities. Vertically, with the wide frequency overlap between the drivers given by 6dB/octave crossover slopes, the situation is more complicated. Sit too high (45", say) and the low treble depresses; sit too low and the same region becomes too high in level. In my room, sitting with my ears around 33" off the ground gave the best balance.

The in-room responses for the CS2 and CS3.5 (figs. 5 and 6, respectively) look worse in the bass, but this is my fault. I was only able to carry out measurements on one speaker of each pair in one position; the elimination of low-frequency room effects by averaging is thus much less efficient than with the CS1.2s, where both speakers were measured. For some reason, the lower-midrange depression is deeper with both speakers than with the '1.2s; I suspect that the proximity of the woofer-to-midrange crossover frequencies to this room phenomenon may be responsible. The CS2 shows
a typical reflex LF roll-off—I measured its nearfield -6dB point around 43Hz, not including the port output—while the upper midrange and low treble are quite smooth. The peak in-room at 12.5kHz was audible, however, and results both from a slight excess of energy on-axis and from a wider dispersion off-axis in this frequency region compared with the octave or so below.

The CS3.5 can be seen to be better in this respect, with a better-controlled HF dispersion off-axis and a smoother balance overall. The effect of the equalizer set to its 20Hz position can be seen in the very extended low-frequency response in-room, to below 25Hz, though the LF measurements can only be regarded as approximate in a smallish room such as mine. The nearfield response extended even further, at -6dB at 29Hz (40Hz setting), and -6dB at 19Hz (20Hz setting). For completeness's sake, fig.7 shows the amount of boost applied by the equalizer in each of its settings. —JA

Addendum

When I began writing this review, my impression was that the various Thiel speakers represented sort of a small, medium, and large version of the same thing. But, as I've listened and relistened as I wrote, I realized that this was not quite true. Although the Thiels are undeniably from the hand and mind of the same designer, they each display a different point in the evolution of that designer's thinking about speakers within a particular price range and size. Looked at from this standpoint, the CS1.2, being most contemporary in design, is Thiel's most successful effort, the "new" version of the CS2 (I don't know at what time this newness came into being) is in second place, and the CS3.5, though overall Thiel's best speaker, is also the oldest design. It is as if Jim Thiel gets to polish up and mildly rework his designs every time he comes back to them—and you can hear the results.

Thiel is representative of just how great the high end in this country is; we should be thankful there are such companies. While good enough at the business end of things to stay around and prosper, their real strength is an almost unending thirst for better sound. There are many such people, whose real driving force is love of well-reproduced music rather than money: Conrad and Johnson, Jeff Rowland, Bill Johnson, Jim Winey, Leo Spiegel and Jason Bloom, Dan D'Agostino, Steve McCormack and Joyce Fleming . . . I could go on and on.

Jim and Tom Thiel, Kathy Gornik, and the others at Thiel Speakers are still working hard to make their products better. If you're in the market for one of the speakers in the price ranges discussed here, or even higher, visit your Thiel dealer for an audition. You may or may not like the speakers—and I hope I've given you an idea of what to listen for in each case—but you'll have heard something into which the makers really put their hearts.

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**THE MOD SQUAD DELUXE LINE DRIVE**

**AGT & PHONO DRIVE**

John Atkinson

The Mod Squad Line & Phono Drive

The Mod Squad Phono Drive: dedicated MC/MM phono preamplifier, with separate line-level amplifier with volume and balance controls. Measured specifications: Frequency response (phono): 5Hz–110kHz, -3dB. Frequency response (line): DC–85kHz, -3dB. Output impedance: 60 ohms at 1kHz (phono direct); 50 ohms (line out). Input impedance: 45k ohms (MM); either 10, 20, 40, 100, 200, 1000, 47k ohms, or user selectable (MC); 11k ohms (line). Phono Sensitivity: 5mV RMS for 775mV output (MM); 0.5mV RMS for 775mV output (MC); 125mV RMS for 775mV output (line). S/N ratio ref. 775mV out (phono MM): 64dB (unweighted), 88dB (A-weighted). S/N ratio ref. 775mV out (phono MC): 41dB (unweighted), 60dB (A-weighted). Dimensions: 16.5" W by 10.75" D by 2.5" H. Estimated weight: 7 lbs. Price: $1295. Approximate number of dealers: 115. Manufacturer: The Mod Squad, 542 Coast Highway 101, Leucadia, CA 92024-0965. Tel: (619) 436-7666.

Thomas Alva Edison may have had a fully equipped laboratory, with a team of assistants slaving every day over ideas to be adopted when ripe as those of the great inventor, but the image of American ingenuity which rings true to me is of the lone tinkerer, working alone and mixing a generous dose of good ol’ Yankee know-how with the sweat of his brow—a lot of it. These days, with the faithful PC and a hardworking CAD program at his side to do the math, the lone tinkerer seems to be thicker on the ground than ever, to judge by the humongous numbers of small companies selling high-end hi-fi components as revealed in Stereophile’s readership survey (see p. 5). Whether these loners will ever rise above their origins depends, among many other things, on their ideas being truly worthwhile.

One such tinkerer is The Mod Squad’s Steve McCormack. I remember being awed the first time I saw the Squad’s stapled catalog, way back in ’82 or ’83: there was page after page of detailed descriptions of how Steve could make Ittok tonearms, or Rogers LS3/5A loudspeakers, or Quad 405 amplifiers, or Spatial Coherence preamplifiers, or Meridian CD players sound better than their original designers had thought possible—or necessary. Who was this guy? I pondered from across the ocean.

A Connecticut Yankee, Steve worked at retail for Los Angeles dealer Jonas Miller, back when high-end meant Quatre and Mitch Cotter, Electro Research, and the various incarnations of the Audio Research SP3. He then acquired valuable experience at the sharp end of the reproduction chain by working as a recording engineer for M&K Realtime. After spending time on the road for Oracle, he and Joyce Dudney Fleming set up the twin-headed operation of The Mod Squad and Music By The Sea, the first to formalize his modifications and to offer a forum for his design ideas, the second to create a dealership working along the lines he and Joyce thought necessary for a high-end operation.

Then came Tiptoes, an elegant—and commercially successful—idea that set The Mod Squad on a different course. Joined these days by circuit-design engineer Jerry Boncer, Steve has steered the Squad upward and away from the art of modification—the modifications are no more, the shop being closed last July. The
Mod Squad has evolved into a bonafide manufacturer of American High-End components; it can now stand on its own feet.

The Mod Squad Deluxe Line Drive AGT: $900

The Mod Squad’s standard Line Drive, the one that's become the passive control preamplifier, costs a mere $500; Steve McCormack is the first to admit that it is a value-oriented design. His ultimate goal, however, was to construct a passive control system that would be sonically identical to plugging a source component directly into the power amplifier. The Deluxe AGT version represents Steve’s best shot yet at that goal: a slam-dunk of a shot in which nothing has been spared to wring that nth degree of transparency from the recalcitrant circuitry—or the lack of it.

It may be thought that $900 is a lot of money for a component that doesn’t feature one iota of active circuitry. Yet when I opened up the case of the Deluxe Line Drive, my immediate reaction was to think that it might even be too inexpensive, such is the labor-intensive quality of the workmanship and parts. This is a handmade item, in the best sense of the word. Starting at the logical place, three of the inputs have Tiffany sockets while two, “CD” and “AUX2,” the latter intended for connection to a phono preamplifier, have the expensive WBT sockets. The two premium input channels have their signals taken to the source selector switch with the conductor used by MIT for their 330 interconnect, while the other three use the uninsulated solid-core Wonder Wire used throughout the conventional Line Drive. (As these are uninsulated, they are routed via what looks like a patch of grooved carpet tile to hold them apart. This also minimizes microphony.)

From the selector switch, MIT conductor takes the signal to the tape selector, which also has a “Mute” position, then to the balance control (this having a central detented position and sourced from Noble), and finally to the volume control. This is the piece de resistance, a conductive-plastic attenuator from Penny & Giles compared with the conventional Line Drive’s Noble component. This component, used in such thoroughbreds as the Krell KRS2, alone costs more than the total parts for a typical inexpensive preamplifier and has a sexy, silky feel that, once experienced, makes all other pots feel unsubtle. (If Noble, Bourns, and ALPs are the Rolexes of the attenuator world, then Penny & Giles are the Blancpain.) MIT conductor then takes the signals from its wipers to the output sockets, one pair WBT, the other Tiffany.

Two tape loops are provided, the appropriate in- and output sockets connected to the selector switch with uninsulated solid-core wire, though it doesn’t appear to be possible to dub from one deck to another unless the source deck is plugged into one of the regular inputs. The tape outputs are buffered with series 2200 ohm resistors. Conforming to audiophile philosophies concerning magnetic distortion, the chassis is nonferrous, being made from aluminum, as is the black-anodized front panel.

Considerable attention has been paid to the grounding arrangement of the Deluxe Line Drive (AGT stands for “Advanced Ground Topology”), Steve feeling that the way it is achieved affects the transparency at high frequencies. Every ground connection, whether it be the body of each socket or the ground references for the balance and volume controls, is taken individually to a single “star grounding” point at the center of the chassis and soldered to it. (Wonder Solder is used throughout.) The user then has the option of whether to electrically connect the chassis to the star ground point for maximum shielding, or to leave it floating for maximum transparency. The chassis is grounded when a rear-panel switch is in the “up” position, which is advised in the owner’s manual only if hum or buzzing is otherwise apparent.

The Mod Squad Phono Drive: $1295

When I first saw the Line Drive prototype, back at the beginning of 1986, I had understood from Steve McCormack that a cartridge preamplifier/equalizer would soon follow, being a basic “black box” that would fit inside the control unit to transform one of its inputs to phono. After working on various IC or discrete-bipolar designs, however, Steve realized that in order to get the sonic quality he felt to be essential, he would have to revise the whole concept, circuitry and all. The result is the Phono Drive, a separate component that externally appears identical to the Line Drive, with

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1 As this issue was being sent to the printer, Steve McCormack informed me that a price hike on the Deluxe Line Drive was imminent, although he was unable to say how much it would be.

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its black-anodized front panel having four control knobs in identical positions. It too has an aluminum chassis, but this time damping material has been applied to the underside of the top plate to eliminate the last trace of microphony. Reducing the effects of vibration on the circuit has been a major priority for Steve, as has been trying to ensure that the circuit sees a stable thermal environment. With the same circuit in the open, he explained to me, as you wave your hand over it you can see noise and distortion levels change as the components are buffeted by the air currents. The Phono Drive chassis, which has no ventilating slots, is therefore used as a long-time-constant heatsink for all the major power-dissipating parts; once it has reached thermal equilibrium, it keeps the circuitry at a constant temperature. In addition, the most thermally sensitive components—the matched transistor pairs for the MC stage and their voltage-regulator current source—are enclosed in blue plastic boxes to act as little thermally stable "ovens."

The Phono Drive takes around two hours to come up to temperature, but attains its best sound after two days of warmup. There is no on/off switch; the unit is obviously intended to be left on all the time. Though fitted with a three-pin mains plug, the grounding pin is not connected, only being used to ensure correct polarity.

Looking inside the Phono Drive reveals one large printed circuit board, finished in black with tracks on both sides, that carries the power supply and both phono-section and line-section circuitry. A small pcb carries the Noble balance and volume controls for the line stage, these connected to the main board with Teflon-sleeved solid-core Wonder Wire. As this is directional, The Mod Squad takes care that its use is consistent with the way it comes from the drum, always following the signal flow. Components are laid out in a "Manhattan" configuration; ie, resistors and capacitors are oriented in two directions, at 90° to each other. The component quality is excellent. WIMA polystyrene and polycarbonate caps are much in evidence, while all the resistors appear to be close-tolerance metal-films (with the exception of one large, 1W dissipation type associated with the MC stage power supply). As with the Deluxe Line Drive, Wonder Solder is used throughout.

Following the electricity from the wall in its transformation from industrial muscle to music, the captive mains lead feeds a small toroidal transformer from the UK manufacturer Cotswold Electronics, the output of which is rectified and smoothed before being fed to a pair of LM317T/ LM337T regulator chips. These drop the supply voltage from ±37.5V to ±26.5V, and, as they carry the entire current required by all the active circuitry, run pretty hot. They therefore use the bottom panel of the chassis as a heatsink, which has the advantage of heating the enclosure to a steady temperature. The preregulated voltage rails are then further smoothed and taken in turn to the voltage regulators proper, another pair of 317/337s for both channels of the line stage, and a pair of series-pass transistors to provide the voltage rails for the MM and MC stages. Though these aren't required to drop as many volts as the preregulators, they also use the chassis as a heatsink. Considerable power-supply decoupling is in evidence throughout the board.

According to Steve McCormack, designing the MC amplifier involved a tradeoff between minimizing the noise and getting the best sound. After trying FETs, he settled on a matched differential pair of bipolars—though obscured by their plastic "oven" covers, these appear to be something like "Supermatch" National LM394s—followed by a p-channel FET source follower. A front-panel rotary knob, connected to a board-mounted switch by a long coupler, selects the MC-stage input impedance, from 10 to 1000 ohms. A sixth position selects a user-definable value, a pair of gold-plated sockets per channel on the board allowing the user to insert his or her preferred-value resistors. Without any additional resistors, this loads the MC cartridge with 47k ohms, which is recommended by many users (though not this one). The MM stage has its own pair of input jacks—all sockets are gold-plated Tifanys—and is selected by another front-panel switch; I measured its impedance setting as 45k ohms. Here Steve has gone for a differential J-FET input stage, with a bipolar emitter-follower stage. This then feeds an output driver using a pair of complementary MOS-FETs per channel, these heavily biased into class-A and sporting porcupine-like TO5 heatsinks. The output of what in effect is a baby power amplifier is then taken via Wonder Wire links to a pair of RCA sockets on the rear panel labeled "Direct Out." The phono stages are direct-coupled throughout; though the MC amplifier is "as is," as it were, the MM stage con-

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tains a DC servo circuit to minimize voltage offsets at the "Direct Out" sockets.

The Phono Drive also contains a line-level section, and here the user is given an option. As supplied, the phono and line-level sections are completely separate. By repositioning a pair of gold-plated circuit-board jacks, however, the phono-stage output can be connected directly to the line stage, giving, in effect, a dedicated LP replay preamplifier, complete with balance and volume controls and capable of driving long cables. The line stage appears to use a pair of complementary bipolar transistors per channel and is direct-coupled; no DC servo circuit is used, nor is there any offset protection, so users are advised to check their ancillary source components. (Such good housekeeping is always a good idea—I once destroyed a review pair of Celestion SL600s by attempting to drive the power amplifier with a defective preamplifier having 15V of DC offset on its outputs.)

Sound quality

The fundamental listening tests involving The Mod Squad Line and Phono Drives were carried out in a system consisting of the VTL 100W Compact monoblock amplifiers driving Celestion SL700 loudspeakers, though I also used the combination for all the loudspeakers that I tested for this and the next issue of Stereophile. In addition, the pair of Thiel CS1.2s reviewed by Larry Archibald in this issue spent a considerable amount of time in my system. Line-level source components included my stock Revox A77 for master tape replay, CD players from The Mod Squad and Marantz, the latter also used to drive the Sony DAS-R1 D/A converter unit reviewed by JGH in December. For LP replay, the source was the fully loaded Linn LP player (Sondek/Ittok/Trolka) sitting on a Sound Organisation table. Very late in the auditioning, the Ittok tonearm was replaced by an early sample of the new Linn Ekos arm ($1995), a fabulous component, in my opinion rivaling the SME V in midrange transparency. The cartridge was loaded with 100 ohms for all auditioning.

Loudspeaker cable was Monster M1, two runs being used to bi-wire the SL700s, while the interconnect between the Phono and Line Drives was MIT 330. That between the Line Drive and the VTLs was initially Monster M1000, then I changed to a 1m pair of MIT's new Shotgun 330 CVT at Steve's behest. This did sound excellent, but as time went on I began to have doubts. With the volume control well up, all was well, but the sound took on a dark character at lower levels. It turned out that the MIT cable has too high a capacitance (see later) to be optimal for use with the Line Drive; I ended up replacing it with Audioquest LiveWire Lapis. This gave a consistent sound whatever the level setting, though I am informed that it does take an unusually long time to break in, perhaps a couple of weeks, which meant that it was probably only starting to give of its best as this issue of the magazine went to press.

For comparison and reference, as well as my usual Krell KR52 ($4500), I had access to the PS Audio 4.6 preamplifier, fitted with its M-500 power supply ($1104), and the Vendetta Research SCP-2 dual-mono phono preamplifier that usually graces J. Gordon Holt's system ($1895). This only just had sufficient gain to drive the VTL amplifiers to levels high enough to boogie by via the Line Drive. (Don't you fret now. It was loud enough.²)

Looking and listening to the Deluxe Line Drive first, with CD and open-reel tape sources, I had expected this component to be very similar to both the PAS-01 passive preamplifier and to the PS Audio 4.6 preamplifier in its passive "Straightwire" mode, which had become my line-level reference following its appearance in the preamplifier review last December.

I was wrong.

Compared with the PS Audio in its passive mode, the Line Drive was just that much more open. It allowed the sound to breathe just that much more easily. Everything sounded just that much more like the real thing. And the ambience . . .

Let me tell you about the ambience.

The venerable Holt (in whom we have trust) has a tendency to put down my love of soundstaging. Indeed, he dismisses my quest for perfection in this area as some queer kind of quirk, brought on by too much rain and the lack of airconditioning featured in my typically British upbringing. Yet it was the realization that stereo playback had the intrinsic ability not only to reproduce the sounds of instruments and voices, "absolutely" if you care to use that particular adverb, but also to present a two- or

² The physical act of tapping the keys of the Toshiba in order to commit this review to floppy disk was performed exclusively to the Polydor James Brown LP collection. That's what I call classical music!

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even three-dimensional space between and behind the plane of the loudspeakers, that fired my interest in high fidelity. Prior to that damascene moment, as a practicing musician—I'm still practicing—I had dismissed records as a convenient consumer product that usefully added to a musician's meager income. But when I realized that a system can give the listener the illusion that he or she is listening into the concert-hall acoustic from what might be the best seat in the house—the listener as ultimate voyeur—the recorded medium for me sprang to life.

One of my standard test tracks for soundstaging is the Chopin Waltz recording on the HF/NRR Test CD. I recorded the piano with a Calrec Soundfield mic set to its crossed figure-eights pattern, and had to work hard to find the best position in the hall—which had, probably still has, a beautiful reverberation signature—to place it in order to get the best ratio between the direct sound of the instrument and the reverberant soundfield. In the control room (actually it was a small dressing room around 100' from the stage), using LS3/5As driven by a Quad 405 handling the direct output of the microphone preamps, the soundstage was awesome, stretching from the tip of my nose to infinity. I made two sets of recordings from the mic feed, one on my Revox A77 and the other on a Sony PCM-F1, of which the analog gets closer to reproducing the sense of space I heard in the control room and the digital gets closer to the actual tonal quality of the Steinway. The CD track was cut from the PCM-F1 recording, so when I listen to it, I am acutely aware of what it tends to lack when compared with what I thought I was recording when listening to the live mic feed. In particular, the hall tends to sound smaller and the instrument closer.

Feeding the CD version straight into the power amplifiers gave a soundstage indistinguishable from when the Deluxe Line Drive was in circuit. The soundstage remained wide and deep. I wouldn't go so far as to say that it approached that from the Revox (though the latter has its own sonic problems), but you could "hear the walls" — the decay of the ambience was presented with sufficient coherence that the recorded acoustic was laid bare.

Of the active preamplifiers available to me, only the Krell KRS2's line stage came close to the Mod Squad's midrange transparency, but was still identifiable when set to unity gain and switched in the Line Drive Deluxe's tape loop. The opposite was much harder, and in fact I have a suspicion that the sonic effect of whatever cables you use to perform such a bypass test is greater than that of the Line Drive itself.

Faults there were few, and I think were more due to the nature of the interaction of the source components and the total load of two sets of interconnects and the Line Drive between them and the power amplifiers. Dynamics occasionally seemed a little suppressed and the bass was very slightly softer than when compared with that from the Krell, particularly when the LiveWire Lapis was replaced with MIT 330 CVT or Monster Cable M1000. The Phono Drive was clearly more musical than the PS Audio 4.6, the latter, though excellent, having a slightly "electronic" nature to its treble in comparison. I therefore carried out detailed comparisons primarily with the Vendetta Research phono amplifier, which is, its absence of a line stage apart, the Phono Drive's nearest equivalent product. (Levels at 1kHz were matched as carefully as possible between all the preamplifiers by using a test record, and both were connected to the Line Drive with 9" lengths of MIT 330.)

The main audible difference between the two phono preamplifiers was caused by noise. My listening room has, at least when the neighbors are not splitting logs for their fire, a very quiet noise background, well under 40dBA. The John Curl design was as quiet as the grave, even with maximum system gain. The Phono Drive, driven by the Troika and with the Line Drive gain set for average listening levels in the mid 90s, could be heard to have a very slight "rushing noise" in the background. A degree of 60Hz hum could also be faintly heard submerged in this background at these spls, which puzzled me given the double-regulated nature of the Phono Drive power supply. I determined this hum to be a property of the interaction of the Phono Drive with the VTLS rather than the Phono Drive itself (see later), and it was not at all audible once music was playing. The noise on the MM input was inaudible at the listening seat, even with the Line Drive gain at maximum.

Compared with the Vendetta, the Phono Drive appeared to have a more solid bass, extending lower and having more weight. The Vendetta's low frequencies were slightly more "rounded," which in themselves was not displeasing, particularly with the Thiel's, but the

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Mod Squad unit's sounded more natural and gave a better foundation to the music with the more tightly controlled Celestions. Up the range, the Phono Drive was a little more forward in its presentation of the midband than the Vendetta, being more akin to the KR$2. High frequencies were very similar from the two phono units, but the Vendetta had slightly more of music's top octave apparent than either the Krell or the Phono Drive.

Both Phono Drive and Vendetta Research presented more detail than the KR$2, but differed in the way detail was differentiated within the overall sound. The Phono Drive seemed to excel in the way it allowed the listener to hear the tonal nature of individual instruments. It was obvious, for example, on the Ry Cooder–produced and naturally recorded Bobby King and Terry Evans album (Live and Let Live!, Rounder 2089), that drummer Jim Keltner was using a snare drum with quite a deep shell. In fact, all percussion instruments were presented with their characters beautifully delineated. The Vendetta Research, however, was just that bit better at presenting the spaces between the instruments in the soundstage (as is the Mark Levinson No:26).

As I said earlier, it was the ability of a high-end system to present a vivid and believable soundstage which had a formative influence on my listening, and that soundstage needn't have any real analog. A favorite recording of mine of a Bacharach and David song is Sylvester's “I took my strength from you” on the overweight androgynous 1978 album Step II (Fantasy FT9556). Here is Mr. S wishing he was Gladys Knight, amply supported by the Two Tons o' Fun (the no-less-ample Izora Rhodes and Martha Walsh). Leslie Drayton's arrangement, though a little on the Nutrasweet side, is still a virtuosic piece of scoring. The singers weave an intricate Staple Singers vocal weave on the chorus, accompanied by duetting flutes, tastefully Leslied organ, Spanish guitar lacework, mariachi trumpets, a spec-ond bass guitar part, and aetherially ascending violin lines. Mawkish, but made more than bearable by the way producers Sylvester and Harvey Fuqua have carefully created an artificial but no less believable sense of space. The Phono Drive's presentation was excellent by any standard, the music communicating effectively, but the Vendetta's spatial presentation was more precise, the careful layering of the instruments being more delicately reproduced. The Vendetta Research soundstage also reproduced with noticeable height information; why this should be I have no idea, but it was a consistent feature through many different recordings (nearly all multi-miked, multi-mono).

This was also the case with such purist-miked classical recordings as James Boyk's muscular live performance of Beethoven's C-minor piano sonata, Op.111 (Performance Recordings PR 1). The sound of the piano had more weight, and sounded more "real" via the Phono Drive, but the image of the instrument in the acoustic of Caltech's Dabney Lounge was more accurate via the Vendetta phono amplifier. Similarly with the 1982 Hyperion collection of songs by Stanford, Trotting to the Fair (A66049), where the music was equally enjoyably robust through either preamplifier, but the image of the singer placed within the piano's recess was more delicately and precisely presented with the John Curl design.

Whether this aspect of the Phono Drive is connected with its higher noise floor, I'm not sure, but it was a consistent feature of my auditioning. Certainly the ambience and reverberant field could be heard to be extracted from the grooves, but the presentation of that information was less coherent, less well correlated with the direct sound of the instruments or singers picked up by the microphones than when played back over the Vendetta Research. I wouldn't have cared so much, though, if the fundamental nature of the Phono Drive's sound was not so damned musical.

I did less listening to the Phono Drive's Line Stage as its gain was superfluous in my particular system. In a large room, however, with more powerful amplifiers and long runs of cable, it will prove useful. I felt that, overall, it sounded a little brash compared with the intrinsic quality of the Phono Drive's disc-amplifier circuitry and the incredible transparency of the Deluxe Line Drive. Low frequencies were powerful, but the soundstage shrank somewhat both in width and depth.

**Measurement**

The only measurements relevant to the Line Drive are the crosstalk between channels and

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3 Long-deleted, I suspect, this album features two mammoth disco hits: "You make me feel (mighty real)" and "Dance (disco heat)," the latter one of the highest-energy pieces of dance music ever committed to vinyl.

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its input and output impedances, which will affect compatibility with source components and interconnect cables. The input impedance on all inputs is a lowish 8200 ohms, which could lead to a lightweight bass with high-output-impedance, capacitor-coupled tube preamplifiers. The Line Drive's output impedance will depend on the volume control setting; the resistance of the conductive-plastic track between the wiper and ground and the wiper and the signal input will be in parallel, meaning that the overall impedance will be at a maximum when the control is set about halfway its travel (in resistance terms). I measured around 30 ohms at 1kHz for the Line Drive's output impedance with the volume control full up, to which must be added the source impedance of whatever is being used to drive the unit. With the volume control set to 12 o'clock, the output impedance measured 1825 ohms; while set to 9 o'clock, it was 800 ohms; to both of which must be added, again, the source's output impedance. The Line Drive's maximum output impedance I measured to be 2050 ohms with the control at 2 o'clock, which means that with reasonably capacitive interconnects such as Monster Cable M1000 or MIT 330, cable lengths of more than 2~3 m are to be avoided if high frequencies are not to be rolled off early.

This is not a trivial point. I measured the 1m length of MIT's new Shotgun 330 CVT interconnect (which I initially used for the auditioning) as having an astonishingly high shunt capacitance of 1600pF—including the Hulse-Hoganesque locking RCA connectors—compared with Monster M1000's 160pF/m or so. With the Line Drive's maximum source impedance of 2100 ohms, and given a respectively low CD player output impedance of 60 ohms, this will give a ~3dB point at just over 47kHz, assuming a high, 100k, power-amplifier input impedance. I actually measured the ~3dB point with the Line Drive set to its maximum impedance and driving 1m of MIT 330 CVT as lying at 55kHz, being 1dB down at 1kHz and 1.75dB down at 20kHz with the 50 ohm output impedance of my signal generator. Dropping the Line Drive's volume control setting to 10 o'clock or raising it to 4 o'clock lifted the ~1dB point to 25kHz, with then just a slight droop in the top octave of the audio band. These figures were taken with the Line Drive feeding the 1M ohm input impedance of the millivoltmeter. With the input impedances of typical solid-state power amplifiers likely to be in the 10k~47k ohm region, and with source components having higher output impedances, the HF loss in the audio band will be severe (to say the least). Replacing the MIT CVT interconnect with Audioquest Lapis, which has a measured shunt capacitance of around 110pF/m including connectors, resulted in a response that was just an insignificant 0.2dB down at 20kHz with the Line Drive's volume control set for the maximum output impedance. It is understandable why I used the Lapis for all the serious auditioning of the Line Drive/Phono Drive combination.

Because of the highish impedances floating around a passive control device, intrinsic separation between channels and inputs has to be high. Crosstalk between channels of the Deluxe Line Drive was low, at ~86dB at 20Hz and ~83dB at 1kHz, dropping to ~72dB at 20kHz, which is still excellent. Between adjacent inputs, it was ~78dB at 20kHz, and unmeasurable at lower frequencies given the fact that the maximum voltage swing available to me for the driven input was 30V p-p. All these measurements were done with the chassis shorted to ground, and seemed unaffected by breaking the chassis/ground connection.

The Phono Drive had a measured output impedance of 60 ohms from its direct-output sockets, and an even lower 50 ohms from its line stage. Neither outputs should have any difficulty driving long or highly capacitive interconnects. The input impedance of the line section I measured to be 11k ohms; again, no problem except with some antique tube components or the Mk.1 version of the CAL Tempest CD player, which had a 5.6k output impedance. The gain structure of the Phono Drive appeared to be around 20dB stage gain from the MC headamp, followed by 44dB at 1kHz from the MM section, which also applies the appropriate RIAA equalization. This should be sufficient to drive power amplifiers with up to 1.5V input sensitivities to full output with anything else than very~low~output MC pickup.

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4 I say "astonishing," as this amount of capacitance will render the cable sub-optimum with many preamplifiers. Some will have too high an output impedance to maintain a flat response through the top octave of treble; some, particularly if they have op-amp output stages (like many CD players), will either be unable to hang on to their stability attempting to drive this much shunt capacitance, or will have difficulty delivering their rated output-voltage swing. Before you commit yourself to purchasing this $1000/m-pair interconnect, be sure to check with your dealer that your preamplifier or CD player will be not be fazed.
cartridges. The separate line stage is polarity-correct and boosts the signal voltage by 15dB: I measured 16dB—must be the thin atmosphere here in Santa Fe.

Fig.1 shows the frequency response of the MM input, measured from the direct-out sockets. Apart from a slight boost in the 10–30Hz region, reaching a maximum of +0.75dB at 12.5Hz, the response can be seen to be effectively flat, at least within the tolerance limits of my inverse-RIAA network, throughout the audio band. The response drops below 10Hz, with a −3dB point at 5Hz reducing the level of warp-induced garbage, while the high-frequency response doesn’t drop by 3dB until 110kHz. The line-stage response is slightly more band-limited, with a −3dB point at 85kHz. Our four cats report that the difference is not worth looking up from their bowls of Kibble for. 5

You will have noted from the report on my auditioning that I found the background noise on the MC input to be a little high. With the MC inputs shorted, I measured the audio-band noise to lie at −41dB with respect to a 775mV output, this improving to −60dB with an A-weighting network switched in before the average-responding meter. This is about 6dB worse than average for high-end, solid-state preamps, but should not represent a particular problem except with such low-output MC cartridges as the Rowland Complement or the Ortofon MC3000. (I won’t even mention the MC2000, with its 0.05mV output!) The MM input was very quiet, with an 88dB A-weighted S/N ratio, though this is academic for me, the only two cartridges to grace my system being MCs: a Linn Troika and a Koetsu Rosewood. (Us English have our standards, you know.)

I thought the measured noise levels worth further investigation, as I couldn’t get rid of the vestigial hum when the Phono Drive was in use. Fig.2 shows the 1/3-octave spectrum of the noise when measured from the Phono Drive “Direct Out” sockets when connected to the VTLs (middle trace), and that from the speaker terminals of one of the VTL Compact 100 amplifiers when driven by the Phono Drive (top trace) or by the Vendetta Research (lowest trace). (The measurements were done with an Audio Control SA3050A analyzer running from its internal battery, with the Troika cartridge feeding the appropriate preamp; all curves are raised by around 50dB referred to the onset of clipping on the VTLs.) The noise spectrum of the Phono Drive (middle trace) can be seen to slope gently down from low to high frequencies, with just a slight peak at the third harmonic (180Hz) of the mains supply apparent. When coupled to the VTL, however, the fundamental frequency of the mains appears at 60Hz, with its second harmonic noticeable at 120Hz. (There is also a slight accentuation of noise in the presence region.) There was no other mains transformer nearer than 3' from the Phono Drive’s MC circuitry; the hum persisted whether one, both, or neither of the VTLs were grounded at the wall socket. It also failed to be eliminated either by separately grounding the Phono Drive or the Line Drive, or by flipping the latter’s AGT switch upward. I had found a similar situation to exist when the VTLs were used with the Krell KRS2, though its audibility was a little lower than with the Phono Drive. At that time I had thought it was due to the mains transformers of the tube amplifiers injecting hum into the MC input. The fact that the hum was present with the Phono Drive but not the Vendetta, coupled with the fact that it is not present on the Phono Drive outputs even when connected to the VTLs, suggests that it is a compatibility problem of the VTL 100s, perhaps due to a less-than-optimum ground topology.

5 Who says that you can’t end a sentence in a preposition?
It was not present to anything like the same degree when the VTLS were driven by the Vendetta Research phono preamp. The lowest trace of fig.2 shows the spectrum of the noise present on the VTLS' output when connected to the SCP-2 under exactly the same conditions as the Phono Drive. It can be seen that there is still a 0.6Hz component present, but that this is now 28dB lower in level, with the overall noise from 400Hz upward below the ~40dB measurement floor.

The other pertinent aspect of a phono preamplifier is that it should have high overload margins. Looking at just the MM input, a 20Hz waveform clipped at 6.3mV, 1kHz at 55mV, and 20kHz at 460mV, all voltages RMS and respectable, though ultra-high MM cartridges are best avoided. With its sensible 20dB gain, the MC stage should have even better overload-margin figures, however. The maximum line-stage output at 1kHz was 11.3V RMS, the negative-going peak clipping first with a burst of 1.4MHz oscillation every cycle as the slope of the waveform changed from negative to positive. This occurred at 2V RMS input, but for those who worry that this is the typical maximum output of a CD player, the line stage is preceded by the volume control, effectively increasing the overload margin to infinity—or at least to the edges of the home galaxy—when the volume control is turned right down.

Conclusion
The standard Line Drive is rated as Class C in Stereophile's "Recommended Components," the original reviewer, Anthony H. Cordesman, ultimately thinking back in early 1987 that an active preamp better presents dynamic contrasts. I actually think that his apparent problem with dynamics was one of interfacing, as a passive control center throws all responsibility for preserving this aspect of music back on the output stage of whatever source component is being used. For the same reason, coupled with the highish output impedance of the Line Drive, the sonic signatures of the cables used will also have a proportionately larger effect on the ultimate sound quality. Its own faults will be subtractive in nature, in my opinion, affecting more the presentation of the soundstage and the overall transparency. From my auditioning, I would consider the Deluxe Line Drive AGT to be at least a Class B component in its intrinsic effect on the music, and with the best source components and cables it will consistently produce Class A sound quality. It will not suit every system, particularly those involving insensitive loudspeakers, power amplifiers that need a lot of voltage swing to drive them to full output, and long cable runs. But in a carefully matched system, it is the least expensive way to obtain the most transparent, most musically satisfying sound.

I bought the review sample to be my reference! Beautifully constructed, the Phono Drive is a true high-end product which, considering its versatility and the fact that it contains a single-input, line-level control preamplifier, is actually cheap for the level of performance it has to offer. The Phono Drive, however, gave me a harder time reaching an ultimate value judgment, perhaps because putting together a musically satisfying LP player and preamplifier combination is a much more personal affair. The higher degree of synergy involved, as well as the wider spread of what is regarded as good sound, mean that every audiophile ends up with, if not a unique, then at least an intensely personal setup. Dropping a different component into that matched system will probably knock it away from its optimum position for that particular listener.

Taking that as a given, the Phono Drive excels at presenting the music engraved within the grooves of the disc. It is one of those rare products where one record inexorably leads to another and the listening sessions tend to last into the wee hours of the morning. Excellent at retrieving information from the disc and reproducing the true sounds of instruments, it is similar to the Krell KRS-2, however, in that it is less good at preserving the exact relationships between different aspects of that information. This is mainly at the expense of the soundstage, which becomes a little untidy compared with, say, that presented by the Vendetta Research SCP-2 or the Mark Levinson No.26. Tempted to recommend it in Stereophile's Class A category, I must temper my enthusiasm: the noise floor on its MC input is disappointingly high, at least with the Linn Troika. This will be less of a drawback with MCs like the Koetsus that are possessed of a hefty output, however, and I suggest that you audition it with your own set-up to determine whether its noise will be significant in your system. If not, it is heartily recommended.
SUBWOOFERS, CROSSOVERS, & OTHER ASSORTED DELIGHTS

Dick Olsher offers a guide to the art of subwoofing


Audio Concepts Saturn Subwoofer. Dimensions: 44" by 13" by 12.4". Sensitivity: 88dB/W/m. Price: $639.90/pr for complete kit (walnut cabinet); $279.90/pr w/o cabinets. Approximate number of dealers: 1 (factory direct). Manufacturer: Audio Concepts, 901 South 4th Street, LaCrosse, WI 54601. Tel: (608) 784-4570.


Threshold PCX Electronic Crossover. Available in two versions: PCX-1, 75-1600Hz; PCX-10, 750Hz-16kHz. Price: $1600. Approximate number of dealers: 60-70. Manufacturer: Threshold Corporation, 1945 Industrial Drive, Auburn, CA 95603. Tel: (916) 888-0600.

There was a time, as recently as 40 years ago, when frequencies below 100Hz were considered extreme lows, and reproduction below 50Hz was about as common as the unicorn. From our present technological perch, it's too easy to smirk condescendingly at such primitive conditions. But just so you're able to sympathize with the plight of these disadvantaged audiophiles, I should tell you that there were two perfectly good reasons for this parlous state of affairs. First of all, program material at that time was devoid of deep bass; not because it was removed during disc mastering but simply because there wasn't any to begin with. The professional tape recorders of the day featured a frequency response of 50-15kHz, ±2dB—just about on a par with the frequency performance capability of a cheap 1988 cassette tape deck. And then there were the phono front ends and the loudspeakers of the day. Un-sophisticated cartridges and a generally highish cartridge/arm resonance frequency made transduction of the lowest octaves almost impossible. How well do you imagine LF groove modulations can be tracked when the arm/cartridge resonance lies at 30Hz? Loudspeaker bass alignments tended toward high Qs, emulating one-note "boom box" response in the naive belief that quantity was ultimately superior to quality. This was a time when the
bass-reflex design was routinely abused, so much so that the name became synonymous with loose and overly resonant bass response. Against this backdrop, limited-frequency program material was really a blessing in disguise.

Ironically, as both home and professional equipment improved, program material failed to keep parity. Oh, I can think of several exceptions, but on the whole records continued to be mastered with very little in the way of deep bass; this time primarily because of commercial considerations. Sure, there's very little musical information in the deep bass, but I believe that, combined the LP's problem with cutting large vertical groove excursions, the prospect of being able to cram more music per side entrenched the practice of mastering with bass summing and rolloff. And because the average home system was still deep-bass deficient, only the audiophiles complained.

The advent of the compact disc has changed all that. The audiophile, after finally purchasing a CD player, quickly realizes just how inadequate his mini-monitors or postage-stamp ESLs really are in handling the potential bass extension and power of this new medium. But being wiser than the average consumer, and thereby realizing that man does not live by bass alone, he's not as likely to alter the status quo of his speakers. The average consumer, however, is much more likely to be fazed by the fact that his bookshelf speakers are not "digital ready." And either the paranoia of "missing something," or the desire to capture the full fidelity of those infamous Telarc cannon shots, a Boeing 747 taking off in his living room, or some such similar sonic spectacular, finally drives him to consider a subwoofer. As we shall see, these are precisely all of the wrong reasons to purchase a subwoofer.

**Bass Terminology**

So that we all speak the same language, allow me to take a brief detour to examine the objective and subjective terms used to describe the bass octaves. I define deep bass as the range from 20 to 60Hz. In terms of acoustic instruments, only the pipe organ, the bass tuba, and the double bass have any dominant spectral energy in this range. But this range is also very important for the proper tonal balance, or body, of the cello and piano. The octave from 60 to 120Hz I take to constitute the midbass. Again, the double bass, cello, and piano figure prominently in this range. Add to this list the bass drum, synthesizers, and bass guitar. Finally, the range from 120 to 240Hz defines the upper bass. This territory represents the heart of orchestral bass, not only because of obvious bass contributions from drums, strings, and piano, but also some of the woodwinds and brass. An excess of energy in this range may be described as thick, mellow, or heavy-bodied sound, while a deficiency of energy in this range lends a thin or lean character to the sound, as it also does in the midbass region. A fat midbass may be best described as tubby, buoyant, or as possessing a grunting quality. Because of the ear's rapidly diminishing sensitivity in the deep bass, and the fact that physical sensation begins to play a part in perception, the deep bass is sometimes referred to as belly lows. But even more important than flat frequency response down here is the criterion of dynamic range.

"Punch" or "slam" describe the dynamic performance of a speaker in the mid- and deep bass when it is able to faithfully execute a bass transient. Inherent to such performance is the woofer's excursion capability or its ability to move the requisite volume of air. When a speaker is unable to meet the brutal excursion demands imposed on it in the LF domain—excursion is quadrupled for each halving of the frequency—the result is usually not only a wimpy or polite bass quality but also gross distortion on heavy peaks. As the woofer's suspension is driven into a nonlinear region of operation, a lot of harmonic distortion is generated. The most prominent distortion product is generally the second harmonic, an octave higher, and at sufficiently large cone excursions the woofer's acoustic output may actually be dominated by the second harmonic. This situation is referred to as bass "doubling."

This leads me to the areas of finesse in bass response, areas often overlooked in favor of frequency response and bass power considerations. I'm talking about bass speed, tightness, pitch definition, and resolution of bass detail. These attributes may be more appealing to the music lover who is certainly not immune to the emotional impact of bass power and thunder, but who nonetheless craves a commensurate dose of bass subtlety and delicacy. Most of these things have to do with the absence of low-Q resonances in the bass response of the speaker. These resonances may be generated
by the woofer, the box cavity, or by flexure of the cabinet panels. The end result is a muddy
ating effect whereby detail and pitch definition
are obscured. The point is that these reso-
nances stay around long after the trailing edge
or decay portion of the input signal has ceased,
ringing while new transients are being pre-
sented to the speaker. In essence, these reso-
nances fill in the silent gap between adjoining
transients with sonic garbage. It is this garbage
or mud that masks bass detail and detracts from
the purity of pitch definition.

Interestingly enough, as Floyd Toole has
pointed out, some low-Q colorations may con-
tribute no more than a 0.5dB bump to the fre-
cquency response and yet be quite audible. This
means that it would be difficult to objectively
discern the presence of such resonances from
merely examining a speaker’s frequency
response. What would be much more useful
would be a three-dimensional plot of ampli-
tude as a function of frequency and time. These
are the type of measurements pioneered by the
late Dick Heyser. Such data would indeed show
up resonances as ripples in the amplitude
response as a function of time. However, even
at this level of sophistication we would still be
unable to resolve the subjective significance
of the various resonances (there will always be
some) without comparative listening tests.
So our ears and brains must be the final arbi-
ters. Contrary to Consumers Union’s claims,
speakers that appear to measure alike in the fre-
cquency domain may differ significantly in
sound quality—even at drive levels that pro-
duce negligible distortion products.

What about bass speed? Some pundits have
branded this term technically inaccurate,
because, as they point out, the steepness of the
transient’s leading edge is determined by its
upper harmonics, which may after all not be
reproduced by the woofer but rather by the
midbass or midrange drive-units. Yet, I think
that we have all observed slow, sluggish, or
woolly bass response. So the real question is:
Does a woofer have to be fast? An excellent fig-
ure of merit for woofer speed is its acceleration
factor, defined as the ratio of the woofer’s mag-
netic force to its moving mass. This is nothing
more than a restatement of Newton’s First Law
of Motion: Force equals mass times accelera-
tion. To increase speed you either reduce the
woofer’s moving mass (which consists of the
voice-coil and cone), or you increase the mag-
netic force. The latter can be accomplished by
increasing the magnetic flux in the voice-coil
gap by using a larger magnet.

Clearly, if a woofer is crossed-over in the
midrange, say around 2kHz, as it might be in
a two-way system, then its speed does indeed
matter if it is to integrate with the upper-range
drivers. And just as clearly, if the woofer’s out-
put can be confined to the range below 100Hz,
then its speed or rise time is no longer critical.
But this is hard to do. Too often, shallow cros-
sovers are used so that there is significant con-
tribution from the woofer in the midrange. In
which case, the woofer had better be suffi-
ciently fast to blend in with the rest of the
system.

Ultimately, audiophiles are polarized into
one of two camps. One camp tends to prefer
bass quantity at the expense of quality, while
the other side almost cheerfully seeks out qual-
ity at the expense of tonal balance and/or
dynamic range. The situation has come about
because so very few speakers out there success-
fully negotiate both sides of the bass equation.
And the ones that do are only affordable by a
select few whose lifestyles can soak up
$10,000/pair price tags. Few of us can have our
cake and eat it too.

What is A Subwoofer?

This is not as simpleminded a question as it first
appears. In the mind’s eye, a subwoofer is a
hippopotamus-sized box with a substantial
foot-long or larger driver. Getting a bit more
technical, a reasonable definition would be a
speaker for the reproduction of the range from
20 to 100Hz. But even this description merely
defines the tip of the iceberg and hardly reveals
the submerged mass of performance criteria
necessary for high-fidelity performance in the
subwoofer range. Faithful reproduction of
lowest octaves presents the most severe
speaker-design challenge, and is the area most
often compromised in mass-market loud-
speakers.

Nature is pretty stingy in the bottom end.
Sidestepping the issue of bass horns, the larger
the direct radiator the more partial Mother
Nature is toward it. Another way to say this is
that the acoustic radiation efficiency of a direct
radiator is proportional to its pistonic cross-
sectional area. It’s a question of having a larger
sail to flap into the air: the larger piston pro-
vides a better impedance match with the air.

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load and hence a more efficient transfer of energy. A 15" woofer is better in this respect than a 12" woofer, and a 24" woofer is even better. Of course, there's a practical limit to woofer size. It's difficult to make large cones sufficiently stiff to prevent serious buckling from the accelerating forces applied at the apex. And large cones also mean huge moving masses that are very difficult to accelerate quickly.

So why aren't large woofers used routinely in commercial loudspeakers? Cost considerations aside, large woofers are a speaker designer's worst nightmare—simply because they require large cabinets. And that is a serious fly in the ointment; almost nobody likes large boxes. For the same reason they're more efficient in energizing ambient air, large woofers are more efficient in pressurizing the air inside the speaker cabinet. Typically, the cabinet-air stiffness drives the speaker's resonant frequency well above the woofer's free-air resonance. The result is a loss of bass extension and a boomy response characterized by a Q well over one.

OK, large woofers and small boxes don't mix well, but how large does the cabinet have to be to minimize the stiffness of the trapped air? Well, let's look at a commercial example using an 18" woofer with a compliant suspension. The subwoofer in Dave Wilson's WAMM system consists of an expensive 18-incher housed in a coffin-sized affair probably large enough to comfortably accommodate even Andre the Giant. Think of the difficulty—read expense—of making such a large box sufficiently stiff to avoid major panel flexure.

(The brave home constructor does have a bit more imaginative flexibility available to him. A closet could be used as a large enclosure. If you've got a basement, floor-mounting the woofer would work very nicely indeed. And finally, by wall-mounting the woofer you could take advantage of the biggest infinite baffle of them all: the great outdoors.)

I have focused on bass efficiency because, to sound loud, bass frequencies must be reproduced at very high SPLs. The ear is insensitive to bass frequencies, the hearing threshold curve rising at about 18dB/octave from 50Hz to about 20Hz. At 20Hz, an 85dB SPL will be just barely audible in an average room.

How loudly a subwoofer will be required to reproduce the deep bass is a crucial design consideration. Louis Fielder and Eric Benjamin have examined this and many other subwoofer performance aspects in a recent milestone paper, titled "Subwoofer Performance For Accurate Reproduction Of Music." For the first time, all of the pertinent performance aspects of subwoofers were carefully researched, and some new information was brought to bear on the subject. I will lean heavily on this paper in the following discussion.

As Fielder and Benjamin note, how loudly a subwoofer must reproduce the deep bass depends on the desired low-frequency cutoff and the amplitude of the bass information present on the recording. The authors investigated the LF-cutoff requirements by analyzing a sample of CDs for minimum audible frequency at two benchmark SPLs. The discs were selected on the basis of either previous knowledge or by recommendation that they had substantial low-frequency content. Each CD was played back through a player with a -3dB cutoff at 3Hz, and the output was analyzed by a spectrum analyzer. Discs that were found to contain significant bass content below 30Hz made up a final sample for further analysis. These 13 CDs were analyzed in detail for minimum audible frequencies based on the threshold of hearing and maximum peak CD outputs equivalent to SPLs of 110 and 120dB. The results are shown in the Table.

What this means is that if you want to feel the 10Hz component of the Telarc cannon, you'd better be able to reproduce that track at 120dB peak SPL. If, on the other hand, you care little for Telarc's sonic spectaculars, pipe organs, synthesizers, or sound effects (not necessarily in that order), then civilized SPLs of around 100dB will do just fine. In fact, Fielder and Benjamin offer the following general conclusions: First, recordings with audible bass below 30Hz are relatively rare. Second, these very low frequencies are generated by pipe organs, synthesizers, or special effects and environmental noises. Other instruments, such as bass guitar, bass viol, tympani, or bass drum, produce relatively little output below about 40Hz, although they may have very high levels at or above that frequency. I think that most listeners would be perfectly satisfied with a 40Hz bass extension provided that there is sufficient

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1 Originally presented at the 83rd convention of the Audio Engineering Society, October 1987 (preprint 2537); since published in the Journal of the AES, June 1988.
excursion capability to reproduce the bass octaves cleanly and effortlessly at peak SPLs of around 110dB at the listening seat. Too often it’s the lack of dynamic power rather than frequency extension that disappoints audiophiles. Take a good 50Hz horn, for example. Despite its modest frequency extension, such a horn invariably elicits an instinctive positive reaction because of its effortless and dynamic impact.

Once the SPL requirement at a particular frequency is known, it is possible to calculate the corresponding woofer excursion. Fielder and Benjamin do this for 100dB at 20Hz in a typical listening room with a 2400ft³ volume and a reverberation time of 0.6 seconds. The required volume excursion is 41.8in² which, for a 12" woofer with an effective piston diameter of 10", translates into a peak linear excursion of 0.53". With four 15" woofers, the linear excursion requirement is only 0.078"—a much more reasonable figure.

Of dubious practical importance is the question of allowable amplitude deviations for subwoofers. Just how flat does the amplitude response need to be below 100Hz? Well, using the concept of “just noticeable difference” (JND) in level, available experimental data suggest that at an output level of 100dB the JND is about 1.0dB at 100Hz and about 1.5dB at lower frequencies. These JNDS were obtained, however, under idealized conditions: in an anechoic chamber or using headphones—room effects did not enter the picture. In the real world, the problem of standing waves in small rooms is so severe that peaks and dips on the order of 8dB are quite common in the deep bass; generally speaking, the gross structure of room modes will overwhelm any inherent response flatness on the part of the subwoofer. Response flatness is much more important in the upper bass and lower midrange, in the range from about 150 to 300Hz where room effects are less important. A 2dB or greater broadband suckout here will definitely be audible as a lean and small-bodied balance. This is a range where typically very few commercial loudspeakers designed to be “free standing” exhibit flat response, this due mainly to a phenomenon dubbed by some as “diffraction loss.”

Let’s assume for the moment that the midrange/woofer puts out an equal amount of energy at each frequency in this range. At frequencies whose half wavelength is smaller than the dimensions of the front baffle, the baffle will keep the speaker’s output “concentrated” in the forward half-space where the listener is located. At some frequency, the wavelength starts to wrap around the front baffle, and the speaker’s output becomes less directional or more omnidirectional. Because now the same acoustic output is being radiated into a larger volume, the average intensity is reduced. Of course, as the wavelength increases further, the floor, back wall, ceiling, and side walls are eventually encountered and reflect acoustic energy toward the listener, which helps lift or boost

<table>
<thead>
<tr>
<th>CDs possessing low-bass information</th>
<th>Minimum Audible Frequency (Hz)</th>
<th>Composer</th>
<th>Selection</th>
<th>Label/Catalog Number</th>
</tr>
</thead>
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<tr>
<td>120dB/110dB</td>
<td>Tchaikovsky</td>
<td>1812 Overture</td>
<td>Telarc/CD-80041</td>
<td></td>
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<tr>
<td>10/12.5</td>
<td>Dupre</td>
<td>Symphony in g</td>
<td>Telarc/CD-80136</td>
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<tr>
<td>16.5/16.5</td>
<td>Grofe</td>
<td>Grand Canyon Ste</td>
<td>Telarc/CD-80086</td>
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</tr>
<tr>
<td>15/17.5</td>
<td>Hindemith</td>
<td>Organ Sonata #1</td>
<td>Argo/417 159-2</td>
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</tr>
<tr>
<td>18/18</td>
<td>Jongen</td>
<td>Symphony Concertante</td>
<td>Telarc/CD-80096</td>
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</tr>
<tr>
<td>18.5/18.5</td>
<td>Film &amp; the BB’s</td>
<td>Big Notes</td>
<td>DMP/CD-454</td>
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</tr>
<tr>
<td>12.5/22</td>
<td>R. Strauss</td>
<td>Also Sprach</td>
<td>Telarc/CD-80106</td>
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<tr>
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<td>J.S. Bach</td>
<td>Zarathustra</td>
<td>Telarc/CD-80097</td>
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<tr>
<td>22/22</td>
<td>J.S. Bach</td>
<td>Kyrie, Gott helliger Geist</td>
<td>Telarc/CD-80051</td>
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<tr>
<td>24/24</td>
<td>Saint Saens</td>
<td>Symphony #3</td>
<td>Telarc/CD-80094</td>
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<tr>
<td>25/25</td>
<td>Williams</td>
<td>Star Wars Theme</td>
<td>Telarc/CD-80088</td>
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<tr>
<td>19/25</td>
<td>J.S. Bach</td>
<td>Toccata &amp; Fugue in d</td>
<td>Telarc/CD-80097</td>
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<tr>
<td>29/29</td>
<td>Billy Cobham</td>
<td>Warning</td>
<td>GRP/GRP-D-9528</td>
<td></td>
</tr>
<tr>
<td>29/29</td>
<td>Various</td>
<td>Movie soundtrack</td>
<td>Windham Hill/DIDX-141</td>
<td></td>
</tr>
</tbody>
</table>
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the mid- and deep-bass response. The end result is a suckout located somewhere in this upper bass range. Distortion loss can be combatted. Manipulating the midrange/woofer crossover (if it is in the distortion-loss region), or using a dual-voice-coil woofer to provide a boost, are two possibilities.

The subject of phase-response errors for subwoofers is complicated by the fact that no perceptual studies have been performed on the audible effects of large group delays below 100Hz. Fielder and Benjamin note that subwoofers introduce phase distortion primarily from two sources. The direct source is the low-frequency cutoff of the woofer. Thus, the woofer may be viewed as a high-pass filter. A subwoofer with a 16Hz, Q = 0.9, second-order, high-pass function has a 19ms group delay at 16Hz and 0.33ms delay at 100Hz. The second source of group delay is the inevitable crossover used to match the woofer to the upper-range speaker. For example, a fourth-order, Linkwitz-Riley crossover would produce 6.2 and 3.4ms group delays at frequencies of 16 and 100Hz, respectively. This represents a worst-case situation; I'm not aware of any commercial audio crossovers using steeper slopes at the crossover point. Current experimental findings indicate a perceptual threshold of 2.5ms at 100Hz for non-reverberant conditions, and predict a doubling of the threshold under reverberant conditions. I therefore doubt that subwoofer- or crossover-induced phase deviations will be audible under typical listening conditions, and see no reason to avoid using a steep-sloped crossover in the bass.

A topic of great importance to the performance of subwoofers is the audibility of non-linear distortion. The ideal subwoofer does not have to produce zero distortion—rather, its distortion products must be inaudible even to the most sensitive listener. Because distortion products are not produced in a vacuum, but instead accompany the music signal, the concepts of masking and critical bands are crucial for determining their audibility. Again, following Fielder and Benjamin's discussion, masking is the concealment of an otherwise audible tone or band of noise by the presence of a louder signal. The higher the masking signal is above the threshold of audibility at a given frequency, the more effective it is in concealing distortion. Because the threshold of hearing rises rapidly and is much higher in the bass octaves compared with the mids, bass signals—relatively speaking—are poor maskers.

Another characteristic of masking is that the closer in frequency the masking signal is to the lower-level signal, the more effective it is. As the masking signal moves away in frequency, its effectiveness diminishes. One way to widen the bandwidth over which a masking signal is effective is to increase its amplitude or volume. This means that the ear is more sensitive to distortion at lower volume levels because there is less masking going on. Certainly, this is a fortunate state of affairs because woofer distortion increases with playback level. The harder the woofer is pushed, the more it distorts, but we're more tolerant of distortion at these louder volume levels.

The critical band concept was first developed by Harvey Fletcher about 50 years ago. In its modern interpretation, the model essentially views the ear/brain as a 24-channel real-time analyzer with varying sensitivities and bandwidth. Above 300Hz, critical bands are about a fifth of an octave wide. Below 300Hz they are about 100Hz wide. A sound signal is detected only if the energy within a particular critical band exceeds a certain threshold. Each band is independent of the others, at least at sound levels near the threshold of hearing. It is possible then for distortion products that span a large number of critical bands to sound louder and more annoying than a larger signal that only triggers one band. Masking is greatest for sounds within the same critical band. More precisely, the maximum masking region is one-half of a critical bandwidth on either side of the masking signal. The subwoofer range spans one critical band, thus one can expect a masked threshold curve that parallels the hearing-acuity curve with its rapid rise at low frequencies.

On this basis, Fielder and Benjamin conclude that intermodulation distortion is not a very important consideration in subwoofer design. First of all, the difference IM products for subwoofers lie in the first critical band, with the masking signals, and are thus effectively masked. The sum products are no more audible than the harmonics of a single sinewave with equivalent level and average frequency. That this is so is apparent once you realize that the IM sum products are less than or equal in frequency to an appropriate harmonic product, and are lower in level because intermodu-
lution divides the amplitude between components.

An important result of Fielder and Benjamin's analysis is that good reproduction of the bass octaves requires that the main speaker, the subwoofer, and the room all produce extremely small amounts of noise and distortion where hearing acuity is greatest: namely, in the midrange. They point out the need to look at the entire audio spectrum weighted by the masking effect and that previous analyses which considered only unweighted distortion measurements could not accurately predict sound quality due to all the non-linearities. Using this sort of analysis, they arrived at the surprising conclusion that the sensitivity to second-harmonic distortion is much less than to third-harmonic. They point out that this is important because speaker systems often have comparable amounts of second- and third-harmonic distortion, and that techniques aimed at reducing even-order distortion products may be of dubious value.

Manufacturers have spent much research and development money on such designs. An example is a dual-spider woofer that provides an even-harmonic canceling, push-pull piston action. The following simple distortion guidelines are offered: Harmonic distortion will not be audible if the second harmonic is below 3%, the third around 1%, and higher harmonics no greater than 0.1-0.3%.

The limits for Doppler distortion were also investigated by Fielder and Benjamin. To refresh your memory, Doppler distortion is frequency modulation of the higher frequencies by the lower frequencies being reproduced by a single driver; something like tape flutter except that here the music or cone excursion provides a constantly varying modulating signal. The bottom line is that, for practical cone excursions, and with the bandwidth limited to 12.5Hz to 100Hz, the FM distortion due to the Doppler effect appears to be far below the threshold of audibility. Thus the harmonic distortion guidelines stated above appear to be the really important distortion criteria for accurate subwoofer performance.

Various combinations of 12, 15, 18, and 24" woofers were tested by Fielder and Benjamin, and none were found to satisfy their distortion criteria at 20Hz and 92dB SPL, 50Hz and 108dB SPL, and 100Hz and 101dB SPL. Several of the subwoofers tested used multiple drivers in an attempt to improve power handling and linearity at low frequencies, but unfortunately the drivers were so nonlinear to begin with that even this attempt failed to meet their criteria. The authors sadly report that it is evidently believed in the loudspeaker industry that woofer distortion is not particularly important; as a result, there are very few drivers built that possess adequate linearity. All of this bodes ill for our chances of finding the ideal subwoofer from a commercial vendor.

Low-Frequency Performance of Small Rooms

All rooms exhibit a set of natural resonance frequencies which are related to the dimensions of the room. The room will respond strongly to those sounds having frequencies close to these natural frequencies. Once they are excited, the result is a set of standing waves, each wave having its own spatial pattern of nodes and antinodes. These standing waves form the room's reverberant field, which is part of the soundfield received at the listening seat. So, unless you're listening in an anechoic chamber, which by definition only contributes direct sound, every room invariably superimposes its own characteristics on any sound source present. Room modes are classified as either normal, axial, or oblique—depending on which room boundaries they graze.

It is possible to estimate the number of normal modes in a given room for a particular frequency band.2 The number of normal modes is linearly proportional to the volume of the room, but increases as the square of the frequency. At higher frequencies, an enormous number of standing waves is generated. These overlap, blend together, and thus smooth out the room response. At the lower frequencies, the only way to generate a large number of modes is by increasing the volume of the room. In a concert hall there are thousands of modes below 100Hz, whereas in a small room there's a paucity of bass modes. For example, in a rectangular room 10x15x20', the natural frequencies below 100Hz are as follows: 27.5, 36.6, 45.9, 55.0, 61.5, 66.0, 71.5, 73.2, 77.5, 78.5, 82.5, 86.0, 90.2, 91.5, 95.5, and 99.0Hz. The net result for this modal sparseness in a typical listening room will be uneven, and hence

colored, bass reproduction.

I've painted a pretty bleak picture for the possibility of accurate bass reproduction in small rooms, and the temptation would be to throw in the towel and accept the natural order of things. This would be a mistake. There's an old saying among chess players that you can't win by resigning. No matter how bleak the prospects are, there's usually one final trap or long-shot resource to try out. In our case, there are, in fact, a number of worthwhile resources available. First, if you have the choice, avoid a symmetrical room; eg, a cube. The response of the room becomes less uniform as its symmetry is increased. Next, it pays to experiment with damping materials and subwoofer placement in the room. If there's a particularly nasty room mode you'd very much like to minimize, try placing the subwoofer in a pressure node or minimum for that mode. In this location, the problem mode will only be weakly excited by the subwoofer. Of course, this presumes that you have the freedom to move the subwoofer about.

There is, however, one location you must avoid at all costs, unless you're more concerned with efficiency than accuracy. Each of the individual standing waves in a room can only be fully excited by a sound source located in a pressure antinode or maximum for that wave. And it so happens that in a rectangular room, the pressure amplitudes of all standing waves are maximized in the corners of the room. A subwoofer in the corner will be able to strongly excite every possible room mode. This blows away the myth that subwoofer placement is not critical and that it may be safely tucked away out of sight in a corner. I realize that the lows are not directional, so that it would be possible to get away with a corner placement without horribly screwing up the soundstage. But what a price to pay! I suspect that this myth was hatched long ago by a manufacturer anxious to soften spousal resistance to the presence of a rather large and conspicuous box in the living room.

The final resource is the use of absorbing materials or wave traps to dampen the amplitude of room modes. Generally speaking, an absorbing surface is most effective in damping a normal mode if it is located in a region of pressure maxima. Because all normal modes have pressure maxima at the corners, absorbing material placed near the corners of a room is twice as effective on the average as alternate placements.

There is another practical problem affecting the accuracy of bass reproduction in small rooms: boundary effects. A small room is much easier to overload with acoustic energy than a large room. This means that structural rattles, buzzes, and wall resonances would be more prominent in a small room. Again, much of the sonic signature of wall resonances can be controlled by lining walls with absorbing material. I have used foam and 1"-thick fiberglass panels (they're cheap) to control room modes and wall resonances. The difference this treatment has made in my room is simply astounding. Without it, the upper bass is highly colored—no matter how accurate the sound source. If your lifestyle allows it, do your ears a favor and go for it.

The Art of Matchmaking: System Integration

It has been some 250 years since Jonathan Swift's Captain Gulliver tangled with the inhabitants of the land of Lilliput. In the interim, it appears to me that a significant number of Lilliputians have succeeded in infiltrating the British Isles. How else am I to account for the uniquely British craze for miniature loudspeakers? The BBC, rumored to be a Lilliputian stronghold, started it all when they licensed commercial production of the LS3/5A mini-monitor. The ProAc Tablets followed shortly thereafter, and managed to infect the minds of audiophiliacs on this side of the Atlantic.

The situation has progressed to the point where recently the Acoustic Energy minimonitor, with a truly Lilliputian 4" woofer, made Stereophile's list of recommended components. A 4" woofer? Give me a break! How can anyone mistake a midrange driver for a woofer? Is it even fair to advertise these wooferless designs as loudspeakers? Well, maybe. Having by now punched a fair number of readers' buttons, I have to confess that I'm actually sympathetic to the Lilliputian Legacy: smaller can be more nimble and cunning.

A few years ago I reviewed the ProAc Tablets (Vol.7 No.4). When JGH, the champion of tonal accuracy, first heard them he was violently put off by their tonal imbalance. "Violins sound like children's toy violins, celli are emasculated," and on and on he went. My review was less than a rave, yet he castigated
me as “having gone off the deep end” for my failure to trash them. Yet in my system, side by side with my reference speakers at the time—the helium-driven Hill Plasmatronics—the Tablettes were superior in defining the underlying bass lines and highlighting the pulse or heartbeat of the music. Thus, through the Tablettes the range below about 1kHz, while not as “accurate,” was more “tuneful.” Shortly thereafter, I sold the Plasmatronics. Not because the Tablettes became my new reference (I also value accuracy), but because they whetted my appetite for a speaker that could reproduce the lower mids and bass octaves with transparency and detail.

Much later, the Celestion SL600s arrived. Of course their imaging was superb, and although there was no deep bass, the tonal balance was a bit too lean for my tastes, and the highs, while extended, lacked air and transparency, what really captured my imagination was the speaker’s ability to focus in on bass detail and clearly resolve bass information. I was almost willing to forgive all of the ’600’s shortcomings for the privilege of clearly hearing what I could not hear before.

The issue can now be appreciated and restated as one of quality vs quantity. The Lilliputians would argue that the finest areas of bass reproduction are best served by minimizing the speaker. The Brobdingnagians, on the other hand, would argue that finesse is not enough, that power and extension are paramount for maximizing realism. The issue of bass quality has had a difficult gestation period in the US, even in the hands of veteran audio reviewers. Not too long ago Anthony H. Cordesman snubbed the Lilliputians with his “bass is bass” motto, finding them guilty of stealing the bass. More recently, a well-known reviewer on the comeback trail—OK, Peter Azcel—preferred the bass of the Carver Amazing speaker to that of the Apogee Scintilla and Celestion SL600s. Speak about a blatant preference for heavy and featureless bass!

Philosophically, it comes down to a personal decision about what factors matter most in enhancing the illusion of life in reproduced music. We talk about the stereo soundstage as a three-dimensional entity; a complete spatial construct with width, height, and depth perspectives. We try to imagine within that space instrumental outlines with palpable breadth and focus. In reality, that soundstage is a phantasm populated by invisible musicians. For the physical trappings of the listening room to virtually dissolve does require a zen-like mental state. To be teleported to another hall and another time is not merely science fiction, but the domain of a superbly crafted state of mind.

But before Scotty can beam you up, certain attributes of live music must be present in the listening room to coax you into the transporter room. Which factors are important to you? Which ones elicit goosebumps? Because loudspeakers often offer either bass quantity or bass quality, you will have to decide which of these attributes matters most to you in fleshing out that illusory soundstage. If quantity is your ticket, go for it. If it’s quality, then seek it out. This is as it should be. The illusion of life is what it must be all about. If you accept that, then it becomes clear that, ultimately, the decision of what is important is a highly personal one; what works for me might not work for you. But at least let’s be wise enough not to be judgmental about our choices. In my case, I have realized that both quality and quantity are necessary if that soundstage in my small room is to come alive for me. The desire for detailed, well-defined bass with power and extension propelled me on my search for a subwoofer.

The choice of satellite speakers obviously affects the choice of subwoofer and crossover. For satellites, I settled on the Celestion SL600 and Magneplanar MG-2.5/R. These off-the-shelf speakers are well-represented in audiophile circles, so my experiences with them will be immediately meaningful to a large number of readers. They are also typical representatives of their respective design classes: minimonitors and small planars. My findings may then be generalized and used (with caution) for similar main speakers.

Driven full-range, both of my satellites were capable of excellent imaging and resolution of low-level detail. Both had problems, however, which would preclude them from long-term residency in my system. Subjectively, the MG-2.5 proved a musically enjoyable speaker with a transparent and spacious soundstage. I agree with JA that it does offer the audiophile on a budget a slice of what high-end sound reproduction is all about. But I found the MG-2.5 to be significantly colored. The upper bass and lower mids are elevated about 4dB compared with the upper mids and treble. The emphasis extends from about 200 to 600Hz. To put it
another way, the range above 1kHz is shelved down 4-6dB compared with the lower mids. The net effect of these tonal balance deviations is a recessed and distant upper range and a thickening of textures in the lower mids. In contrast with the MG-2.5, the tonal balance of the SL600 begins to look like a reference standard. Its in-room response is extremely tight from 200Hz to 20kHz. There is a modest suck-out of about 4dB in the octave between 100 and 200Hz, which results in a “lean” sort of balance. And, as I mentioned earlier, despite the frequency extension of the SL600’s tweeter, the subjective impression was of a closed-in, lifeless, and slightly opaque upper treble.

The Celestion’s in-room bass half-power response was at a frequency of 50Hz. The SL600 woofer can thermally sink quite a lot of power, able to suck dry the 150Wpc Boulder 500 amplifier into clipping without any apparent damage. Yet the power the woofer sinks is not going into acoustic output, but merely heating the voice-coil. It is obvious that, on heavy bass transients, the SL600s are unable to “rise” to the occasion because the woofer is excursion-limited. The resulting compression robs wide-range orchestral music of its full dynamic range and power. The SL600s, therefore, proved an excellent candidate for a subwoofer; and because of their facility in the finest areas of bass reproduction, they turned out to be a very critical tool in assessing the impact of the subwoofer on mid- and upper-bass quality.

While the MG-2.5 measures slightly deeper in the bass with a bass half-power frequency of about 40Hz, it too is quite obviously excursion-limited in the bass, descending convincingly into the deep bass only on small-signal drive. There’s a 50Hz high-Q peak that on first impression gives the illusion of bass power, but after extended listening a more accurate picture is possible: The bass is slightly loose and wimpy when negotiating large-scale bass transients. Here, a subwoofer would hopefully yield better bass dynamics and control.

With a clearer picture in mind of the bass-performance capabilities of our satellites, an important issue to resolve is the optimum crossover point. It is common practice to use 100Hz because it is generally a good compromise between the needs of the satellite and those of the subwoofer. Placement of the subwoofer is less critical at 100Hz compared with a higher crossover point, and the subwoofer response need not be very smooth above 100Hz. The benefits to the satellite are still substantial at 100Hz—providing that the high-pass (HP) filter roll-in is sufficiently steep to exclude most of the deep bass energy. The perceived benefits involve reductions in intermodulation and harmonic distortions due to a reduction in excursion demands on the suspension of the satellite’s woofer. The overall improvement should be along the lines of cleaner and more effortless reproduction of the middle octaves. The bass alignment designed into most small speakers features a modest bump in the deep bass, or—to put it in equivalent terms—a Q slightly greater than 1. This is done in order to achieve a sense of a fuller and, if you will, a more “natural” tonal balance, and if it isn’t overdone the loss in bass tightness is not particularly objectionable. The resultant peak in the frequency response is usually around 60Hz. Now, with a crossover point of 100Hz, this peak is a mere half-octave away, and unless the satellite’s HP filter is quite steep it will not be adequately attenuated. The peak will then be superimposed on the response of the subwoofer to yield a boomy bass quality.

In general, then, at 100Hz a steep-sloped filter of at least 18dB/octave is very desirable. In the course of this evaluation I experimented with crossover points in the 100–250Hz range. My findings clearly show that a higher crossover point around 250Hz provides further gains in the area of dynamic range expansion—even when an 18dB/octave HP filter is used. The overall sound of the system becomes more powerful and effortless at the higher crossover points. However, there is a price to pay: It becomes much more difficult to preserve the quality of the satellite’s upper bass. For example, at 250Hz, I could not retain the SL600’s original level of upper bass resolution and had to settle on 100Hz as a compromise between dynamics and definition.

Of course, operating at a crossover frequency as high as 250Hz presumes that the subwoofer is comfortable in the woofer range. Some subwoofers can be pushed high enough in frequency, while others are only comfortable as subwoofers.

Based on my findings, minimonitors first and foremost cry out for a good woofer that can be crossed over in the upper bass without loss of quality. There’s a lot of energy in the 100–
250Hz range. Minimonitors would benefit more from help in this range, compared to a fix below 100Hz. A linear woofer of sufficient excursion, properly integrated into the system and operating over the 40–250Hz range, should prove to be much more impressive in terms of bass dynamics and portrayal of orchestral power than a true subwoofer. Fortunately or unfortunately, depending on your viewpoint, many commercial subwoofers are only so in name, incapable as they are of decent bass extension below about 40Hz. So if, by chance, you’re stuck with one of these sub-par “subwoofers,” don’t despair. The more burning question is whether it can perform smoothly and with speed up through the lower mids.

It stands to reason then that, in addition to steep slopes, the crossover should also provide ready means to adjust the crossover point, at least over the 100–250Hz range. These considerations pretty much rule out the use of a passive crossover. You might as well resign yourself to a biamped system with the extra expense of a second amp and active crossover. And a good crossover isn’t cheap either.

Warning! You are now entering the twilight zone of speaker design. By controlling the crossover slopes and frequency and the relative positioning of the speakers, you’re in effect playing speaker designer. You’re in charge of integrating the overall system. For many people this could turn out literally to be mission impossible. Many people are initially excited by the prospect of bass extension, cleaner mids, and enhanced dynamics, the sorts of benefits subwoofers are ideally supposed to provide. After the initial period of excitement, usually brought on by the novelty of more bass, there follows a long period of frustration when it is realized that the sound quality of the whole is less than that of the parts. Imaging, speed, focus and/or resolution of bass detail usually suffer in the process.

You then realize that the reasons for which you bought the minimonitors in the first place are seriously compromised. In the end, the subwoofer is put up for sale. It really is that difficult to successfully integrate a subwoofer or woofer into a system. I’m not suggesting that it’s impossible; but you should carefully research the various possibilities and alternatives before you jump in with your checkbook.

The Crossovers
During the course of this project I experimented with several active crossovers. What follows is a synopsis of my sonic impressions of these crossovers.

Vendetta Research TPC-1A: $499
This modestly sized crossover, designed by John Curl, features fixed slopes of 12dB/octave high-pass and 24dB/octave low-pass, but the crossover point is independently variable for each channel from 60 to 300Hz via front-panel pots. A bass level control is also provided on the front panel. The “TP” in TPC stands for “transient-perfect,” the initial 12dB/octave low-pass section being derived by subtracting the high-pass response from the input. As with most reasonably priced actives, I found the TPC-1A to have an audible sonic signature. Fortunately, its sins of commission are sufficiently small to be mildly annoying only on a very high-resolution system. The reproduced soundstage is nicely focused, and it clearly bettered the Audio Control Richter Scale in this area. Compared with the Threshold PCX crossover, however, the mids are distinctly grainy and lacking somewhat in transparency.

Blending the SL600s with some of the subwoofers proved especially difficult with the TPC-1A’s 12dB/octave high-pass slopes. Because of the wide overlap between subwoofer and satellite, I could not get a proper balance between the mid- and upper bass at a crossover frequency of 100Hz. With the midbass bal-
anced correctly, there was too much upper-bass heaviness.

The variable crossover frequency is a nice feature, but the shallow high-pass slope I feel will be a serious limitation in many applications.

**Audio Control Richter Scale Series III: $349**

The Richter Scale is much more than an active crossover. The fine print on the front panel proclaims that it is in fact a half-octave equalizer/analysizer with subsonic filter and electronic crossover, and thrown in for good measure is a rumble-reduction circuit. The wonders of integrated circuits! The crossover section is completely independent from the equalizer and analyzer sections and may be used alone or in conjunction with the equalizer section. The crossover provides sharp 24dB/octave high- and low-pass filter slopes. The filter design is a cascaded Butterworth type better known as a Linkwitz-Riley alignment. Such filters are highly selective in the frequency domain, and eliminate much overlap between drivers. Although they are far from being transient-perfect—there's a transient overshoot on the order of 10%—they do preserve an in-phase condition between drivers at the crossover frequency and thus minimize acoustic interference in the transition region. The crossover frequency is preset at the factory at 90Hz. However, the crossover point can easily be changed in the field via substitution of 16-pin resistor packs on the chassis. Resistor modules are available from the factory for almost any frequency from 20Hz to 20kHz. A level control pot is provided only for the low-pass filter.

The six-band, half-octave equalizer and analyzer connects into the system through the preamp's tape monitor loop. Center frequencies provided are: 125, 90, 63, 45, 31.5, and 22.5Hz with a maximum boost or cut of 12dB. While it is impossible with such limited resolution to equalize the fine structure of room modes, the Richter Scale does allow one to judiciously extend the frequency response of a subwoofer. A calibrated microphone is supplied with the unit; together with a warble-tone test signal and meter, it allows a limited real-time analysis in the bass. The Owner's Manual clearly describes the procedure for using the analyzer and equalizer sections to flatten and extend the room response of a woofer.

I did not experiment with the Richter Scale's analyzer section, but did use the equalizer section in conjunction with my Neutrik frequency-response measurement system to equalize the response of the Audio Concepts Saturn subwoofer. I was able to extend the response to 20Hz, although the Saturn was unable to play cleanly at loud levels below 30Hz. The envelope of the equalized response measured flat to 20Hz, although there was the inevitable overlay of dips and peaks due to room modes. In this case, I felt that the equalization afforded by the Richter Scale considerably enhanced the deep-bass performance of the Saturn and the bass balance in the transition zone to the satellite.

The crossover section also measured well, but sonically I found the overall sound to be slightly "blah" and muffled. There are losses in the areas of clarity, transparency, and soundstage definition. Its sonic performance would place it in the realm of low Class C or Class D of Stereophile's "Recommended Components" listing, and in the context of such a system the Richter Scale is...well...the right choice. It strikes me as a flexible and cost-effective means for integrating a subwoofer into one's system.

**Shadow Engineering Limited Edition Electronic Crossover: $359**

This model from Audio Concepts is nominally an 18dB/octave Bessel low-pass, 6dB/octave high-pass crossover with a fixed frequency of 100Hz. In my brief encounter with this unit, I did notice significant losses in midrange clarity, focus, and transparency. Instrumental outlines were less distinct, and detail was also blurred in comparison with the Threshold PCX. But to be fair to the Shadow, I should
Shadow Engineering Limited Edition electronic crossover/analyzer

point out that it was apparently “misbehaving” at the time and failed to meet specifications. (I later measured a high-pass frequency of around 200Hz and a low-pass frequency of about 50Hz.) Thus, its poor subjective sonic impression may very well have been caused by defective circuitry. I hope to resolve all of this with the distributor in the near future and report to you in a follow-up.

**Threshold PCX Electronic Crossover: $1600**

The PCX, in the broadest sense of the word, is a “high-end” product. The active stages are discrete and use JFET, MOSFET, and bipolar devices in a direct-coupled topology. The power supply is housed separately and connects to the main chassis via an umbilical cord. Part quality and the level of construction quality are excellent throughout. The high- and low-pass filter slopes are fixed at 18dB/octave. The crossover point is variable by substitution of resistor packs on the PC board, high-quality, zero-insertion-force DIP sockets being used. A total of 17 resistor DIP modules are provided with the unit and span the range between 75Hz and 1602Hz. A x10 version of the PCX is available on special order which spans the range from 750 to 16,020Hz.

Sonically, the PCX is difficult to fault. It is, in fact, the most transparent and least conspicuous active stereo crossover I have heard to date; high praise indeed in a field where typically the presence of the crossover is about as well camouflaged as a bull in the proverbial china shop. Its faults, if any, must be very small because I have not reliably put my finger on any after many weeks of use. The sound character is pure and clean, and bears a family resemblance to that of Threshold’s FET-10. If you like the FET-10, you’ll love the PCX. I do wish, however, that a 24dB/octave version were available. But if you can make do with slightly gentler filter slopes, then the PCX is highly recommended.

**The Subwoofers**

This was not meant to be a comprehensive survey, and it certainly didn’t turn out that way. I would have liked to include the likes of Velo- dyne, Eniec, and Janis, to name just a few, but this didn’t prove possible at this time. (Reviews are planned.) Rather, this evaluation attempts to give you a flavor of what to expect in the marketplace, and expose you to the labor pains involved in trying to integrate a subwoofer into one’s system.

The testing protocol involved considerable experimentation with subwoofer location, crossover point and slope, and relative level adjustments. Listening impressions were finalized only after a particular setup was optimized. In most cases, both the SL600s and the MG-2.5 were used as satellites, but due to the fact that the SL600s proved to be the more demanding of the two in terms of fine-tuning, they did see

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**Threshold PCX electronic crossover**

Stereophile, January 1989
more use. CDs were used to judge the deep-bass extension and general bass dynamics of the subwoofers under test. Articulation of bass lines and midbass punch were also assessed with CD program material. Questions about the success of the system integration, however, were answered with analog program material. In particular, upper-bass detailing, overall balance, midrange clarity and focus, and response speed were investigated with the help of some very familiar LPs.

Measurements included both nearfield and in-room frequency sweeps with a ½-octave warble tone, the idea partly being to get a handle on the impact of the room on the subwoofer's performance. Preamplification was provided exclusively by the Threshold FET-10, while a host of amplifiers was used, including the Mark Levinson No.23, the Motif MS-100, the Don J Cochran Delta Modes, and the Electrocompaniet Ampliwire 100. The phono system consisted of the SOTA vacuum, the SME V tonearm, and a Boron Virtuoso cartridge from Sumiko. The Kinergetics KCD-30 figured in all of the CD listening. In case you're wondering, speaker cables were the TARA Labs Space & Time Phase II and The Cardas Hex.

**Terpsichore Bifocal Subwoofer: $1400 each**

The name, I believe, was derived from the fact that originally a pair of Focal woofers was used in each subwoofer. Current production uses a pair of high-quality 8" Kevlar-coned drivers sourced from Eton in West Germany. I think the name is still apropos because it aptly describes a design with a "faulty vision." And I'm not referring here to the looks of the speaker, which are undeniably appealing. Despite a largish footprint and a 20"-wide front baffle, the overall impression remains elegant, due in large part to the beautiful black-lacquer, plastic laminate finish.

Neither am I being critical of the transmission-line principle employed here. I happen to think that the transmission line is a legitimate bass-loading principle capable of excellent results — providing it is done right. What continues to amaze me, however, is the simple-minded belief that the mere act of hanging a pipe onto the back of a woofer somehow bestows mystical attributes not achievable through any other means of bass loading. All one has to do, according to this school of thought, is to provide a line whose length is equal to a quarter wavelength at the driver's free-air resonance frequency. This is supposed to work for all woofers, regardless of any other driver parameter including driver total Q.

The transmission line was invented by Benjamin Olney in the 1930s and in those days called an acoustic labyrinth. It was seen by Olney as a means of minimizing cavity resonances, extending bass response, and better damping the LF mechanical resonance of the woofer. His first-order analysis showed that the air velocity at the open end of the pipe was in phase with that of the driving piston if the pipe length was an even multiple of the quarter wavelength of the radiated frequency, and that the open-ended pipe output was exactly opposite in phase when the pipe length was an odd multiple of the quarter wavelength.

To follow Olney's line of thought, let me quote directly from his work: "...consider a tube lined with a material whose coefficient of sound absorption rises with frequency. Let one end of the tube be coupled closely to the back..."
of the loudspeaker cone and the other end left open. Let the length equal a quarter wavelength at a frequency about an octave below the lowest frequency to be reproduced. At the lower frequency (corresponding to a quarter wavelength), the impedance on the back of the diaphragm will be high and may be predominantly resistive if the tube lining is sufficiently absorptive. Diaphragm motion and sound radiation will be relatively small. At a frequency an octave higher (corresponding to a line length equal to half wavelength), the impedance will be that of the open end modified by the absorption in the tube and will be relatively low, and there will be, in the usual case, a rise in diaphragm velocity. On account of the 180° phase relation between the velocities at the front and back of the diaphragm and the further 180° shift through the tube, the velocity at the end of the tube will be in phase with that at the front of the diaphragm. The radiation from the two sources will be additive if they are located within, say, a quarter wavelength of each other...

What this means, for example, is that if the line length is a quarter wavelength at the free-air resonance of the woofer, the back wave of the woofer will radiate weakly from the vent and the pressure buildup behind the cone will help damp its resonance. An octave higher, when the line length is equal to a half wavelength, the woofer's back wave—which is already 180° out of phase in relation to the front wave—will undergo a phase reversal because of the transit time in the tube, and radiate strongly from the vent in phase with the woofer's front wave. Higher-order pipe resonances must be damped out by sufficient lining in the tube. Arthur Bailey rediscovered the acoustic labyrinth in the 1960s in the UK. He renamed it the "transmission line" and claimed that his pipe was "nonresonant" and different from an acoustic labyrinth because it was better stuffed; the back wave was supposed to get lost in the pipe rather than contribute to the primary output. To really lose the back wave, you'd need an infinitely long line, which even Bailey could not construct. It boiled down to just how long a line one could afford to build; because of the expense involved, most commercial lines are too short.

The Terpsichore subwoofer appears to be such a case. The immediate problem is the absence of really deep bass. The nearfield response shows an overdamped alignment with a gradual roll-off between 100Hz and 50Hz, followed by a steeper descent below 50Hz. In other words, there isn't much output below 50Hz. The in-room response also shows a suckout centered between 60Hz and 125Hz, and which I could not eliminate or account for as a room effect. Interestingly, the vent output is centered around 80Hz, and it certainly indicates too short a line.

I could not integrate the Terpsichore with either satellite because of its uneven midbass response, and I sorely missed the deep bass. Trying to reproduce the weight and power of an organ through these "subwoofers" proved a taxing experience. At $2400/pair for these overdamped woofers, they represent one of the worst values in audio today.

**Cogan-Hall ContraBass 12:**
$970 each

Imagine a cylindrical cabinet about 30" tall, with a 12" downward-firing Dynaudio woofer,
and you'll get a fair idea of what the ContraBass 12 looks like. Other construction details are not so immediately obvious. The rigid plywood shell is heavily lined with bituminous sheeting so as to create air spaces between the layers and thus increase the acoustic absorption efficiency. Tensioned steel rods connect the 1”-thick top and bottom endcaps of the cylinder. A set of 6”-high steel legs raises the cabinet off the floor and creates, in effect, a slot between the end cap and the floor through which the woofer radiates. A set of shorter legs is also provided for use in situations where a greater amount of slot loading may be desirable. These I did not experiment with. The slot loading, together with the vertical orientation of the woofer, greatly reduces the off-axis intensity of any high-frequency distortion products that may be generated by the woofer. Spikes that mount at the end of the legs are provided for better floor coupling of the enclosures.

The cabinet is vented through the top, but this is not your ordinary bass-reflex alignment. The vent is heavily damped in an attempt to absorb much of the reflex action of the cabinet. And Cogan-Hall is careful to point out that their design is “aperiodic,” that it does not depend on any cavity resonances to augment the LF response of the system. The vent then acts as a large pressure relief to minimize the sort of nonlinear air compression one sees within a closed box. Unfortunately, the ContraBass design is also based on the premise that only in this way can a vented system achieve a critical bass damping with a system Q of 0.5. The Small-Thiele school of loudspeaker design tells us that it's stupid to throw away the contribution of the bass-reflex vent and that a range of system Qs is available—even for a straightforward bass-reflex design.

Without much vent contribution, and since it cannot cheat the laws of nature, where is the deep bass extension of the ContraBass to come from? The answer is in the form of passive equalization circuitry. A small “bass contour” unit is supplied with the subwoofer. It is to be installed between the crossover and the bass amplifier and provides around 6dB of “boost” in the deep bass. The word “boost” must be used guardedly here, because no bass gain is possible with a passive unit. The apparent bass boost is achieved by cutting the higher frequencies following a 6dB rolloff which shelves out at 70Hz. The passive equalizer is sourced from Delay Labs (332 Tuttle, San Antonio, TX 78209), who also offer an “audiophile” version of the Bass Contour called the Passive One. The Gold Edition Passive One uses Sidereal caps, MIT cable, Resista resistors, Wonder Solder, Tiffany connectors, precision ten-turn pots, and a shielded enclosure. I tried both bass equalizers and, not surprisingly, preferred the Passive One (but with the frequency switch set to 70Hz). It is slightly cleaner than the standard version.

The best system integration was possible with the SL600s. Each Contrabass was positioned a foot behind the satellite. With the Threshold PCX set at 235Hz or with the Ventura Research set at about 260Hz, the system sound took on a sense of dynamics and punch far superior to what the SL600s are capable of alone. Bass transients were gutsy and tight to the point of actually being scary, at least for someone accustomed to the limited dynamic scale afforded by the Celestions. All of this was accomplished with only a modest loss of midbass and upper-bass articulation. In fact, it was possible to preserve all of the SL600’s bass-resolution capabilities with a lower crossover at 100Hz. But the price was a dramatic reduction in the dynamic range of the overall system.

Based on my observations, the ContraBass 12 is sufficiently fast and well-behaved to be pushed upward of 200Hz. Its basic problem, though, is the lack of substantial bass output below 40Hz. Under nearfield conditions, the woofer’s equalized response was down 3dB at 40Hz. This is not, however, a realistic measurement condition because it fails to take into account what contribution there is from the vent. Because the vent output is out of phase with the woofer’s front radiation below system resonance, I would expect the system output to roll off even more rapidly in the room. And that’s exactly what I measured. How about 10dB down at 40Hz? Again, this is the equalized response with the Bass Contour unit in the circuit.

What I find difficult to accept is the notion of equalizing a vented system, which has a theoretical 18dB/octave rolloff in the bass, with a mere 6dB boost at 20Hz. I raised this problem with Ken Cogan (the designer) early on, and he agreed to substantiate the frequency-response claims for the subwoofer by sending me his own measurements. Cogan’s data do show an equalized nearfield response that is...
down only 2dB at 20Hz. I simply cannot duplicate his measurements. And certainly I do not hear that sort of deep bass response from this subwoofer. For example, an organ low E through the Contrabass is not reproduced with great conviction.

Based on my findings, I must conclude that the Contrabass 12 is a good but pricey woofer with the speed to blend with fast time-sig-nature satellites. You'll be happy with it—as long as you don't expect much in the way of deep bass.

Audio Concepts Saturn Subwoofer: $639.90/pair (kit)

For a number of reasons I thought it worthwhile to include the Saturn kit in this evaluation. First, it is said by Audio Concepts to be the "best subwoofer money can buy for all-around accuracy, power, and extension." If any of this is even close to being true, it would indeed loom as a great bargain. Second, as a kit it offers substantial savings to the brave souls willing to undergo the kit-building experience. Audio Concepts has been specializing for a number of years now in offering the home constructor a line of complete kits. By that is meant that the cabinets are fully assembled so that no woodworking is required. Thus minimal skills are necessary in order to assemble one of these. For those into woodworking, a semi-kit is also available with cabinet plans and all of the drivers, boards, etc. you will need. Having built enough speakers to last me a lifetime, I decided to forego the kit-building process and ordered a fully assembled pair from Audio Concepts.

This is a technically interesting design: A pair of 12" poly-coned woofers are operated push-pull fashion in a bass loading known as Isobarik (Linn Products hold a patent on the idea as realized in their speaker systems) or compound (Harry Olson's original nomenclature). The woofers are coupled so tightly together that they operate as a unit with an overall acoustic compliance half of that for a single woofer. This, coupled with the doubled moving mass, reduces the volume requirements for a particular bass cutoff. The woofers are mounted in the bottom of a narrow-profiled minitower and fire through a narrow slot. The design attempts to reach a decent bass cutoff in a modestly sized closed box. The vertical mounting of the drivers and the slot loading reduce the off-axis amplitude of any potential high-frequency distortion products. Also, the push-pull operation of the woofers works to minimize the generation of even-order harmonics.

The Satsums were positioned directly behind both the SL600s and the MG-2.5s in separate tests. Crossed over at 107Hz using the Threshold PCX, the bass qualities of both satellite speakers did not suffer. For example, the tightness and pitch definition of the Celestions was preserved, but with the important difference of much better deep-bass extension and dynamic range. The subwoofer's potential to free up the midrange was clearly realized. Midrange textures were cleaner, as if layers of dirt had been washed away. Low-level detail was better resolved with the Saturn in the system, and generally a feeling of reduced strain and heightened effortlessness was apparent.
The measured nearfield response gave a half-power frequency of 40Hz. However, because the response rolls off slowly at the rate of 12dB/octave, the response was only down 10dB at 25Hz. This accounts for the reasonable sensation of deep bass generated by the Saturn. But again, this level of bass extension is far from the subwoofer ideal, and aficionados of organ music will be clearly disappointed, as will most folks when listening to high-powered orchestral music.

It did prove possible to extend the response of the Saturn using the Audio Control Richter Scale. At low signal levels, a flat response to 20Hz was achieved this way, and even heavy bass transients were cleanly reproduced under equalized conditions to about 30Hz. If you’re willing to live with the sonic limitations of the Richter Scale, this combo appears to be the most cost-effective means I know of to achieve decent subwoofer performance in the home. On its own, although the Saturn fails to meet my idealistic definition of a subwoofer, I can certainly recommend it with confidence as an excellent woofer.

**Lantana Laug Subwoofer:**

**$450 each**

Laug is an acronym derived from the speaker's full name: it's a "low frequency augmentation system." Visually, the Laug does little to convince the senses that it really is a subwoofer. Two 8" cones are mounted in a smallish vented box. Yet, through the magic of "critical alignment" and "laminar flow vent technology," a response of 25Hz to 90Hz, ±3dB, is claimed. A first-order (6dB/octave slopes) passive crossover is provided. It is physically accessed from the bottom of the box through (ugh) spring-loaded terminals. However, I have been informed by Mark Merlino, Senior Engineer at Lantana, that current production incorporates bi-ampable input terminals in the form of five-way binding posts which bypass the internal crossover. A level control or pad is not provided, so that the only way to match satellite/subwoofer volume levels is by adjusting the relative positions of the two. This is not a very desirable procedure, especially when first-order filter slopes are used, because the subwoofer may end up a considerable distance from the satellite with little hope of time-aligning the acoustic output in the crossover region. In a situation where the woofer and midrange drivers are widely separated, the wide frequency-band overlap typical of first-order slopes would degrade the system's ability to tightly focus images within the soundstage.

In the immortal words of Yogi Berra: "It's deja vu all over again." Yes, this is my second attempt at reviewing the Laug; sort of like trying to review a boomerang—it keeps coming back. Here's what happened during Round One of testing: The Laug is meant to face away from the listener, preferably from behind the plane of the satellites and facing either the back or side walls. But no matter how I positioned the Laugs in my listening room, the results were very disappointing. There was no deep bass, and the midbass was boomy, with a significant loss of pitch definition. The measured frequency response resembled that of a bandpass filter centered at 80Hz with a rapid rolloff be-
low 70Hz and above 90Hz, a half-power frequency of 60Hz, and a -18dB point at 30Hz. This looked to be a bit bizarre, but I did not pursue the subject further at that time. After the review was sent out for manufacturers’ comments (standard procedure prior to publication), Lantana challenged the accuracy of my measurements. JA offered to remeasure the Laug just to make doubly sure. He measured the frequency response in the nearfield of one of the drivers with the test signal feeding either the “Input” and the “Output” terminals on the Laug. In one case he was able to duplicate my measurements, while in the other case the response was quite a bit better with a half-power frequency of 50Hz. So here we go again: start of Round Two.

No, it’s not what you’re thinking. I remeasured the Laug samples both nearfield and in-room, and was able to duplicate my original measurements when the test signal was feeding the “Input” terminals. Through the “Output” terminals, however, the measured response was quite a bit better, with -3dB points of 50 and 150Hz and a rapid bass rolloff below 40Hz. Better, certainly, but still no subwoofer-class performance. The solution to the mystery was that the input/output terminals were mislabeled or miswired. The output terminals were really the inputs, and vice versa. Don’t they check these things before they ship them? Feeding the amp into the Laug’s input terminals actually routed the signal through the high-pass filter section of the crossover, leading to the funny bandpass frequency response. All of this meant that the previous listening impressions were invalid; a new listening session was in order.

Of course, I was careful to reverse the wiring, but even so, the results the second time around were only slightly better than before. I tried a couple of placements. With the Laug 24” behind the SL600s and facing the side wall, the deep bass was smoothest, but the midbass was too prominent. I found a more acceptable placement with the Laug 26” behind the Celestions and facing the rear wall. Here the deep bass was not as smooth, but the mid- and upper bass were much better integrated with the rest of the range.

On the plus side, I liked the overall tonal balance very much. The Laug filled in the SL600’s lean character in the 100-200Hz region. The result was a beefier balance that did not shortchange the weight of orchestral timbres. The bad news was that this additional midbass energy came at the expense of quality. In fact, judging by the standards set by the SL600s, the resultant bass quality was appalling. Pitch definition and resolution of bass detail suffered most. It became much harder to resolve bass lines with the Laugs in the chain. The midbass was consistently loose and murky-sounding, as if the Laugs were losing it on the decay portion of bass transients. Double-bass reproduction was quite indistinct. For example, take a listen to the “Midnight Sugar” track on The Famous Sound of Three Blind Mice (Vol. I) sampler CD (TBM CD-9001, distributed in the US by Scandinavian Sounds). Three mics were used to record the double bass in a studio acoustic. The result is an upfront, instrument-up-your-nose perspective, and a spatially overblown image. But the available detail and impact are very striking. With the Laugs, much of this detail was fuzzed over, and a significant chunk of clarity lost.

As if that weren’t bad enough, I also found that the Laugs adversely affected midrange reproduction. Veiling of the soundstage and loss of image specificity (consistent complaints of mine) made it difficult for me to resolve spatial and hall-reverb information. Under such circumstances I found it tough to get into such tracks as “Columba aspetit” on Hyperion’s A Feather On The Breath Of God (CDA66039). The voices should be tightly focused spatially within the confines of a cavernous church acoustic. Here, as on other recordings, the Laugs blurred image outlines and muddied hall reverb to the point of annoyance.

In case you’re wondering, the patented concept of “critical alignment” deals with the placement of two identical drivers in a vertical array on the front baffle. At the critical spacing, the wavefronts from the two drivers are claimed “to interfere constructively, virtually [eliminating] standing-wave and doppler distortion within the listening window.” The US Patent (Number 4,119,799, dated October 10, 1988) sheds more light on how to achieve this critical spacing: “...a distance vertically apart which is the effective piston diameter [of] one driver times the universal constant Pi.” Clearly, wave interference is a function of the wavelength. Why this simple equation, which is frequency-independent, should work at all wavelengths is not explained, nor is any supporting data provided to back up this amazing
which drivers electronic Subwoofer principle claim. If we apply the critical alignment principle to a pair of 8" woofers, the critical spacing would be about 24". This distance is a small fraction of deep-bass wavelengths, and as long as this is the case, the woofers will not interfere destructively. Only when the woofer spacing is about half a wavelength will destructive interference be possible between the woofers.

The "Laminar Flow Vent" turns out to be not a tuned port, but a "linear pressure release valve" which "simulates a cabinet of infinitely variable volume" and enables the drivers to operate without the "negative effects of uncontrolled resonance and mechanical stress."

In summary, I get the impression that the Laugs were designed with a healthy dose of wishful thinking. Bass extension is OK for a woofer, but not for a subwoofer. And even as a woofer, the bass quality of the Laug is undistinguished. Buyer beware.

**Kinergetics BSC SW-100 Subwoofer System: $790/pair**

The stereo system tested consists of two speaker enclosures, each housing a pair of 10" drivers operating in parallel, and one SW-200 electronic interface. The electronic interface, which costs $599, incorporates the signal-processing circuitry, the crossover, and a stereo bass amplifier. The combination of the SW100s and a SW200 is, therefore, a stand-alone system, no additional expense needed. The built-in bass amplifier may be bypassed should you desire to use an amp of your choosing. The crossover filters are both first-order, the HP section being passive (a single high-quality series capacitor), the LP section active. The crux of the design is the use of the processing circuitry to condition the response flat to 20Hz.

The wide overlap allowed by the BSC crossover precluded a successful integration with either of the reference satellites. In the case of the SL600s, I found the upper bass a bit too heavy, with an attendant midbass drumminess. With the MG-2.5s, I was aware of insufficient midbass punch, the dynamic compression of the satellite still too obvious. Certainly, the situation would be helped by much steeper filters. There was also, in general, some loss in soundstage focus and transparency.

The measured in-room response of the system was extended, to 20Hz, and quite flat if one ignores the overlapping room modes. However, the system is severely excursion-limited. Below 30Hz, much of the response at moderate SPLs was due to bass doubling. Above about 85dB SPL at 30Hz, and above 75dB at 20Hz, second- and third-harmonic distortion products were evident on the scope, and at 90dB levels the distortion amplitudes were on the order of 50%. This means, in my opinion, that the equalization fed to the woofers is too severe. I think that the system would work better if the equalization were moderated below 30Hz or so, and if more selective filters were provided. There is much promise here, and the price is very attractive, but as of now the highish distortion at reasonable levels precludes an enthusiastic recommendation.

**FOLLOW-UPS:**

**Sumo Samson Subwoofer,**  
*Celestion System 6000*

Both of these products have been previously reviewed in *Stereophile*, the System 6000 by Martin Colloms in Vol.10 No.2 and the Samson by John Atkinson in Vol.11 No.4. What follows is simply meant as a quickie followup to both of these in-depth reviews.

*Stereophile* loaned me the pair of Sumo Samsons ($749 each) for a listen, which I used with Threshold's PCX rather than Sumo's Delilah crossover ($550). With the Threshold PCX set

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**Kinergetics BSC SW-100 subwoofer**

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at 107Hz, there was lots of bass to be had. What there was, however, was not very deep or particularly well-defined. Apparently, without the equalization included in the Delilah, the Samson's response is down 3dB at about 45Hz. Midbass punch is quite good, but the loss of bass-line articulation is distressing. This product leaves me with the strong impression of quantity over quality.

Someone was bound to ask how Celestion's dipole subwoofer system ($2699/pair complete with electronic crossover) compared with the products surveyed herein, especially in view of the liberal use I've made of the SL600. So I endeavored to obtain a sample, which arrived just in time for a couple days' listening.

Here is a product designed to mate specifically with the SL600. Not surprisingly, therefore, the overall integration was very smooth—except for an annoying room mode at 60Hz which I couldn't eliminate. The improvements wrought by the introduction of the subwoofer were dramatic. Bass extension and dynamic headroom were much improved. Bass detail and pitch definition were as good as ever. The range handled by the SL600s was much more effortless, with much reduced congestion on loud peaks, better detail, and, believe it or not, imaging stability was up a notch. The imaging was stable before, but now it's solid as a rock. The measured nearfield response of the subwoofer was well extended, with a -3dB point of 25Hz. However, there's not much dynamic headroom below 30Hz. An excellent subwoofer system, nonetheless.

Early on, I was bothered by grain and veil-
ing in the upper midrange. It seemed reasonable to attribute this to the high-pass filter section of the line-level Controller, because the problem went away when the SL600s were operated fullrange. I’m surprised that MC did not comment on this in his review. After about a 48-hour warmup, the upper mids smoothed out quite a bit. But the problem was not adequately addressed until I replaced the Levinson with the Cochran Delta Modes as satellite amps. Is it possible that the tubed front-end of the Delta Modes filters most of the dirt generated by the Controller? I’m left with a nagging suspicion that perhaps the Controller could benefit from a discrete no-holds-barred design. Let’s see, if I could talk Threshold into rebuilding the Celestion Controller...

**Summary**

One of the important lessons of this evaluation is the realization that subwoofing is a minefield. There are many opportunities either to adversely impact the bass quality of the satellites or to miss out on convincing reproduction of the deep bass. It is critical to maintain the integrity of the satellites. After all, they were purchased on the basis of what they could do in the region of bass definition that big, dumb boxes could not. So if you’re frustrated in being unable to maintain the satellites’ finesse in the bass octaves, why subwoofer in the first place?

Ideal subwoofer performance, following the criteria of Fielder and Benjamin, is a rare bird in the commercial arena. To achieve that level of performance involves a costly and physically large design. While on the subject of cost, consider for a moment the total dollar investment involved in subwoofing. In addition to the obvious cost of the subwoofers, you’ll need a good crossover. And a good one is not cheap. Then there’s the cost of an extra amp for driving the subwoofers. At this point, it seems more logical to me to weigh the alternative of purchasing a new fullrange system, and leave the subwoofing to others.

Subwoofing makes good sense only if you’re buying a sure thing, like upgrading to a Celestion System 6000, or if you are a risk-taker who can afford the cost of experimentation.

If you decide to experiment, then the best strategy is to bi-amp using steep filter sections and a nominal 100Hz crossover point. And finally, stay away from small woofers that make big promises.

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**A WHOLE BUNCH OF LOUDSPEAKERS**

John Atkinson


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Stereophile, January 1989
In answer to a reader's letter last month, I somewhat bluntly stated that Stereophile's reviewers use "hi-fi" adjectives to describe loudspeaker sound because even good loudspeakers are too far removed from sounding "real" to be compared directly with live music. Upon reflection, this may have sounded too dismissive, so I will elaborate a little in this introduction.

What would be the specifications necessary for a loudspeaker to sound "real?" First, it should have a bandwidth as wide as possible; with the exception of a slight HF roll-off when you sit in the back row of the stalls at an orchestral concert, what you hear live is what the instruments emitted, so let's go for HF extension well above 20kHz at the top — 40kHz, for example, giving us an octave's margin above the limit of hearing. At the low end, "DC" is not possible, though let's say a few Hz would be sufficient to minimize the effects of low-frequency group delay. The on-axis response should, of course, be absolutely flat. There is still plenty of debate over whether a speaker should have a flat on-axis response or a flat power response — the reverberant response in the room should be flat with frequency, which implies a rising on-axis response with frequency in a conventional room. I would suggest that it is sufficient that the on-axis response be flat, the energy falling away smoothly as the listener moves increasingly off-axis, either vertically or horizontally, with no sharp discontinuities. In live sound every frequency component constituting that sound reaches your ears at the same time, i.e., a linear phase response. For the phase response of the loudspeaker, it is sufficient that it be identical to that of an electronic filter in that it should be minimum-phase; i.e., having the appropriate relationship to the amplitude response so that flattening the latter flattens the former. For optimum amplitude stereo imaging, the loudspeaker must approximate either a point- or a line-source across the whole audio band. Finally, measurements of the dynamics of live orchestral sound suggest that a peak spl capability of 115—120dB, unweighted, would suffice. Regarding non-linearity, let's specify under 1% THD and IMD across the audio band at 96dB average levels.

There isn't a speaker yet designed that comes anywhere near these specifications!

But don't despair. By choosing a set of reasonable compromises, a talented designer can end up with a loudspeaker that satisfies musically on an individual basis. The user just mustn't forget that every area of reproduction has necessarily had to be compromised somewhat in order for the listener to be able to afford to buy something other than a Wilson WAMM or Infinity IRS V.

With a loudspeaker intended to sell for under $1000/pair, the compromises are of necessity greater than usual and it takes a designer of genius to provide a model offering an all-round musical performance in this price range. My first batch of reviews of inexpensive loudspeakers appeared in Vol.10 No.5; since then, I have reviewed some 29 different models costing $1500/pair or less in my quest for affordable excellence. This month's offering is the latest installment, but there will be more to come, of course.

As you will note from "Coming Attractions" in the December 1988 issue, I had originally intended for there to be more loudspeakers included in this review. A couple of models failed to make it into this issue because of lack of time on my part. It still surprises me, however, when manufacturers are unable to supply working samples of their products for review. In this case, both the Amrita Amrit-MiniMonitors and the Taddeo Domestic Monitor Ones featured one speaker of the pair dead out of the box. At the time of writing, I am still awaiting replacements; I hope to receive them in time to publish reviews of these speakers in the February issue of Stereophile.

The group of speakers in this review, therefore, ended up being a pretty international bunch, with one model each from the US, West Germany, the UK, and Sweden. They are all two-way designs, however, with the three "aliens" featuring metal-dome tweeters. All except one are reflex-loaded in the bass, all are of similar
specified sensitivity, and all are intended to be used on stands.

The test procedure followed, with minor changes, that established for my previous loudspeaker reviews: each pair was used with both a Krell KSA-50 and a pair of VTL 100W Compact monoblocks, connected with Monster M1 speaker cable. Preamplifier was either a PS Audio 4.6 with its M-500 power supply or a Mod Squad Phono Drive/Deluxe Line Drive combination. Source components consisted of a Marantz CD-94 CD player, which was also used to drive the Sony DAS-R1 D/A converter unit reviewed by JGH in December, a 1975-vintage Revox A77 to play my own 15ips master tapes, and a Linn Sondek/Itoh/Troika setup sitting on a Sound Organisation table for LP replay. Interconnect was initially Monster M1000, later replaced with MIT 330 and MIT CVT. All the speakers requiring stands were placed either on a pair of Chicago Speaker Stands 17" Hercules stands—the latest models with the uprights filled with Sims Vibration Dynamics “Navcom” material—or 24" Chicago Speaker Stands wooden stands. A sheet of Navcom, which absorbs vibration resistively, turning it into heat, was also used between the top-plate of each stand and the loudspeaker. The loudspeakers were carefully positioned for optimum performance, and the stands were coupled to the tile floor beneath the rug with spikes. In addition to a rigorous listening test, with no other speakers in the room, each pair of speakers was used for a period of everyday use.

The change of impedance with frequency and the voltage sensitivity (using pink noise) were measured, while the nearfield low-frequency response of each speaker was assessed with a sinewave sweep to get an idea of the true bass extension relative to the level at 100Hz. The frequency response of each speaker was measured in the listening area using pink noise and an Audio Control SA-3050A ½-octave spectrum analyzer. Nine sets of six averaged measurements were taken independently for left and right loudspeakers in a window 72" wide and varying from 27" to 45" high. The response shown in each review is the average of these measurements, weighted slightly toward the sound heard at the listening position. This spatial averaging is intended to minimize the effect of room standing-wave problems on the measurement and gives a response curve that has proved to correlate reasonably well with what is perceived; it also gives an idea of the off-axis behavior of the speaker under test.

Regarding the in-room measurements, these are the first that I have performed in my new listening room. The sound in the two rooms, new and old, is astonishingly similar after acoustic treatment, but there is a narrow peak at 63Hz, 4.5dB high, in the new room compared with the old which I have not yet been able to remove. In addition, all the averaged responses taken in the new room have a slight loss of energy in the 250Hz bands compared with the old, which I assume is due to destructive interference in this region between the direct sound and the primary floor reflection. For the sake of readers being able to visually compare these measurements with those taken in my old room, I have “normalized” the in-room responses in these reviews for the octave between 50Hz and 100Hz, using the different measured responses of Celestion SL600, SL700, Acoustic Energy AE1, and Image 200 loudspeakers in the two rooms as a base.

**MB Quart MB 280: $579/pair**

A new name to me, West German company MB Quart GmbH is, in fact, the reincarnation of the Peerless loudspeaker company that until 1983 used to be owned by New York–based Electro Audio Dynamics (EAD). The company has been in existence for over 20 years and under either name has an excellent reputation for its drive-unit technology, MB being one of the first manufacturers to offer an OEM metal-dome tweeter. Their 1" titanium-dome unit, for example, was featured in Dick Olsher’s Dahlia-Debra DIY design,1 and I became quite enamored of the effortlessly clean nature of that speaker’s treble.

MB opened a US subsidiary company in June 1987 and offers a range of models ranging in price from $479/pair to $7000/pair. The 280 is the second up in that range, and appears typical of West German design in that it features superb cosmetics and finish, real-wood veneer being offered even at this budget price. Was this latter emphasis, rare in the world of “real” hi-fi, achieved at the expense of the sonics? We shall see.

A two-way design, the MB 1", ferrofluid-cooled, titanium-dome tweeter is coupled with

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1 See Stereophile Vol.10 No.4 (June 1987), p.65; and also Vol.10 No.6 (September 1987), p.83.
The different woofer's patterns.

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The tweeter crosses over to the woofer with second-order, 12dB/octave slopes below 1500Hz. This is a low frequency for a two-way design and will be expected to place demands on the HF unit to handle rather more power than would otherwise be the case. The MB tweeter is said to have a vented chamber behind the dome to lower its intrinsic resonant frequency. The woofer has a long-throw voice-coil and its radiating area is maximized by use of a narrow, butyl-rubber surround.

The cabinet is constructed from a proprietary five-layer wooden laminate veneered on the sides only, the top, bottom, and back being finished in black vinyl, and the front baffle in what looks like black velvet. This is actually a flock with the fibers electrostatically aligned at 90° to the surface, which is said to give a "sharper image focus," presumably by absorbing high-frequency waves traveling parallel to the baffle. The fiber length appears to be too short to offer any real resistance to audio-frequency sound, however. Also affecting diffraction will be the two solid-wood vertical strips flanking the baffle, the presence of which raised my eyebrows somewhat. Putting such acoustic obstacles in the tweeter environment is not particularly a good idea. The grille, too, consists of brown cloth stretched over a ½"-thick particle-board frame, with no attempt made to profile the frame edges near the tweeter. Auditioning, however, was carried out with the grilles in place. Electrical connection is via angled, knurled binding posts inset on the rear panel.

The sound: The first thing I do in a review is to listen to how the loudspeaker handles pink noise (noise with equal energy per octave, such as FM interstation noise). On the tweeter axis, though relatively neutral, the MB Quart 280 did appear to have a slight "double-hump" response, with accentuation in the lower midrange and the low treble/upper midrange. The high-frequency content of the sound rose with the listening axis, though with the appearance of a suckout around crossover, and the amount of low-treble emphasis could be reduced by moving off-axis to the side. After some experimentation, I ended up with the speakers firing straight ahead, the listening seat then being 20–30° off-axis horizontally, with the listener's ears just below the tweeter axis, which gave the smoothest transition between the drive-units. Sitting below that axis leads to the HF rapidly becoming depressed in level. The 24" stands were therefore best suited to the MB 280s and were used for all the listening tests. The low frequencies were noticeably lightweight, so I experimented with a variety of distances from the rear wall, ranging from 4' to around 16", to see if I could arrange for some expeditious boundary reinforcement. The closest spacing sacrificed some of the imaging accuracy but did give the best mid- to upper bass balance.

First impressions were very favorable. String tone was reasonably natural and voice reproduction was unfatiguing. Male voice, too, was neutral, while female voice lacked any empha-
sis of sibilance. Imaging was less precise laterally than I would have liked, however, particularly in the midrange—certainly it was nowhere near the standard set by such models as the three-times-the-price Acoustic Energy AE1. Presentation of image depth, too, was less than satisfactory, even when the 280s were positioned well out in the room to minimize the contribution of rear-wall reflections. With my own crossed-figure-eight recordings, good loudspeakers present a well-focused image having a considerable degree of soundstage depth. The 280s brought everything forward, almost to the plane of the loudspeakers.

The bass, though lightweight, was typical of a well-tuned infinite-baffle design: tight and well controlled, without any obvious overhang. In my opinion, it suited LP playback, which tends to be rich in the low bass, better than did the drier-sounding CD. Dynamics seemed rather suppressed, however, with kick drum on track 13 on the HFN/RR Test CD being overcrowded by the tom-tom sound an octave or so higher. Moving up into the lower midrange revealed a "warmish" balance, almost an "aww" coloration, which obscured instrumental tonal identities lying in this region. Viola took on some of the cello's characteristic tone color; cellos sounded as though they had mutes on.

High frequencies were smooth and extended, though perhaps a little reticent. More problematic, however, was the nature of the 280's low-presence region which could sometimes become too forward. Listening to the Chopin Waltz on the HFN/RR CD revealed that the region between G and B-flat above the treble staff was too lively; these notes being more forward than the regions above and below. It is a rare speaker that presents this particular track with an even emphasis throughout the treble clef. Nevertheless, the MB 280 was too lively for my tastes, though I am sure that many listeners will enjoy this added "presence," particularly with nonclassical music.

Measurement: The MB Quart 280 is definitely a 4 ohm design, to judge from the graph of modulus of impedance vs frequency (fig.1). Apart from the sealed-box resonant peak around 75Hz (of moderate height), the impedance doesn't rise above 5 ohms until 450Hz. Above the fundamental tweeter resonance (which appears to be of moderate Q), the 280 presents an easy load to the driving amplifier, averaging 8 ohms between 3 and 20kHz. Coupled with its low sensitivity (my measurement indicated around 86.5dB/W/m), however, the 280 will need a good, gutsy power amplifier to be driven to best advantage. This is not a speaker that will work best with high-output-impedance tube amps or Japanese receivers with limited current delivery. I was surprised to see the tweeter resonance lying at 1450Hz as, in my opinion, this is a little close to the driver's passband above 1500Hz. This probably correlates with my feeling that the 280's low treble is somewhat aggressive; certainly this band could be heard to be accentuated on pink noise. If I were a speaker designer—and thank God I'm not—I would have crossed over to the tweeter at a somewhat higher frequency to get out of the way of the tweeter's resonance. This is supposing that the woofer could be used any higher in frequency, however. Probably not, which is why MB's designers were forced to use this particular configuration.

The nearfield bass extension measured -6dB at 63Hz, about that to be expected from the small cabinet, although as can be seen from the spatially averaged in-room response (fig.2,
taken with the speakers on the 17" stands), the rate of roll-off below the cabinet resonance is gentle. A very slight rising trend through the midrange can be seen, though there is no strong evidence for any problems around the crossover frequency, apart from the barest hint of boost in the 1.6kHz third-octave band. The broad peak in the treble is more due to the increased dispersion of the tweeter in the two octaves above crossover, leading it to contribute more to the room reverberant field than the directional woofer does below crossover. In fact, compared with the similar responses taken for the Acoustic Energy AEI, and the Celestion SL600 and SL700 in the September '88 issue (pp.104, 109), the tweeter is probably slightly too low in level compared with the woofer, the HF balance being more like the SL600’s than the SL700’s. The tweeter response is smooth, however, with a well-controlled roll-off. While sweeping the sinewave tone, I noticed that the cabinet of one speaker very slightly buzzed at 225Hz and that both speakers were quite live in the 200–230Hz region. Otherwise, the cabinet walls were relatively dead.

Conclusion: Overall, I feel that the MB 280 offers quite a lot of loudspeaker at a very affordable price. Well-engineered and excellently finished, it offers a basically good sound. However, it falls down in areas where I am particularly sensitive, those involving stereo imaging and lower-midrange coloration. It does rise above its similarly priced competition in having a fundamentally excellent tweeter, capable of smooth and detailed high-frequency reproduction, and it is possible that the next speaker up in the MB Quart range, the three-way 390 ($899), which also uses the titanium-dome HF unit, would be a better all-round performer.

Rauna Freja: $695/pair

The Swedish company Rauna has become noted for their choice of cast concrete as the preferred material for their speaker cabinets. When correctly constituted, this material can be both stiff and acoustically inert, pushing cabinet-wall resonances up in frequency above the midband and reducing their amplitude by virtue of the material's self-damping. The fact that the box appears to be made from concrete is not always a guarantee that this will, indeed, be the case; I auditioned a pair of Danish speakers a couple of years back that rang like a bell when you tapped the cabinet. Rauna, however, seems to have consistently worked the trick; their floorstanding Balder model, which I reviewed favorably last June, was impressively "dead," and the little Freja (pronounced "fray-a") is the same. Tapping its wall is like nothing so much as tapping a piece of rock.

The petrological resemblance extends further than the cabinet material: in form, the Freja resembles a small gravestone; or, if that seems too necrotic, an enlarged version of a pawn in those once-fashionable Nordic chess sets. The front, its edges chamfered, slopes gently back to give a degree of spatial coincidence to the drive-units' acoustic centers; while the cabinet walls are deliberately unsquare, the enclosure tapering from bottom to top. The rounding of the front panel edges reduces the baffle area to the sides, and above around the tweeter, to just a thin strip, which should widen high-frequency diffraction. The grille is a sheet of wire mesh covering the drive-units' radiating areas and the port. This is attached with four plastic, push-in rivets and is not intended to be removed.

The drive-units, all sourced from the Norwegian SEAS company, are mounted vertically in-line on the front panel, with the 2"-diameter and 7.5"-deep reflex port immediately below

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the woofer. The tweeter is the 1" aluminum-dome unit developed by SEAS for Monitor Audio and first seen in 1986 in that company's R652/MD model. The OEM version has appeared in models from Siefert as well as, with a shallow horn flare added, in Rauna's Balder design. The woofer appears to be a quite conventional polypropylene-cone unit, with an inverted-roll surround. No details on the crossover were forthcoming, but the frequency appears to lie around 2800Hz. Electrical connection is via two 4mm sockets on the rear panel. These seemed a little oversize, as Monster X-Terminators could not be expanded sufficiently to give a good grip.

The sound: Michael Mussachia of US distributor Scandinavian Sounds informed me that the optimum listening axis was between the tweeter and woofer. This necessitated using the 24" stands, but was confirmed by pink noise, this axis giving the best integration between the drivers. The midrange sounded forward, with lightweight, not particularly extended, and rather undercontrolled low frequencies. There was also a slight emphasis in the high treble. The speaker seemed quite directional at high frequencies despite the elaborate baffle contouring. I found the most neutral sound to be obtained with the Frejas pointing straight ahead, meaning that I was sitting around 20° off the horizontal axis. This reduced the high treble sufficiently for my tastes, though some may prefer the extra sense of "air" that listening to the speakers directly on-axis will confer.

On went the HFN/RR Test CD, track 11, my own recording of Anna-Maria Stanczyk performing Chopin. The sound of the Steinway was presented with too much of a clangorous quality and the bass registers were thin. There was also a very slight "thuffiness" apparent in the high treble. The midrange, however, was relatively smooth compared with the other speakers in this review batch, and the piano image was accurately presented, the keyboard being just to the left of center and the sounding board extending to the right-hand speaker position. The walls of the recording venue were also easily distinguishable. The drumkit recording on the same CD was also reproduced with an excellent sense of space, achieved without sacrificing the pinpoint lateral precision of imaging. The kick drum, however, had very little power, and the image depth was rather de-pendent on frequency, the body of the snare drum sound being presented more forward than the rattle of the snares. Listening to a succession of naturally mixed recordings, however, left me with the feeling that of the four speakers reviewed, the Raunas were the only ones capable of consistently presenting a believable soundstage, totally detached from the speaker positions.

This delicacy of image presentation added enjoyment to such complex passages as the Act III quintet from Die Meistersinger, where each voice could be perceived in its correct spatial relationship to the others. This lack of confusion on densely scored passages was a consistent pleasure with the Frejas.

The Freja is not without problems, however, as the midrange emphasis noted on piano recordings was associated with a degree of "aww" coloration on orchestral music. Oboe took on more of an oboe d'amore tonality, violins acquired slightly larger bodies, while flute became quite "creamy," the fundamental tone being reinforced at the expense of the instrument's upper partials. The lightness of bass gave double basses too much of a nasal quality, though low-frequency control seemed good for a ported design. This midrange emphasis, while not associated with any fatiguing resonant effects, was persistently noticeable and had to be heard through for consistent musical enjoyment.

These criticisms, however, must be viewed in the context of the price. The Freja is fundamentally an excellent-sounding design.

Measurement: Despite the Freja having a claimed sensitivity of 90dB/W/m, I found it to be rather less so on pink noise, about 87dB/W/m being nearer the mark. Fig. 3 shows the manner in which the Freja's modulus of impedance varies with frequency. With a minimum

Fig. 3 Rauna Freja modulus of impedance
of 8 ohms in the low midrange, the Freja should be an easy amplifier load and there will not be any amplifier incompatibility problems here, though the low sensitivity will rule out the use of low-powered amplifiers. The port can be seen to be tuned to a low 35Hz. Measured in the nearfield, midway between the port and woofer, the low-frequency -6dB point appeared to lie at 49Hz, this reasonable for such a small enclosure.

Fig. 4 shows the in-room averaged response, weighted toward the listening position. (Due to a touch of brain strain, these measurements were taken with the speakers sitting on the 17" stands, which exaggerates the dip in the response between 200Hz and 400Hz.) Ignoring these room effects in the lower midrange, low frequencies can be seen to be lightweight, not reaching significantly lower in frequency in the room than close to the woofer. There is a hint of boost at the port frequency, but this is too low in frequency to adequately extend the lows. Above the bass region, there is then a rising trend apparent through the mids (which may explain the discrepancy in measured sensitivity; that at 1kHz is going to be higher than the speaker taken across the whole audio band). The tweeter is smooth through the bottom of its range, which somewhat surprised me, given the proximity of its resonance at 3kHz to its passband, but there appears to be a touch too much energy in the 12.5kHz and 16kHz bands. Looking at the responses to the speaker sides, where the HF rolls off early, this on-axis rise seems due to the directivity of the tweeter being quite narrow in this region, pushing more energy toward the on-axis listener.

The measurements taken at the equivalent of 15° above the optimum axis revealed a notch developing in the crossover region which leaves the tweeter isolated. Low stands are thus to be avoided with the Frejas.

**Conclusion:** The Freja's rather midrange-forward balance took a little getting used to on classical music, but after that it was possible to appreciate the speaker's low levels of resonant colorations, smooth, transparent high frequencies, its natural presentation of detail, and excellent soundstaging. This is excellent performance in this particular price range. All things considered, however, I would have liked just a little bit more weight in the bass.

If you are partial to the tonal balance offered by the Freja, then it would be worthy of a Class C rating in Stereophile's "Recommended Components" listing. Otherwise, high Class D would be appropriate.

**Spectrum 208B: $449/pair**

The original $295/pair Spectrum 208A was a 1985 Audio Cheapskate fave (see Vol.8 No.3), Mr. Tellig liking the fact that it played loud, had excellent bass extension, and featured a very smooth treble. Not having had any experience of the "A," I am not sure what differences, other than an extra $154, are featured in the "B" revision, but it, too, comes recommended by the Cheapskate. "Take a listen," ordered the re-doubtable Mr. T last August; "this Spectrum is better than it has any right to be."

Visually, I remain unimpressed. The Spectrum 208B is a largish, wider-than-deep box with a black-vinyl finish. The grille only covers...
the top two-thirds of the front baffle, which frankly I find gives the speaker an unfinished appearance. Upon closer inspection, this is due to the fact that the two drive-units are flush-mounted on a sub-baffle raised above the main baffle. The grille frame then butts against this sub-baffle so that there is no acoustic obstruction placed in the environment of the drivers—ingenious and showing that first impressions can be misleading. The drive-units are mounted vertically in-line, but offset to one side; the speakers are therefore supplied as a mirror-imaged pair. The cabinet is made from \( \frac{3}{4} \)" particle board and lined with a 1" layer of fiberglass.

The drive-units also appear unprepossessing. An 8" doped-paper-cone woofer crosses over at a low 1.6kHz to a Foster 1", soft-dome tweeter, this loaded by a short horn flare. The bass alignment is reflex, a 5-\%" "deep-by-3" diameter port venting to the bottom of the cabinet rear. The crossover is hardwired, with good-quality components—air-cored coils and plastic-film capacitors—glued to the back of the terminal plate. The high-pass leg is second-order, with a small series resistance to reduce the sensitivity of the tweeter, while the low-pass drive to the woofer appears to be first-order, with the coil bypassed by a cap, presumably to add some corrective EQ. There is also a series fuse in the tweeter leg. Connection is by—hooray!—good old five-way binding posts.

**The sound:** Auditioning was done with the grilles in place, and with the pair seated on the 17" stands and placed about 24" from the rear wall. The drivers were on the speakers' inside edges. Pink noise revealed that the axis giving the smoothest integration between the drive-units was with the ear just above the woofer, though this did necessitate me slouching somewhat in my listening chair. Slightly higher stands, or tilting the 208Bs back on low stands, would be good ideas, though the axis didn't appear to be too critical, the only sonic problems being above the tweeter axis, when a peak appears in the low treble, making the tweeter sound rather disconnected.

Well, good old Sam was right about the bass. Now, as you probably are aware, I am no big fan of vented enclosures in inexpensive loudspeakers, the errors, either by accident or design, often resulting in an underdamped, rather boomy sound. The Spectrum 208B, however, while undoubtedly a reflex design—that is that unmistakable softness to the upper bass—is in no way a boom box. Low frequencies seem well-extended, with good definition all the way into the lower midrange. Double bass reproduced with excellent weight, the full power of the instrument being more than merely suggested. The Spectrum designers, helped by their choice of a larchish enclosure for the 208B, have achieved an excellent compromise between low-frequency extension and overall sensitivity.

High-frequency reproduction was excellent for a soft-dome tweeter, there being no "fizz" in the top octave of the treble. The balance between the treble and the midrange was also well-managed, the 208B being neither too dull nor too bright. This is not to say, however, that all was well with the treble. There was a slightly hard, "shouty" quality apparent on instruments such as the flute. Investigating further with the All-Star Percussion Ensemble CD (MMG MCD 10007) revealed that woodblock instruments such as marimba and xylophone took on a somewhat metallic character. The tonality of different notes became slightly smeared, almost as if there was a burst of noise with each note that diluted its pitch center.

Piano is the instrument I feel to be the best at revealing upper-midrange problems, and so it was with the 208B. Playing master tapes of Polish pianist Ann-Maria Stanczyk performing Chopin showed that the reproduction of the two octaves from F at the top of the treble staff was extremely uneven, piano chords taking on a clangorous quality (much more so than the Rauna). The Chopin Op.31 Scherzo in B-flat minor, for example, ends on a high F (fundamental frequency around 2800Hz), which positively leaped from the soundstage, while the F, F\#, and G, both one and two octaves below, were also thrust forward at the listener to a much greater extent than with the MB Quart 280. Pink noise revealed that the speaker had a severe resonant peak in the 1600Hz region, audible as a "rattly" quality, while the woofer also was having problems at 810Hz, approximately the frequency of G at the top of the treble staff.

Whether these problems were audible to the detriment of the music or not depended very much on the type of music playing. As I implied, the 208B did not fare well with piano,
flute, or xylophone. On the other hand, the lively quality of the low treble made voice sound quite exciting, and, on rock or new-age music, was barely noticeable. There also seemed to be a volume threshold below which the resonant problems became much less apparent.

The midrange was also not without its share of problems, basically a degree of hollowness and cupped-hand coloration apparent on low strings and male voice. Again, however, this character was far less apparent on rock music.

Dynamics were excellent, the 208B playing very loud indeed with just 100W. Soundstaging was, like the curate's egg, good in parts. Lateral imaging was basically quite precise, but when instruments had high energy in the speaker's problem areas, they both splashed across the stage a little and jumped forward. Image depth thus depended to some extent on the tonal quality of the instrument or voice, instruments such as bassoon and viola appearing too far back while flutes and percussion were presented in the plane of the speakers.

Don’t get the idea that the Spectrum 208B is a bad speaker. In fact, the powerful low bass made it relatively easy to forget its problems much of the time and enjoy the music—which is, after all, what it is all about. It is just that at this price level, the designer can’t optimize performance in every area.

**Measurement:** The measured sensitivity with pink noise was a little lower than specification at a hair over 89dB/W/m. This is still high, however. Looking at the way the impedance changes with frequency (fig.5), the fundamental box resonance can be seen at 63Hz, with the port tuned to 40Hz, suggesting relatively good low-frequency extension. The overall load is benign, never dropping below 8 ohms; I would suggest that this, coupled with the high sensitivity, makes the 208B a good choice for using with inexpensive, low-powered amplifiers or receivers. Measured in the nearfield of the woofer, the bass is 6dB down at 49Hz, though this measurement doesn’t take into account the output from the port, which will add another third of an octave or so of extension. Measured in-room (fig.6), the −6dB bass point appears to lie around 30Hz, though this is disguised by rather an elevated bass region compared with the upper-bass/lower midrange, which is rather depressed. As well as the slight peaks in-room at the port and box resonance frequencies, this may also have something to do with the fact that the cabinet was very live in the whole 135–260Hz region, its unbraced sidewalls literally shaking at 150Hz and 210Hz, for example. Or, of course, it may not.

Above 400Hz, the spatially averaged in-room response is relatively flat, though with perhaps too much energy in the 10–16kHz region (note the sharp "knee" in the measured response). Though the curve appears smooth through the crossover region, the tweeter, like that of the MB Quart 280, is operating near its resonance region at 1600Hz (see fig.3); this could well correlate with the rather "shouty" quality of the low treble observed, although the woofer also sounds as though it has a slight peak in this region. The measurements also indicate that the 208B mustn’t be used on too low a stand or—Heaven forbid!—on the floor, as then the lower mids become sucked out and a crossover notch appears in the treble. The low-frequency definition will also suffer.

**Conclusion:** Unprepossessing in appearance, the Spectrum 208B is rather more than the sum of its parts, and is obviously the work of a designer who knows his craft. He hasn’t quite wrought a silk purse from a sow’s ear, the speaker being rather colored in the midrange and featuring a tweeter too fierce for my tastes.
in its first octave. Nevertheless, the 208B has superb low-frequency performance and is smooth through the top two and a half octaves of treble, factors which imply a speaker that will not fail to please on nonclassical program. Its high sensitivity and very kind impedance load mean that it will work well both with inexpensive electronics, provided that they are well-behaved in the low treble, and with typical inexpensive MM cartridges, which have a lack of energy in the very region where the 208B tweeter has its sonic neuroses. Which is appropriate, considering the 208B's low price. Given my druthers and a taste for classical music, I would opt for the Magnepan SMGa or the Spica TC-50 in this price region, but the former is as idiosyncratic as the Spectrum, and the latter lacks its powerful bass.

**Wharfedale 507.2: $940/pair**

Probably best-known in recent years for their best-selling “baby” speaker, the Diamond, Wharfedale is one of the UK’s oldest manufacturers of loudspeakers. The company was the subject of a management buyout earlier this year, following a rather unsettled period when it changed hands several times. Now with new American distribution by Vector Research, the brand is reinventing itself in the US with two new ranges of loudspeakers, the 507.2 being one of the “audiophile” models. Both drive-units are made in-house; the first generation of Wharfedale loudspeakers to feature this 19mm aluminum-dome tweeter—the 506, 508, and 708—appeared in early 1985. Though these were sealed-box designs, the 507.2, which still uses that tweeter in conjunction with an 8” polypropylene-cone woofer (6.5” radiating diameter), is now reflex-loaded by a 4”-deep by 3”-diameter port on the rear panel.

Other aspects of the design are familiar from previous Wharfedale designs. The rear panel of the particle-board cabinet is recessed by 1” to add a degree of stiffness to the sidewalls, and rather than fasten the woofer to the baffle with woodscrews or T-bolts, a patented, bayonet-fastening system locks it in place.

Electrical connection is via 4mm binding posts on the rear “tray.” The 507.2 is a particularly handsome speaker, in my opinion, being veneered on all surfaces, except the rear, with a real wood that looks like cherry. The brown-cloth grille covers all of the speaker’s front except a narrow strip at the bottom bearing the Wharfedale logo. With its veneered baffle, the 507.2 looks “finished”; accordingly, I left the grille off for the auditioning.

**The sound:** Pink noise revealed that the optimum listening axis was on a level with the tweeter, the 17” stands therefore proving a little low and the 24” stands a little high. Below, and the already forward midrange became more so; above, and a lack of energy became apparent in the upper mids, leaving the tweeter sounding disconnected. In fact, even at a 7” listening distance on the optimum axis, the tweeter still sounded a little wispy and “separated” from the body of the sound, slightly accentuating sibilance and cymbal sound.

Low frequencies had reasonable weight when compared with the Rauna and MB Quart designs, but without much deep bass apparent, particularly when compared with the Spectrum 208B. Undoubtedly the product of a reflex alignment, the upper bass was soft, the left-hand piano register acquiring a slight “purr” and kick drum acquiring rather more overhang than usual, sounding “slow.” Male speaking voice, however, was commendably neutral, and relatively free from the “enlarged chest” syndrome. The midrange, as indicated above, was rather forward in balance, though this wasn’t perceived as a coloration, but more as an accentuation of the treble-clef region. Reproduction of female voice was delicate and
unstrained at moderate listening levels, and natural in the relationship between chest and throat tones. Check out Carmen Balthrop’s Spanish song recital on Elan 2208 for an example of the kind of natural vocal recording which sounds at its best on these Wharfedales. Violin tone, too, was superbly natural at moderate playback levels, high frequencies being neutral in balance, apart from the aforementioned wispiness.

Note the qualifiers in the above paragraph. The area of dynamics was where the 507.2s fell down, unfortunately. All my positive comments related to average levels between 84dB and 94dB in my 3000ft³ listening room, when I liked the speaker a lot. When the playback level was raised above the mid 90s, however, the sound hardened considerably. Neutral in sound quality with volume low, the 507.2 becomes hard and rather fatiguing at average levels above 94dB, which is too quiet for my tastes. The first presentation of the brass “Siegfried” motif in the prelude to the first act of the Solti Götterdämmerung, for example, is tonally correct when quiet but fails to uplift, the sound being too small; when loud enough to uplift, the sound becomes unnaturally bright and you want to turn it down. Piano sound was considerably more detailed than with the Spectrum speaker, but only at moderate levels. At higher levels, the sound became similarly clangy with different recordings, regardless of each recorded piano’s intrinsic character.

This two-faced nature of the treble also affected imaging. Laterally precise at moderate levels, there was good image depth apparent in the lower midrange, but less so in the upper midrange and treble. Raise the playback level and the stage shallows considerably.

The 507.2 is a “small-signal” loudspeaker. At low to moderate listening levels, it is neutral in tonal balance (apart from a slight accentuation of the mids), offers reasonably good imaging, and has a smooth, fatigue-free treble. With music having any dynamics, however, the sound tends to hardness and becomes rather confused. Sonic schizophrenia!

**Measurement:** Looking at the way the 507.2’s impedance changes with frequency (fig. 7), the main box resonance can be seen to lie at 75Hz, with the port tuned to 52Hz, which suggests moderate LF extension. This was confirmed by the nearfield measurement which, without taking the output from the port into consideration, indicated a –6dB point at 62Hz. Though typical of an 8 ohm design in the woofer region, the tweeter is undoubtedly a 4 ohm unit. This is presumably to get sufficient sensitivity from a ¾ " dome, which has significantly less radiating area than the ubiquitous 1" metal-dome. The smaller dome diameter, however, does make it easier to push the “oil-can” resonant mode up away from the audio band. This resonance of the Wharfedale tweeter is said to lie at 37kHz. The high crossover frequency of 5kHz also implies that the tweeter has little in the way of power-handling capacity, though this also means that it is operating nearly two octaves above its own resonant frequency.

The cabinet seemed pretty dead in the midrange, but I did note two frequencies where its walls vibrated: 345Hz and 250Hz, the lower being particularly strong. (Interestingly, Martin Colloms noted a 2nd-harmonic distortion peak at this frequency in the November 1988 issue of *Hi-Fi News & Record Review.*) Putting an ear to the cabinet sides with pink noise playing did reveal a strong “warble” around middle C (262Hz).

In-room and spatially averaged (fig.8), the treble is about the flattest I have ever measured, ±0.4dB limits sufficing from 1600Hz to 12.5kHz, though conspicuously lacking is the expected hump in the presence region due to the HF...
unit's effectively hemispherical dispersion in this region. The woofer must be operating well into breakup in the top two octaves of its range, which may well help match its directivity with that of the tweeter at crossover. Below this band, however, can be seen a moderate rise centered on 800Hz, which probably correlates with the forward midrange balance noted.

The fact that the 507.2 has a smaller box volume than the Spectrum 208B can be seen in the fact that it starts to roll off 20Hz earlier in the bass. You just can’t beat a big box for low-frequency extension (though, as Dick Olsher points out in his subwoofer review in this issue, larger boxes do have larger problems, particularly in the midband). The low frequencies seem from the curve to be a little underdamped, which would indicate that placing these speakers near the rear wall to take advantage of low-bass boundary reinforcement would not be a good idea.

The set of responses taken from a 45” microphone height show a dip developing in the region around crossover, from 4–8kHz; in fact, the optimum axis seems to be level with the tweeter, which is rather a low listening height with the speakers on 17” stands; 20” stands would be a better match, given the typical height from the floor of a listener’s ears of around 36”. Measured sensitivity was apparently the same as the much larger Spectrum 208B at around 89dB/W/m, but this discrepancy is accounted for by the lower average impedance of the Wharfedale, the speaker sucking more than 1W from the amplifier at the 2.83V input level. Assuming a 6 ohm nominal impedance, this figure will drop to around 87dB/W/m; ie, right on spec. Somewhat unusually, compared with the other speakers I have reviewed, the response in-room on-axis from the lower midrange (500Hz) up was within ±0.5dB between channels. This excellent pair-matching indicates good quality control on Wharfedale’s part.

**Conclusion:** Beautifully finished and constructed to a high standard, with low levels of coloration, adequate low-frequency extension, and a neutral treble, the 507.2 is let down, in my opinion, by its limited dynamic range. This factor, coupled with a relatively high price, just precludes recommendation in *Stereophile*’s “Recommended Components” list. In small rooms, however, where the hardening of the sound at high levels will not be too much of a problem, the 507.2 will be an excellent loudspeaker for the reproduction of voice and chamber music. And my wife thought it “extremely handsome.”

**Comparisons:**

As with last month’s preamplifier reviews, I thought I would rank the four loudspeakers in order of merit in a number of different performance areas, in order to give you a clearer idea of where, in my opinion, each has its particular strengths and weaknesses:

- **Price:** Spectrum 208B, MB Quart 280, Rauna Freja, Wharfedale 507.2
- **Amplifier compatibility:** Spectrum, Rauna, Wharfedale, MB Quart
- **Bass extension & weight:** Spectrum, Wharfedale, MB Quart, Rauna
- **Midrange neutrality:** Wharfedale, MB Quart, Rauna, Spectrum
- **Treble smoothness:** Rauna, MB Quart, Wharfedale, Spectrum
- **Imaging accuracy & focus:** Rauna, Wharfedale, Spectrum, MB Quart
- **Transparency:** Rauna, Wharfedale, MB Quart, Spectrum
- **Overall dynamic range:** Spectrum, MB Quart, Rauna, Wharfedale
- **Best suited for classical reproduction:** Wharfedale, Rauna, MB Quart, Spectrum
- **Best suited for rock/jazz reproduction:** Spectrum, Rauna, MB Quart, Wharfedale
- **Overall merit:** Rauna, Wharfedale, MB Quart, Spectrum

**Next month**

God willin’ and the creek don’t rise, I hope to finish this current batch of reviews of relatively inexpensive loudspeakers with a look and listen to the Amrita Amrit-MiniMonitor, the Angstrom Reflexion and Black Bag from Canada, Monitor Audio’s R300/MD, Wharfedale’s Diamond III, and the Taddeo Domestic Monitor One, as well as possibly taking a look back at the venerable LS3/5A. In the meantime, for those planning to purchase a pair of loudspeakers in this approximate price range, the Table shows the models costing under $2000/

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3 A rather loose parameter, combining sensitivity with current requirements. The higher the ranking, the better suited the speaker for use with low-powered or inexpensive amplification.

4 A close call with these four above 2kHz.
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*Floorstanding; stands not required
**Stands included in price
†Review and rating were of earlier version, practically identical to Si
††Limited LF extension

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pair which have been reviewed by Stereophile in the last two years or so and which are still current. (Back issues of Stereophile are available from the address given in the advertisement in this issue.) The rating (if any) referred to is that achieved by the loudspeaker in question in Stereophile's "Recommended Components" (see Vol.11 No.10, October 1988).

### LEXICON CP-1 DIGITAL PROCESSOR

Bill Sommerwerck takes a lengthy but preliminary listen to the first in a new generation of audio processors

![Lexicon CP-1 surround-sound processor](image)

Digital processing system; provides the following functions, both singly and in a variety of combinations: ambience extraction; image expansion; binaural playback over loudspeakers; ambience synthesis; stereo synthesis from mono sources; surround synthesis from stereo source; Pro-Logic playback of Dolby MP-encoded sources. Frequency responses: unprocessed channels: 10Hz–100kHz, +1, −3dB; processed channels: 10Hz–16kHz, +1, −3dB. Total harmonic distortion (1kHz, maximum level): less than 0.05%. Subwoofer crossover output: 100Hz 12dB/octave. Maximum level, minimum input level: 300mV RMS. Maximum output level: 35V RMS. Input impedance: 50k ohms. Output impedance: 500 ohms. Signal/noise ratio: 85dB minimum, A-weighted, reference 1kHz maximum level. Dimensions: 17” x 12.5” x 2.5” (43.2 x 31.8 x 6.4cm). Weight: 11 lbs. (5 kg). Accessories: two pairs of sleazy audio cables that even Julian Hirsch would throw out (supplied), remote control, and two senile carbon-zinc AAA cells (supplied); rack-mount adapter for the pretentious (part #021-06639), optional. Price: $1295. Approximate number of dealers: 185. Manufacturer: Lexicon Inc., 100 Beaver St., Waltham, MA 02154. Tel: (617) 891-6790.

A review shouldn't begin with an apology, but this one is mandatory. During October, I was suddenly hit with an enormous workload that ate up three of my four weekends. The time I had scheduled to complete my listening and write the reviews for the Lexicon CP-1 and Yamaha DSP-3000 was wiped out.

Consequently, I did not have time to complete the Yamaha review, which was supposed to have run parallel with the Lexicon. I expect to complete the DSP-3000 review in time for the next issue. In addition, I did not finish my impressions of the Lexicon's Dolby MP decoding capabilities, so this review is incomplete in that respect (though it is just as well, given its length). As I now have three Dolby Pro-Logic decoders on hand (the Lexicon, the Yamaha DSR-100, and the NEC PLD-910), I don't think Lexicon or Yamaha will object to the three being reviewed in a single issue—though which issue that will be, I can't say at the moment. Real soon now.

If you have not read the review of the Yamaha DSP-1 that appeared in Vol.10 No.4, you should do so now. It contains a great deal of background information about reverberation, ambience perception, and the design of ambience-simulation systems which cannot be included in this article.

### Warning!

In the time since I reviewed the DSP-1, I have gone from four Acoustat Sixes and two Stax ESTA-4U Extra mini-electrostatics, to (gasp!) six B&W 801 series 2s. There is no question that point-source radiators do not sound as inherently spacious as gigantic electrostats. This has altered my opinion of the DSP-1 for the worse, as you will read. My system electronics have not changed: two Denon 2000Z preamps, the

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Denon 3300 CD player, and three Hafler XL-280 amps.

One more point. I have never reviewed such a complex product as the CP-1; even the Yamaha DSP-1 and DSP-3000 pale in comparison. Despite the outrageous length of this article, I have not discussed every operating feature.

Nonetheless, the CP-1 is not difficult to use. (Somewhat to their surprise, Lexicon reports that even technically ignorant users, such as doctors, have little trouble with it.) Its complexity should more accurately be called "richness"; it does many things, with a wide variety of options. Do not expect the CP-1 to reveal its depths in an evening of indifferent doodling. Give yourself time to set it up properly and read the manual carefully. Ambience systems restore most of the "noodling" and tweaking that Compact Disc has taken away; you should savor the experience, rather than rushing through it.

So, on we go . . .

Lexicon is the oldest manufacturer of professional digital signal-processing equipment, having set up shop in 1972. Their products have a reputation for outstanding sound quality, a reputation I can neither confirm nor deny, having had very little contact with pro gear. The CP-1 (as its name suggests) is Lexicon's first consumer product. At the rapid rate it's selling (mostly to 58-year-old physicians, says Lexicon), it won't be the last.

Lexicon claims to know better than anyone how to make natural-sounding digital reverberation. Considering the success of the Yamaha DSP-1 and the spate of copycat Japanese components that were almost certain to surface in its wake, Lexicon needed a lot of confidence in their ability to compete in an area where they had no experience—consumer electronics.

The top of their current pro line is the 480L Digital Effects System. Its electronics are on plug-in cards, permitting it to be tailored or upgraded as desired. Similar products will eventually appear for home use, but there are several problems. First is price; the kind of super processing power the 480L offers costs 10 times as much as the CP-1. Second, no one yet knows what hardware and software configurations best meet the needs of the home listener. Still, Lexicon and I have discussed the possibility of reviewing the 480L next year. Not so much to promote its sale (though I'm sure some wealthy readers would rush right out in a buying frenzy if we recommended the 480L), but rather to educate these ears as to what is possible in a pro ambience system. It would be a good reference for reviewing consumer products.

Which brings us to the CP-1. Revolutionary is the only word that will do. The CP-1 ranks with electrical and multi-channel recording as one of a handful of genuine advances in sound reproduction. Unlike the CD, which is simply a more reliable and convenient way to distribute recordings, but which does not significantly improve fidelity, the CP-1 is the first product that truly justifies the development of digital recording. (This point of view is explained in my article in this issue, "The Future of Hi-Fi?")

What makes the CP-1 revolutionary is that it takes full advantage of digital signal processing. The software that provides logic steering and music-only stereo synthesis is a programming tour de force. The circuitry in the Yamaha processors is probably capable of such feats, but Yamaha failed to exploit the potential. It is to Lexicon's credit that they have looked beyond the obvious.

Another point of departure from the Yamaha DSP series (and similar products now appearing from other companies) is that the CP-1's room simulations were not based on measurements of actual halls, but on acoustic theory. These models were then refined according to measurements of Boston's Symphony Hall and other reverberant venues.

Lexicon's studies produced several findings that fly in the face of widely accepted acoustical theories. The first is that RT60 (the time it takes an initial sound to decay by 60dB) is not well-correlated with perceived reverb time. The build-up and decay of reverberant sound is far less even than previously believed. This unevenness causes the perceived reverb time to be longer than predicted by RT60 measurements.

Lexicon also discovered that early reflections don't behave according to theory. Textbooks on acoustics state that, in a good hall, each direct sound is followed by a series of widely spaced discrete reflections. As these bounce around the room, secondary and tertiary reflections gradually "fill in the gaps" until the reflections blend into a smooth ambience. Lex-
icon's research showed that "there is no empty interval between the direct sound's arrival and maximum reverb density to be filled in with discrete early reflections. Instead, the reverb builds gradually, with diffused and complex reflections..." This was an important finding; I'll explain why when I discuss the CP-1's Reverb mode.

Another significant point of advance for the CP-1 (and the Yamaha DSP-3000) is that these are stereo devices, not mono. That is, each channel is processed separately.

The first consumer ambience system, the Audio/Pulse Model One, was stereo. Each channel had three different initial delays, which were cross-mixed and recirculated to create a smooth decay. In order to produce less-expensive products, something had to be eliminated. That meant fewer initial delays. The delay itself cost very little; it was the D/A converter you had to hang on to each delay that ran up the price. The Audio/Pulse Model Two consequently had only three delays, the bare minimum needed for decent-sounding reverb. Since three delays don't divide between two channels very well, Left and Right were summed before processing, which further reduced costs. Additional phase shifts and frequency contouring reduced "pleasing spread sound" in the ambience channels, but the original directionality was lost.

The Yamaha DSP-1 was also a mono device. Its ambience generation assumed a single source, located stage-center. Both channels were treated identically. (Yamaha did have the good sense to take their measurements off-center, which threw some pleasing asymmetry into the ambience.) Bert Whyte vehemently rejected the DSP-1 for this reason, telling me he much preferred the Sony 505, an ambience-extraction system, because it was stereo. (This product, perhaps the best of its kind ever made, was reviewed in Vol.11 No.3 and is still on Stereophile's "Recommended Components" list, for those who abhor "artificial anything."

The CP-1 adds reverberation to each channel separately. You can plainly hear this with the front channels switched off; the rear channels retain much of the directionality of the original program. It is also audible with the front channels on; percussive sounds or sharp transients to the left or right clearly reverberate to the left or right. This greatly enhances the illusion of "natural" reverberation.

Stereo operation seems to be the reason for the CP-1's vastly enhanced sense of spaciousness. I compared the CP-1 with the DSP-1, using "comparable" settings. (The CP-1 does not have models of specific rooms, but rather generic models for different room sizes and types of reverberation. It is thus difficult to make an exact comparison.) The CP-1's reverberant field surrounds you, spreading away in all directions. Frankly, the DSP-1's ambience sounds like a confused bolus of reverb surrounding your head. Sort of as if your head were stuck in a nimbus of ambience. The difference is not at all subtle.

Why didn't I hear this when reviewing the DSP-1? I suspect that the ability of planar loudspeakers to project a large apparent sound source, combined with the hugeness of my former living room, masked the effect. (The Yamaha DSP-3000, also a stereo device, lacks this problem; it sounds much like the CP-1.)

It is necessary to point out that, while stereo operation is a major improvement over mono, it is still not "ideal." Theoretically, one should create a reverberant model for the position of each instrument, then apply that model to the instrument's individually recorded sound. As this would require a 50- to 100-channel anechoic recording, it is clearly impossible. Someday it may be possible to design ambience-generation algorithms that focus on sections of the orchestra. Until then, we'll have to suffer with "just" stereo synthesis.

The CP-1 is unusual in another way. Its internal architecture is significantly rearranged for different operating modes. In any of the surround-sound modes (which include Dolby MP decoding and dialog extraction/stereo synthesis), and in the image-enhancement/binaural playback modes, the main channels are subjected to A/D and D/A conversion. The conversion is required because the logic-directed steering is applied digitally and operates on all channels, and subjects the front channels to the same conversion/reconversion delay received by the digitally derived cross-talk-cancelation signals. In either the Ambience or Reverb modes, the main channels are left unprocessed.

In all cases, every channel goes through VCA's (voltage-controlled amplifiers) to set their levels. This permits convenient remote-control adjustment, at the expense of having to run the signal through additional electronics. Which

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brings us to the next topic, setup.

There are two ways to set up the CP-1: Lexicon's way, and the right way. (Sorry, guys, just teasing.) Lexicon strongly recommends hooking the CP-1 into the tape-monitor loop and letting the CP-1's remote volume control set the system level. This setup is tempting; Lexicon figures you'll want to use the CP-1 almost all the time. Owners of CD players have no doubt noticed that CDs require more frequent level changes than LPs. The disadvantage is obvious: the main signal has to go through two more cables, plus the electronics within the CP-1. Lexicon feels the convenience of remote volume control outweighs any minor loss of sound quality. In my own bypass tests (using the Stax Signature headphones and ED-1 equalizer) I found no change in transparency, cleaness, or spatial character. However, brass and strings were lightened in texture, with a slightly steely quality added. This error is not really irritating (indeed, on some dark-sounding recordings it's actually pleasant), but I don't feel the CP-1 is quite good enough to be the master volume control in a really top-end system. Besides, putting the CP-1 in the tape-monitor loop is actually less convenient than hooking it to your preamp's main output.

Here's why:

As with all digital devices, the CP-1's input level is fairly critical. (There is a front-panel control and LED bargraphs for proper setting.) Too high, and you clip the converter during peaks. Too low, and noise or non-linearities may be audible in the effects channels.

The problem in feeding any digital processor from the tape monitor is that the feed occurs before the volume control; the processor's input level will then vary with the source level. This isn't a problem with CDs (whose peak levels are pretty much fixed, regardless of the program material), but it is a problem with LPs, whose levels vary all over the place. If you change the CP-1's input level to match a different source, you then have to change the CP-1's System Volume to compensate for the change. This is convenience?

The "correct" solution is the same one I proposed for the Yamaha DSP-1 (but to which no one paid the slightest attention). Simply feed the CP-1 from one of your preamp's main outputs. Many of even the cheapest preamps have two outputs, so this shouldn't cause too many problems.

This arrangement works well because listeners tend to play most recordings at the same peak level. A "loud" program source is turned down, and vice versa, which largely eliminates the possibility of overdriving the CP-1 (or any other digital processor, for that matter). Chamber music or quiet jazz will, of course, come in at a lower level than Mahler or Glenn Miller, but underdriving the unit in its ambience modes isn't a serious problem; you have to really cut back before you start hearing quantization noise in the rear channels.

The disadvantage of this setup is that the CP-1 cannot be used in any of its modes that process the front channels. This includes stereo and surround synthesis, image enhancement, binaural playback, and Dolby MP decoding. Lexicon has provided a solution to this dilemma in the form of a second input. By connecting a spare tape monitor to input 2 and the CP-1's main outputs, you have access to these other features; simply select input 2 and switch on the tape monitor.

Should you feed the CP-1 with the same brand of cables you run to the power amp? The answer, unfortunately, is "yes." The tonal differences between el-cheapo cables and the better brands can be clearly audible, and will appear in the ambience channels. Ditto, unfortunately, for power amps. When I switched from the smooth, dark-sounding Marantz integrated amp that drove my side speakers to a third Hafler XL-280 (which is nearly neutral in balance), the change was audible and required some system recalibration. If you can't afford to match cables and amps, at least try to find less-expensive products with a similar tonal balance.

Side and rear speakers should be chosen carefully. Less-expensive speakers from the company that made your front speakers are a good bet. (You may even find that used speakers with a clean, low-coloration midrange work well. I've heard one system with mismatched power amplifiers and three different brands of quality speakers that sounded fine.) When buying new ambience speakers, be sure the dealer gives you at least a week to make up your mind. This is a major sale for him, so he should indulge you.

There is something to be said for mixing dipole panel radiators for the ambience channels with point-source speakers for the main channels. Even brand-new, Acoustat 1+1s or
Magnepan MG-IIIIs are not horribly expensive. The “largeness” of their sound and the additional reflected radiation might produce a spectacular effect. (This opinion is based on the differences I heard when switching from dipoles to point-source speakers.) This recommendation is strictly theoretical; if it appeals to you, check it out before spending any money!

One of the CP-1’s best features is its capability of being configured for any number of speakers, from two to seven. (Plus a subwoofer output, which I didn’t test.) You hold down the Bank button on the remote control until the CP-1 switches into setup mode, then select the layout which most closely matches your speaker setup. (There are layout diagrams in the manual and a separate reference card.) Most of my listening was done in mode 9, which feeds six speakers: two front, two side, two rear.

Speaking of remote controls, the CP-1’s is perhaps the best I’ve ever used. The layout is so logical that the first-time user can operate it blindfolded after about 15 seconds’ study—no kidding. It selects any of the 12 operating modes; switches between the preset and user program banks; selects the parameter to be altered; adjusts the parameter’s value up or down; controls system volume and front/back/left-right balance; raises or lowers the Effect level; and mutes the entire system, or just the Effect signals. All in a thin, light box that’s easy to hold and operate (unless your hands are paws).

Like many sophisticated consumer-electronic products, the CP-1 has moved almost all its controls to the remote. Since ambience synthesizers must be operated at the listening position, it’s assumed the listener won’t miss on-unit controls. My only gripe about the remote is that its lack of bulk comes from using AAA cells. These cost as much as AA cells, but don’t last as long. Also, the “bean counters” at Lexicon decided to include cheap zinc-carbon cells, rather than alkaline cells. Naughty, naughty.

The CP-1 has no external balance control. In the Panorama, Ambience, and Reverb modes, input balance is adjusted electronically from the remote control. In the Surround modes, the processor automatically adjusts input balance (and timing errors!) to correct for poorly recorded soundtracks. (This feature will be analyzed in my forthcoming review of the CP-1’s Dolby MP section.)

The CP-1’s operating modes
The CP-1 has four groups of operating modes. The fourth group, Surround, includes stereo and surround synthesis, and Pro-Logic playback of Dolby MP-encoded program material. This group will also be covered in an upcoming review.

The first mode group, Panorama, provides ambience extraction, image enhancement, and playback of binaural records. These effects are achieved by introducing varying amounts of interaural crosstalk cancelation. Used in small amounts, the recording’s ambience is more clearly revealed, even when only two speakers are available. Used “full-strength,” each ear hears only one speaker, permitting binaural recordings to be heard as if the listener were wearing headphones.

As with any product offering crosstalk cancelation, there must be an adjustment to set the correct time delay for the angular displacement of the speakers. The CP-1 offers twelve possible angles, from 29° to 90°. (The JVC Biphonic Processor could be set only for 30, 45, and 60°, and the Carver Sonic Hologram works at only a single listening angle.) You should be able to find a setting appropriate for your normal listening position.

The CP-1 has a noise generator that can be switched between left-only and right-only signals. You simply turn on either signal, then adjust the angle (via the remote control) until you get total (or near-total) signal cancelation in one ear. There is a secondary adjustment, Listener Position, which allows you to get most of the effect even if you have to sit off-center. The manual makes the setup needlessly complicated by adjusting Listener Position while setting the angle. It’s much easier to sit dead-center (even if that’s not your regular listening position) and set the angle, then move and adjust the Listener Position (if needed).

Lexicon claims the crosstalk-cancelation algorithms are based on recent, detailed studies of exactly how the average head alters sounds before they reach the ears. Despite the fact that my room is dead, I was never able to get a really sharp “right-only” effect. (The “left-only” signal was nearly perfect.) Still, the Panorama modes largely lived up to their claims.

The Normal position is principally for ambience extraction, and worked fairly well. Even with the rear speakers shut off, there was an increased sense of depth and spaciousness.
that extended to the sides of (but not behind) the listening position. (In the Panorama modes, the rear signals are simply a delayed difference (Left minus Right) signal.) Switching to speaker mode 1, for two front speakers only, most of the effect was retained. (Why a mode for just two speakers in a surround-sound product? Lexicon wants you to be able to use the product even if you haven’t yet bought additional speakers.) I was especially impressed with the lack of phasiness, a common problem in image-enhancement systems of this type.

Of course, if you have four or six speakers, you will probably use the Panorama “Wide” mode more often. It applies the crosstalk cancelation more vigorously, causing the frontal sounds to move to the sides. The effect is similar to that produced by a surround decoder, except that extreme-left or extreme-right sounds do not move to the rear, and there is no logic action required to achieve directionality; the effect is totally acoustic.

One recording that especially showed the strengths and weaknesses of this mode was the CD reissue of Columbia’s original Broadway cast album of West Side Story. There is no copyright date on the album, but considering when WSS was first performed, the recording must have been made in the early years of the stereo LP era—certainly no later than 1960. By today’s standards, the sound is rather grey and colorless.

The Wide mode really brings it to life. Band 3, “The Dance at the Gym,” is noteworthy. Frontal sounds move to the sides, and the recording’s ambience surrounds the listener. The depth of the original recording is increased. Voices seem closer, instruments farther away. Both show an enhanced sense of the surrounding reverberant space. The sound is more viscerally exciting and emotionally involving. Most of the “greyness” disappears, taking about 10 years off the recording’s apparent age. (No offense to the late Goddard Lieber-son, who produced many classic Broadway musical albums, but the sound is not state-of-the-art for its era, an era that produced some exceptional recordings, even from Columbia.)

Something is lost, though. This recording appears to have been made on stage, using a pair of spaced omnis as the principal mikes. (Many sounds image beyond the speakers, an effect that does not occur with the common forms of coincident miking.) However deth the sound, it has a coherence that the image enhancement removes. It’s as if someone took a black-and-white photograph, vividly colored it, then cut it apart and reassembled it into a collage. The effect is exciting, but not appropriate for all recordings.

Both the Normal and Wide Panorama modes have a surprisingly wide listening area. Unlike JVC’s Biphonic system, and the Carver Sonic Hologram, both of which lock you into a very narrow “sweet spot,” the CP-1 lets you move your head about 4° to the left or right before the effect deteriorates. Even so, the wider image and enhanced spaciousness are still partly audible off-axis, so the non-central listener does not miss all the benefits.

The Binaural mode is supplied for playback of true binaural (dummy-head) recordings. It didn’t work properly at first. Then I remembered the Effects level, and turned it all the way up. Bingo! (The manual neglects to remind the user that full cancelation is obtained only when Effect is fully advanced.)

Although I have a number of binaural recordings (remember the Stereo Review disc?), Stax was kind enough to donate one of their binaural demonstration CDs. (This disc was created to demonstrate their headphones, and the improvements wrought by the ED-1 equalizer.) As I was not able to get total cancelation on the test tones, I was not surprised that the effect was incomplete. (When the speakers spoke directly into the ears of the dummy head, their apparent positions were slightly forward and about 3’ away.)

Nonetheless, I would judge the CP-1 as giving the best binaural playback from loudspeakers I have yet heard. Speakers and performers seemed to be there, in the room, and to move naturally from position to position. The sound was never phasey, and the relatively wide listening window made it possible to relax and enjoy the effect, instead of having to lock one’s head stiffly in place.

Now the part you’ve been waiting for—the ambience-synthesis modes.

The CP-1’s two groupings of hall-synthesis modes are called Ambience and Reverb. The former creates primarily the initial room reflections; they decay without blending. The Reverb mode ignores initial reflections, instead focusing on a smooth blend and decay. (I would be inclined to swap the names of these two groupings, but nobody in product
development wanted my opinion.)

This dichotomy appears to be dictated by cost. The expensive part of the CP-1 is its proprietary signal-processing IC. (Lexicon calls it the "Lexichip." ) It appears that one Lexichip cannot simultaneously process two channels while still providing both initial reflections and decay. (Before you complain that the Yamaha DSP-3000 does both, note that it costs 50% more.)

Unlike the Yamaha products, there are no markings like "Cathedral," "Chamber," or "Jazz Club" on the Lexicon's remote control. Instead, there are three room sizes: Small, Medium, and Large (no XL, though).

The Yamaha products have a plethora of parameters for each mode that cover such items as decay rate, reverb build-up, ambience level, and so on. The Lexicon has "only" two or three principal parameters for each room size.

One of these is high-frequency rolloff. As with most products of this kind, I find the default settings let too much high-frequency energy through; the sound is too airily spacious. Of course, you can adjust this parameter to your taste.

Another setting controls the character of the reverb. In the Reverb mode, this is reverberation time. In Ambience mode, there is no reverberant decay as such, and this setting is marked "Liveness"; it appears to affect the reflectivity of the model's "walls."

Unlike the Yamaha, where the reverb time can be set in increments of 0.1ms, the reverb times on the Lexicon are widely spaced. For example, the Medium Reverb setting offers times of 0.64, 0.76, 0.92, 1.08, 1.28, 1.6, 2.0, 2.6, 3.6, and 5.6 seconds. That's it.

The Reverb mode has a third significant parameter, Bass Reverberation Time. This sets reverb time at low frequencies to 1.25 times the value for mids. It's interesting to note that Yamaha offers a similar option, but for high frequencies; their reverb time can be set to 0.7 times the mid value. If I could have only one of these options, it would be the extended low-frequency reverb of the Lexicon. Reproduced sound often suffers from a lack of warmth or fullness (especially home-brew recordings where the amateur recordist lacks the time or equipment to "doctor" the recording.) In every case where there was enough bass in the program material for the longer reverb to be audible, I preferred the effect; it added warmth and fullness. The Muti Pictures (Angel 47099) demonstrates this beautifully: Bass transients linger appealingly, without becoming "mud" or obscuring detail.

This is not a gimmick. High frequencies are generally absorbed more strongly than mids, and mids more than lows, so the reverb time in real concert halls generally falls with rising frequency. I think Lexicon has chosen the better compromise. After all, if there is too much high-frequency reverb, you can always roll off the rear channels with either product; if there isn't enough bass reverbation, only the Lexicon lets you warm up the sound.

One of the ambiences options is to switch from a rectangular room model to a fan-shaped one. It has been known for about 10 years that long, narrow concert halls have the most pleasant sound, so one would expect the Fan mode to sound bad. It doesn't. It sounds dreadful. The sound bounces all over the place, like billiard balls on a Teflon pool table with Super-Ball bumpers, then mysteriously disappears without any "natural" decay. There must be some pop music this mode sounds good with, but I haven't found it yet (and don't intend to search). [Oh, Bill!—Ed.]

There are some other secondary parameters which will be of interest to some listeners, but I'm saving those until I discuss the quality of the ambience. (This is what you're waiting for, right?)

The CP-1 is the best-sounding hall simulator I have yet heard, and for a simple reason. It is the first one with which I can hear the walls. The Yamaha DSP-3000 sounds every bit as spacious, and has a wider range of adjustments, but the walls are missing. Space without a building. The Lexicon CP-1 gives you not only the ambience, but the reflections. What makes this especially remarkable is that the Reverb modes don't synthesize the early reflections, just the reverberation! Here are some more specific observations and recommendations, based on many weeks of listening:

To begin with, despite the CP-1's sophistication, it cannot arbitrarily superimpose new ambience on an existing recording. To a significant extent, the added ambience must "match" the ambience in the recording. This is true of all ambience-synthesis systems.

I found myself using the Medium Reverb mode most often, which was hardly a surprise.
I was, however, surprised at the large minority of recordings that sounded best in the Small Reverb mode, even though they were full-orchestra recordings. (I noted the same thing with the DSP-1, and ascribed it to a failure to correctly judge the ambient character of the recording.)

This effect persisted with the CP-1, despite its more limited range of selections. I finally figured out what was going on. You see, the values given to the parameters on these processors are based on the assumption of a "dry" source. However, most recordings contain ambience (whether natural or ersatz), and the processor "reverberates the reverberation." Hence, acoustical spaces seem larger and more reverberant.

One thing the CP-1 did very well (with some recordings) was to give the illusion that the added ambience was nothing more than the ambience of the recording, expanded to fill the listening room. This was particularly noticeable with the Colin Davis performance of Faure's Requiem (on Philips) and Joseph Papp's production of The Pirates of Penzance (on Elektra). To go from the recording alone, to the recording-plus-synthetic-ambience, and hear no change in the character of the ambience (just an enhanced spatiality) was pleasing, rewarding, and psychologically comforting; the product must be doing its job right, right?

Lexicon emphasizes that the most important speakers are those to the sides, not the rear speakers; if you only have one extra pair, place them to the sides. I confirmed this by listening separately to each pair. The rear signals, by themselves, sound like a disconnected lump of reverberation. The side speakers, in comparison, add greatly to the spread and depth of sound, largely removing any sense that you are listening to just two speakers. (You are, of course, listening to four, but I mean the two of conventional stereo.) In conjunction with the side speakers, the rear speakers add an appropriate sense of space and acoustic "scaling" behind the listener, but are not acceptable by themselves. (I might add that there is no metallic or "bwangy" quality to the ambience channels when they are heard alone. This indicates high echo density and a good reverberation model.)

The Small Reverb model did not work well (for me) with chamber music; it was too reverberant. I switched to the Small Ambience model (which only generates initial delays), and found it worked much better. The Small and Medium Ambience models were also more effective with popular music, which sounds too reverberant in the Reverb mode. A similar problem occurred with the John Eliot Gardner Messiah (on Philips); the Small Ambience model worked best.

One of the secondary features in the Ambience mode is Speech Detection. The processor notes when speaking (not singing) voices are present, and reduces their level in the ambience channels; the idea is to prevent spoken voice from sounding "cavernous." It worked as claimed. Most of the suppression occurred in the side channels, not the rear. The only difficulty with this feature is that one hears the ambience "opening up" and "closing down" as a recording switches from spoken dialog to music, and back. (Again, the Pirates album gives a good demonstration of this feature.)

There was one secondary control I could not get to work correctly. It appears in the Panorama modes, and is called Low Frequency Width. What it does is control the level of difference signal (L-R) at low frequencies. Especially with spaced-omni recordings, it is supposed to produce a vast improvement in low-frequency spaciousness. Despite a personal demonstration from the factory rep, I heard little or no change, let alone enhancement. Let me know if it works for you.1

Perhaps the most interesting and valuable secondary feature is the ability to synthesize ambience with only two speakers! It works like this. The reverberation signals are subjected to the same image-enhancement processing used in the Panorama mode for the main signals. This causes the ambience to spread to the sides. The main program material is left unaltered. The direct sounds stay where they belong and the ambient sounds spread out.

This system is available in any Ambience or Reverb mode. The CP-1 must be configured for two front speakers (setup modes 1 and 2), or the ambient signals will not be added in. Within the selected Ambience or Reverb mode, you set the Speaker Angle and Listener Position

1 Such "shuffling," where the difference signal can be boosted at low frequencies, is essential, according to Lexicon, to enable binaural recordings to be played back over loudspeakers. It will also add LF spaciousness to coincident-miked recordings, which can be near-monaural in the bass. —JA

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to the same settings they were given in Panorama mode. The Panorama Effect parameter then adjusts the "width" of the added ambience, while the Effect buttons perform their usual function of adjusting the ambience level.

This two-speaker system works quite well, but it is not up to the quality of a four- or six-speaker system. For one thing, the reverberation sometimes seems excessive; you should select a shorter reverb time and/or a smaller room model than you would when using more than two speakers. The extra signals confuse the image a bit, and add a touch of metallic coloration at times.

On the other hand, the apparent expansion of the performing space without a widening of the performers is nice. And you can be enjoying the CP-1 while saving up for the extra speakers and amps.

With all these options, you will doubtless want some way to save your favorite setups. Like the Yamaha products, the Lexicon CP-1 has two banks of program memories. One bank has preset parameters for each of the 12 operating modes. Although the user may change their values, the new settings are lost when a different mode is selected.

The other ("user") bank memorizes favorite settings, so that the user does not have to reset the unit each time it is turned on. (User memory is backed up with a lithium cell, so its settings are not lost when the CP-1 is turned off.) What makes the Lexicon's user memory unique is that, unlike the Yamaha's, changes to user settings are stored immediately; no separate step is needed to store them. This makes it much easier to compare a new setting with a reference setting.

My sample was from the first production run (one of a number slated for the press, which didn't have UL approval; are they trying to bump us off?) and suffered from misaligned DACs; at low playback levels, strange sounds and noises came from the rear channels. A trip to the factory trimmed the DACs and exchanged the system ROM for a new version, which has some trivial software improvements over the original.

I have some minor complaints about the CP-1. The LCD seems to be the same one used in the Yamaha DSP-1. (It even has a yen rather than a dollar sign.) It's small. Even though my new glasses give me better than 20/20 vision, I have trouble reading the thing. (Perhaps Lexicon could include a cheap pair of opera glasses.) A larger display or a video interface (both of which the DSP-3000 has) would be nice.

I'd like a finer range of increments on the reverb times and liveness settings. Although I never had trouble finding a good setting, it would at least be psychologically reassuring.

I'd also like to see the reverb times shortened. The reverb models are based on the assumptions of an unoccupied hall and a dry program source. In practice, an audience reduces the reverb time, especially at mid and high frequencies, and most recordings contain more than a little reverberation.

**A summing up (in both senses)**

The CP-1 is, in some ways, the most sophisticated audio product manufactured. The process of analysis is one of dissection, which can make any product look like a hodgepodge of unrelated features. So let me reiterate my original point, in a slightly different fashion.

The CP-1 is the first consumer digital processor that really takes advantage of digital processing. Not only does it have useful features that are not easily designed in the analog domain, but it imaginatively combines these features to create a product whose capabilities are greater than the sum of its functions. It marks an important turning point in the history of hi-fi sound reproduction—it is the first product that clearly anticipates a totally digital sound system through which the listener has complete control over sound quality.

In the here and now, suffice it to say that the Lexicon CP-1 is the best-sounding consumer ambience system on the market (the Yamaha DSP-3000 included). If it cost $1500 and had only ambience synthesis, it would be a good product at a fair price. The addition of effective Panorama and Binaural modes, as well as the Pro-Logic Dolby decoding, make it an exceptional value at $1295. I urge you to audition it even if you have no intention of buying it. Your intention may change.

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Stereophile, January 1989
**FOLLOW UP**

**Infinity IRS Beta loudspeaker**

Rave or not, my report in Vol.11 No.9 (September 1988) on this Infinity flagship system ended on a note of uncertainty, concerning an audible difference between the sound of the two mid/high-frequency-range panels which was messing up the imaging and exacerbating program grunde in one channel.

When I phoned Infinity president Arnie Nudell and reported that my upper-range panels weren't matched, he didn't believe me. "Why," he asked, "didn't any of us notice it during our visit?" I explained it was probably because no one was listening for it, and besides, the brighter, more sizzly side had been at the right, out of reach of such things as massed violins, which were most affected. At the right, it only added additional guttiness to cellos and basses. So, on the (reasonable) assumption that one of my two upper-range panels was out of whack, Infinity sent a single replacement.

The idea was to compare the new one with the two originals, and toss out (as defective) the one that didn't match. But it wasn't that simple. (Things rarely are.) Instead of two different sounds, I now had *three*. The new panel sounded almost exactly halfway between the other two. Of those, I put aside the most sizzly-sounding one, and phoned Arnie again. This time, he sent John Miller to Santa Fe again, with two large boxes of test equipment.

First, we listened. Yes, John could clearly hear the difference I was talking about; no, it wasn't "normal," and no, he didn't know yet what was causing it. After a full day of measuring, during which I went off and tended to other matters, John felt he had the problem pinned down. He told me he had found a very small inaccuracy in the value of a crossover capacitor, resulting in a 1dB reduction in the level of the rear-firing tweeter, which spans the 5-12kHz range. He corrected it, and we listened to the result.

Now the speakers sounded virtually identical, and I expressed disbelief that such a small change could have had such a noticeable effect on the sound. But...the panel he claimed to have found the problem in was the one whose sound I had liked the most. Now I did not care for the system's sound at all.

After John left, I continued to work over the speakers, adjusting driver levels, changing room placements, trying other electronics, all the while becoming increasingly convinced that something was drastically wrong. I could not get them to sound nearly as good as they had originally. There was now a persistent coloration—best described as a steely sizzle—in both panels, which made any loud orchestral music sound so relentlessly strident as to set my teeth on edge. (Of course, that had to be the week of *Stereophile's* annual reviewer convention, and everyone wanted to hear my system. Only a few of them were polite enough—or embarrassed enough—not to tell me they thought it sounded dreadful!)

Meanwhile, a couple of other things developed that put the Betas in a less than favorable light. First one, then several, then all of the loudspeaker terminals came loose. They didn't actually fall off, but they became so wobbly that I started to wonder when their electrical connections would start to become intermittent. (None has, yet.) Then the crossover module's turnover control knob started to slip on its shaft and, with continued use, finally came completely off in my hand. The reason for this then became obvious: The knob had only one set screw to lock it to the shaft, the screw was very small, and the shaft had no flattened side for the screw to seat itself against. (Worse, the set screw is recessed behind the front panel when the knob is in place; it would have been necessary to dismantle the whole case to replace the knob. I just used pliers for future adjustments.)

Granted, these are minor mechanical problems which seem to have no effect on the sound, but to my way of mind they are inexcusable in a $10,000 product. It's not as if we're dealing with frontiers of technology here; control knobs and 5-way binding posts have been around for longer than I have! I have a cheap Sears-Roebuck radio that has been in use for more than 25 years, and nothing has ever fallen off *that*.

I placed another call to Arnie, and learned that John hadn't just made a small crossover-part "correction," but had also replaced the EMIM and EMIT drivers on both panels, "just to be safe." Arnie declared he was sending
another matched set for me to try.

The drivers were a cinch to replace, but did they solve the problem? Well, yes, no, and maybe. The speakers now sounded quite a bit more pleasant than they had, but they still lacked the gorgeous richness and ease that had attracted me so much to the sound of the original panels. (I should say, "to one of the original panels," because it was what that panel was doing to left-channel sounds that made the system so appealing.)

It seemed to me that most of the sizzle still remaining was coming from the EMIs, so, just on a hunch, I swapped out the latest pair for the previous pair. Sure enough, the problem was slightly worse.

Accordingly, we arranged for Infinity to send us yet another pair of upper-range panels. These, which I am assured are "right out of stock," are the best-sounding of any I have heard to date. The steeliness which afflicted some of the previous samples is completely absent, and nothing else of value has been lost. The system now sounds just as magnificently rich and powerful as did the first samples I reviewed, but with far better imaging than that first pair. However, the very fact that the latest pair are different from the previous pair, even if only slightly, has not helped to dispel the impression that there is some sort of quality control problem here. Unfortunately, it doesn't seem to be susceptible to the usual QC solutions.

The problem sounds very much like a simple frequency-response aberration, which should be easily measurable. In fact, we tried early on to find a frequency-response anomaly that would account for the perceived brightness difference between the two panels which had sounded the most dissimilar, and failed. The probe mike was not moved between comparative tests, the speaker locations were identical to within as small a fraction of an inch as we could get them, and the two people in the room during the tests were as far as possible from the soundfield and in identical poses for each response run. No consistent differences were measurable, and the inconsistent differences measured (on the order of ±1 to 2dB) were of insufficient amplitude to account for the audible differences. Indeed, it took almost 3dB of EQ (downward, at 5kHz) on the Accuphase G-18 equalizer to make the two panels sound fairly similar, but they then measured almost 3dB different at that frequency.

The problem for a manufacturer, of course, is that it is impractical to do QC by ear. The challenge is to find an objective substitute.

—JGH
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Mahler the death-obsessed; Mahler’s Ninth Symphony as the last testament of an artist through whose soul ran the insistent echo of a physician’s death sentence: these are standard critical assessments of one of the foremost thinker-artists living at the turn of this century. There are, of course, those revisionists, such as Michael Kennedy and the late Deryck Cooke, for whom consciousness of death is not the salient feature of Mahler’s work, nor even of his Ninth. They value Cooke’s completion of the Tenth, finding in it a hopeful look toward a new 20th-century music and proof that Mahler was neither despairing nor resigned when composing the Ninth. But even if one sees this completion as a work standing on its own merits (I do, and assert that it has kinship with Charles Ives’s work in that, had it become well known at the time of composition, the face of succeeding music might have been very different), this hardly invalidates the crises, finally and desperately more personal than religious or aesthetic, which come to musical resolution for Mahler through composing the Ninth. There is also a more mundane and immediate correlation:
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that so many conductors have given great performances of the work when near their own deaths.

If the Ninth is an examination of death, then what conclusions may be drawn? What, in the world of this symphony, is the spiritual effect and significance of death? Lewis Thomas, in his famous essay "Late Night Thoughts on Listening to Mahler's Ninth Symphony," recalls a more innocent, pre-nuclear age when he could find in this music "a metaphor for reassurance, confirming my own strong hunch that the death of every creature, the most natural of all experiences, has to be a peaceful experience." Bruno Walter must have had a spirit kindred to Thomas's, or so it would appear from his 1938 recording with the VPO (Electrola C147-01402-3). This is a reading Thomas would warm to, resonating with that side of Mahler's personality which found a moral imperative in music, and a closeness to nature. Walter links the first-movement Andante comodo with the "Abschied" from Das Lied von der Erde, hardly death-obsessed, but conscious of death and life as eternal cycle. What he misses is some of the despair, or defiance of despair, engendered by postwar interpreters who have the dubious benefit of hindsight, decades of systematic technological holocaust and secularized world-view having changed radically a man's relation to the universe, the quality of encounter with his own death.

When Walter again recorded the Ninth for Columbia in 1960, the result was inspiring: the favorite recording of many sensitive Mahler listeners; surprisingly tough: slower, more inflected, less comforting than the Vienna version. Walter, on the eve of his own death, stands here a representative of a more spiritual era, yet still able to conduct a Rondo-Burlesque of bite and chaos, fully incantatory of the music as funeral rite for natural order; he goes on to peer unflinchingly into the fourth-movement abyss, triumphant over meaninglessness, his time redeemed.

(The VPO performance is available on two German EMI-Electrola LPs, coupled with the Symphony 5 Adagietto and Kindertotenlieder, with Kathleen Ferrier; the Columbia has recently been reissued on CBS CD M2K-42033.)

If Walter toughened his view of Mahler in the face of a changing world-view, others have carried "soft" interpretations of the Ninth into the last decades of this century. Rafael Kubelik's recording on DG Privilege (DG 415 634-1, nla) is one such: brisk, almost breezy, lacking tension; the horn-flute-cell interlude of the Andante comodo is chamber-like, but in no way conveys the rootless significance of the passage. The BRSO plays four-squarely, as if too conscious of the notes. Contrast them with Maurice Abravanel's Utah Symphony, recorded on Vanguard (VCS 10075/6). Abravanel demonstrates what a skilled conductor and well-rehearsed provincial orchestra can accomplish with Mahler. Emphasis is on excellent ensemble, moderate pacing, and attention to the printed score. If not a great interpreter, Abravanel proves positive and absorbing, banishing any vitiating literalism. Fine sound, too, with reverberant Mormon Tabernacle ambience, good depth and spread to the sound, and excellent tonal balance, aside from a slight bass rolloff. Most of Abravanel's Mahler is worth seeking out in the used-LP bins.

When one talks about Mahler in good recorded sound, the Eliahu Inbal/FRSO cycle on Denon CD demands mention. Inbal's Ninth (CO-1566/67) is no exception: it shares with the other Denon issues realistic timbres, dynamics unrestrained from hush to thunder, and a natural recorded perspective. You simply will hear details missed in other recordings. Would that Inbal's performance were so true. The first movement is fussy but emotionally imprecise. The Landler has the virtue of the long line, building up to a fast, emphatic climax; but the themes themselves emerge druggy rather than charmingly oafish. Inbal's Rondo-Burlesque is neither; no wildness here, the interplay of themes controlled and self-conscious. The finale is better, but betrays a rather Platonic view of life and death; and it's hard to imagine Mahler as Platonist. Denon's liner notes quote prominently from Schonberg's famous polemic assigning the Ninth as emotionless; the work has for Schonberg "the clear coldness of spirituality and abandons animal warmth." A fitting gloss for Inbal's reading.

At least Inbal proves commitment to a certain view of the work. Herbert von Karajan, in his first (1980) recording of the Ninth with the BPO (DG 2707 125), shows little commitment, despite marvelous orchestral playing and inner movements full of wit and understanding. Karajan's phrasing is orotund, the emotional edges of the outer movements smooth, almost maudlin. Quite a contrast with Karajan's/BPO's.
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followup, recorded live and digitally at the 1982 Salzburg Festival (DG 410 726)! Karajan and orchestra are again their virtuoso selves, but the result is less facile: un-neurotic, broad but not depressive. In the Andante Karajan wrings primordial order from silent chaos, celebrating joyous life-force, becoming reposeful where other conductors see disintegration. The central movements are surprisingly crude: the finale weighty enough to counterbalance the Andante, seeming to transcend earthly life in the long closing decrescendo. It's not the ideal reading, bearing inappropriate Karajan sheen in places, parts of the finale blandly heroic; and Karajan repeats an objectionable mannerism from the 1980 recording, deemphasizing almost to inaudibility the cello line beginning at m.24 in the finale. Perhaps he seeks to banish the dark side of death-realization, but it is at the cost of undermining this most perfect of detached Mahlerian counterpoint. This Salzburg Ninth is nevertheless a great example of Karajan superseding his role as the conductor inoffensive to the bourgeoisie. One sees as justified a quote about the Ninth from his April '88 Gramophone interview: that, after Salzburg, he "would not dare to touch it again."

Bernard Haitink, longtime conductor of the Amsterdam Concertgebouw, weaves of whole cloth quite a different tapestry of the symphony (Philips 670 021). His less frenetic approach to Mahler works well, the reading gentle without becoming incongruously pastoral. Haitink misses some of the conflict in the outer movements, the Andante comodo even taking on a mysterious but un-childlike and unpastoral Nachtmusik quality which I find akin to moments from the Seventh; but, unlike Kubelik, there is no benign tendency to force a round peg into a square hole. He conducts a wonderful Landler, slightly Kappellmeisterish, but calculated. The very slow finale is not particularly emotional, but unlike Inbal's reading is not about intellectual pointmaking; Haitink punctuates the movement's great organic decline with outbursts of passion. Sound is classic Philips: slightly bland, slightly sweet, with much ambience.

Klaus Tennstedt is decidedly less remarkable in his try at the Ninth with the LPO, recorded in 1980 at the nadir of EMI analog (Angel CDCB-47112). His reading has no mystery, sweep, or backbone. First-movement tempi come off rubbery rather than elastic; the makeweight Rondo-Burlesque has neither viciousness nor Apollonian counterpart; the finale is unforgivably pathetic and episodic. Another London orchestra, the LSO, was better served by Leopold Ludwig in a 1960 recording made on 35mm film by Everest (SDBR 3050-2, nla). Ludwig, journeyman conductor though he perpetually was, doesn't quite plumb the work's depths, and orchestral ensemble is imperfect. Yet the performers had the advantage of recording before Mahler issues became routine. The overall effect is propulsive, emphasizing clarity and the chamber-scored sections, but is not without connection to the otherworld. LP sound is spacious, airy in treble (listen to the first-movement bells), colorful in the midrange, with much inner detail revealed (especially so since Leopold divides the violins). The major sonic flaws appear to be differences in gain and balance between sections (and presumably between sessions or takes). This recording has been reissued on a single inexpensive Bescal CD; if the sound is passable, it would be an excellent value.

Georg Solti was of course the LSO's music director for a time, and recorded the Ninth with them in 1967. Here he explores the spiritual aspects—even the most serene and introspective—in his own virile fashion. The Andante comodo is played big, establishing a feeling of triumph over death which remains the theme throughout. Only Solti's Rondo misses the mark; despite a blazing pace and expert contrast between elements sacred and profane, Solti, who probably has not a nasty bone in his body, misses the bitter irony. Some listeners might wish for more delicacy in the small-scaled parts than Solti's raw-boned conducting provides, but he achieves a consistent and positive structure. Sound from the currently available Jubilee LP (London 410 264-1) is acceptably vivid in tone, limited in dynamics. In 1983 Solti re-recorded the symphony digitally with the CSO (London 410 012-1). This performance is more hushed and measured than with the LSO, more formally balanced; but it just isn't quite Solti, and is the less because of this. Sound is early London digital, which is to say terrible.

Jascha Horenstein was a frequent guest conductor with the LSO. He conducted the Ninth with them in 1966; a recording of that performance is available on two Music & Arts CDs
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Nitty Gritty, 4650 Arrow Hwy #F4, Montclair, CA 91763 (714) 625-5525
(CD-235), in wretched electronic stereo, paired with a Marian Anderson Kindertotenlieder. His performance goes not gently into any good night; it is about great ideas and contrasts, the yearning of the first-movement string passages ultimately unfulfilled, the response to this disappointment slashing (just listen to the brass at m.237 of i: the precipitous decline, the feeling of desolation from the shadowing strings that follow). Horenstein’s Landler is nastier than most, its second trio-subject the decaying essence of the ballroom. His Rondo-Burlesque avoids the twin pitfalls of making the music a 20th-century exercise in academic counterpoint on the one hand, and making of it aimless savagery on the other. A most effective touch is the slow and weighty restatement of the main Rondo theme (Tempo I subito, m. 522). Others take this at Tempo I or faster, and, unlike Horenstein, lose a slow starting-point from which to contrast a feverish end. Finale is very slow, with lacerating blankness of vision. While not effacing memories of Horenstein’s hard-to-find Vox recording, the Music & Arts issue is to be recommended to those who can bear the poor recording and occasional orchestral wobbles. (Now if only M&A could release on CD the 1959 Horenstein/LSO Eighth, once available on LP from the allied Discocorp label.)

Going from the sublime to the ordinary, there’s America’s own generic conductor Lorin Maazel on CBS M2K-39721, leading the VPO in a Ninth of admirable clarity, moments of passion, and little consequence. The second movement is so much clockwork, the Rondo goes bump-de-bump. The Finale is very slow, and, unlike Horenstein’s, Bernstein’s/Concertgebouw’s, and Levine’s, excruciating for this. One gets the impression that the eyes of musicians and conductor never strayed from their chronometers. Despite the formal gravity of the finale, the work is not the maudlin of a lite Mahler, in colorless digital sound. James Levine and the Philadelphia Orchestra fare better in their warmblooded reading (RCA RCD2-3461), though occasionally a mite sentimental in the outer movements. Unfortunately, it is sabotaged by RCA’s dreadful CD sound: brash and scratchy, without real lows or softs.

Because he was an Eastern European, Vaclav Neumann perhaps had the advantage of not laboring under the shadow of Bernstein’s Mahler performances. His Ninth on Supraphon (C37-7340) is flowing and straightforward, like Haitink’s showing Nachtmusik elements, the Schattenhaft passage of the first movement evoking Bartok’s Music for Strings. This reminds one that Mahler was no Austrian, but born in Bohemia. Neumann’s finale brings consolation. If occasionally more metrical than Haitink’s account, at least there is more depth than Kubelik’s. Sound is good, though the digital process cancels much of the familiar reverberation of Prague’s Hall of Artists.

Carlo Maria Giulini’s CSO reading (DG 2707 097) has a distinctly 19th-century effect, occasionally reminiscent of Brahms. Uncharacteristic for Giulini, the first movement comes off fragmented, perhaps because he has always fared best in melodic works like Brahms’s, and Mahler’s Andante con moto contains precious few melodic fragments to grasp onto. But the rest of Giulini’s performance! The Landler full of portamento, the sweet gruppetto themes of the Rondo-Burlesque contrasted with the surrounding brutality. And it is the more than favorable contrast with the Andante that makes this Adagio the emotional center for Giulini; this a beautiful, simple traversal, casting death almost as a friend.

Death is no friend in Otto Klemperer’s controversial 1967 New Phiharmonia recording (Pathé Marconi 2C 165-52525/6). For many, his vision may be maddeningly steady, with too much sacrificed to clarity; about as personal as tectonic motion. The Rondo is especially obsessive: slowly, carefully elucidated counterpoint framing a titanic struggle of ideas rather than any danse macabre. At the end of the finale one senses no resignation, but something more cosmic, or, more precisely, geologic. Klemperer’s conducting of this symphony is unique; his heroic response to death (as well as to his own physical suffering) quite different from other, more despairing or resigned conclusions. Perhaps it’s because of all the time he spent reading Nietzsche. The New Philharmonia has its moments of spotty ensemble; the recording is tonally lifelike, but mercilessly analytical.

Furtwangler, for reasons of politics, taste, audience receptiveness, or whatever, committed little Mahler to record, and none of the symphonies. Had he recorded the Ninth, I’m convinced that it would sound a lot like John Barbirolli’s BPO disc. There were in the 1964 BPO players who remembered Furtwangler;
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because of unfamiliarity, they had few preconceptions of Mahler. They find inspiration with the English conductor, their playing spontaneous-sounding, with wide fluctuations of tempo and emotion (listen to m. 211 ff. of the Andante, an intense rumination on the chaos preceding it). The Berlin strings are less honeyed than they were to be for Karajan two decades later, but they sound no less concentrated or emotionally intense. The sound of the Classics for Pleasure LP (4426) is sweet but mushy. (I believe this Ninth is still available on a French EMI three-LP set, coupled with Barbirolli's first-rate Fifth.) The Berlin discs make quite a contrast with a Barbirolli radio performance, recorded at Turin four years earlier, available on two fine-sounding true stereo Fonit-Cetra LPs, recently transferred to a single Hunt Productions CD (CD-34003). Perhaps being in Italy fired Sir John up, for the playing has bite and abandon, the first movement heating up relentlessly from a slow, quiet opening. The Landler is as delicate as any Austrian orchestra. Most listeners will, however, be put off by the sloppy orchestral playing: the contrabassoon makes heavy going of its fourth-movement solos; several unfamiliar instrumental solos are spawned of blown entrances; and the Rondo is beyond the capabilities of the players.

During the latter half of the 1950s, the NYPO’s triumvirate of conductors comprised three of the greatest Mahlerians who ever lived: Bruno Walter, Dimitri Mitropoulos, and the young Leonard Bernstein. In January of 1960, the composer’s centenary year and the last year of Mitropoulos’ life, they collaborated in a Mahler festival, in which Mitropoulos conducted Symphonies 1, 5, 9, and 10—Adagio. The Fifth and Ninth have recently resurrected as single Hunt Productions CDs (CD-523, CD-521); all four have been available on a Fonit Cetra LP set, along with earlier performances of the Third (texts in English) and Sixth. The Ninth from this set is beautifully proportioned, a great inverted arc of drama. By 1960 Mitropoulos was two years past his difficult tenure as NYPO music director; the musicians play like angels for him, as they didn’t always when he was their boss. As with Horenstein, the dramatic nexus and nadir of the first movement is the Schattenbaht indication at m. 254. The central movements are careful contrasts of the delicate, crude, and febrile, the Rondo effective because not always driven full-bore. Bernstein once characterized the finale as a Zen-like meditation on death, but his distinctly Faustian performing personality has rarely approached anything Oriental in spirit when playing Mahler. Here Mitropoulos, clear-eyed and unsentimental, outstrips his acolyte by the acolyte’s own criteria.

I’ve saved Bernstein for last, a fittingly prominent position for our outstanding living Mahler interpreter. Upon reacquaintance with his NYPO performance of the Ninth, reissued by CBS on mid-priced and mid-fi CD (M3K-42200, with Symphonies 7 and 10—Adagio), one realizes that this performance has exceeded the critical celebration it received at its 1967 release to become the standard recording, with which critics make comparisons. Bernstein absorbed his influence well, balancing Mitropoulos’s concept of architectural purity, and of the music as distinctly 20th-century, with a measure of Walter’s poetry. His result may be more emotionally expressive than either mentor’s. Hindsight also reminds us of some shortcomings. The Landler is strictly New York, a bit breakneck, without trace of even ironic Central European feel. (Bernstein had not yet conducted the VPO.) And while he shows astonishing grasp of the work’s neurotic structure, young Bernstein, despite his reputation as an impulsive, damn-the-torpedos interpreter, sounds slightly premeditated. One is reminded of what a commentator said about history’s greatest musical improvisor, Charlie Parker: “When he goes up there, he knows every note he’s going to play.” The NYPO Ninth may be an extreme example of this observation, with a little bit too much foreknowledge and a shade too little now-feeling.

Not at all the case with Bernstein’s 1985 Concertgebouw Ninth (DG 419 208), a realization equalled by few Mahler recordings as symphony embodying the world. It has attracted much criticism for being dilatedly slow and overinflected. Such comments suggest that their sources haven’t thought long on how the nearness of death must feel. Bernstein obviously based thought about it, how it must have felt to Mahler, and to Tchaikovsky, whose Sixth Symphony, one of Mahler’s models for his Ninth, Bernstein recently re-recorded with similar death-obsessed stasis, to receive even worse critical comment. The Andante comodo
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of this Ninth is wiser and less controlled than with the NYPO. It relates the collapse of organic existence to the collapse of the symphonic form: when Bernstein stresses the muted trumpet note which invokes the entropic interlude for flute, horn, and celli, one knows that something of stark and dread consequence is happening. Bernstein does so much with the dissolving line and tonality here that one wishes that he would undergo a change of heart and undertake the Tenth, a work he has publicly rejected.

Bernstein's Rondo-Burlesque, taken out of context, might seem unremittingly furious; but in apposition to the Adagio, where Mahler-Bernstein is purged of rage, finally of all emotion, the approach is unquestionable. It is this slow, static finale which Michael Kennedy described as "lachrymose," but it is Bernstein's slow pace and emotional intensity that prevents this finale from being overshadowed by the counterpoised Andante. Kennedy's judgment also betrays misunderstanding of (what I think is) Bernstein's thesis in this performance: that while Das Lied tells me that earthly life will die only to live again, like the seasons, much as the Resurrection tells me about the life of the spirit, what of my life? My ego and emotions? Such feelings must be allowed to surface, even to shout out, before they can be catharsized in the musical stillness of the Ninth's closing pages. Death here is not the resigned death of the ascetic, nor the consolation of Boethius; but the existential reality of Robert Jordan lying in a Spanish forest, struggling, even as his life bleeds away, to perform one last great act; or the moment when Camus's condemned Stranger realizes his uniqueness within a benign universe.

One fact cries out from Bernstein's reading of the Ninth, as from Mahler's biography: a desperate love of life. Returning to the essay of Lewis Thomas's, for whom listening to the Ninth in our world on the edge of holocaust has become too painful, causing him to wish abjuration of human language: It is precisely this tenacious clinging to life which sacrifices life. Mahler's Ninth Symphony tells us that the peace and fullness of death is not easy, and can only be achieved through anguished struggle. There is no more eloquent argument for the survival of human language, and of music.
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Part Three of Richard Lehnert's Exhaustive Study of Frank Zappa on Record

Did you know that once upon a time, way back a long time ago, before the Big Bang, there was this portly maroon sofa? That an infinite (well, from Belfast to Bog nor Regis, anyway) expanse of oak flooring came next, followed by a chrome dinette set? That the Big G, whenever He gets down to some serious creating, speaks German? My, but there's a lot to learn.

But so it is taught in the Gospel According to Frank Zappa which begins Vol. I of You Can't Do That On Stage Anymore (YCDTOSA). This long-awaited series of six live double-CD sets, all of which should be available by the end of 1989, is unprecedented in the history of releases by living rock, pop, or jazz artists; Keith Jarrett's 10-LP Sun Bear Concerts pales by comparison. Self-indulgent? So far, an emphatic "No." As a regular attendee at Zappa fetes, I've always been astounded at the over-abundance of near-genius material presented, and invariably disappointed at how little of that music ever made it onto records (even with Zappa releasing twice as many discs as any 191
Linn IsoBarik News

As we go to press, Linn Products has just unveiled the latest generation of their IsoBarik Loudspeakers, the DMS (Domestic Monitor Speaker) and the SARA (Small Acoustic Reproduction Apparatus).

Like the Linn Sondek Turntable, the Linn IsoBariks have gone through a continual series of refinements since their inception some fifteen years ago. These speakers have long set standards for both their musical performance and their uncanny ability to provide extended, low distortion bass from a moderate size enclosure. Now, through the application of the same computer simulation techniques used in the development of Linn’s new Nexus and Helix loudspeakers, the performance of these speakers has been advanced by an order of magnitude!

The new computer-generated crossovers take into account the measured, real-world characteristics of the drive units. Rather than being treated as theoretically perfect drivers, the drive units actually become a part of the crossover. The result is unusually accurate frequency and phase response.

The DMS Crossover is a 24dB per octave Linkwitz-Riley configuration, and is mounted externally. This arrangement removes the crossover from the constantly changing pressures inside the enclosure, reducing microphonic distortions. The heavy-duty, double sided board now fills the entire bottom of the speaker stand (and increases the weight of the stand to 35 pounds!). The larger board, besides providing room for the more sophisticated circuit, allows greater spacing between parts, reducing inductive coupling.

This new crossover provides for conventional single-wire operation, tri-wiring (a technique that reduces intermodulation between the various frequency bands, and results in a substantial audible improvement), passive bi-amping, and passive tri-amping. As an added bonus, since it is externally mounted, the crossover can be traded in on Linn’s Aktiv Electronic Crossover, minimizing the cost of eventually stepping up to Linn’s top-of-the-line active tri-amp system.

Introduced at the same time as the crossover, a set of stand damping panels eliminate standing wave problems associated with the cavity under the cabinet, prevent any ringing in the steel DMS stand, and form an enclosure for the external crossover.

The new SARA also employs a Linkwitz-Riley configured crossover and features full phase and time compensation. While this crossover has been used in the SARA for the past year, the current upgrades add facilities for bi-wire and passive bi-amp operation.

These enhancements to the DMS and SARA not only provide significant improvements in performance, but considerably increase the flexibility of the loudspeakers. It is now possible to painlessly upgrade to a multi-amp configuration as your budget allows.

For additional information on these and other Linn products, and the name of the dealer nearest you, contact:

- Audiophile Systems, Ltd., 8709 Castle Park Dr., Indianapolis, IN 46256 (317) 849-7103
- Aldburn Electronics, 127 Portland Street, Toronto, Ontario, Canada M5V 2N4 (416) 863-0915
other rock musician). That imbalance seems finally to be righted by the Zappalanche of CDs and LPs under review here.

The fact is that Zappa's bands simply play better than any other rock/fusion bands you could name, a fact that is finally becoming more widely known. The problem FZ's unclassifiable music has always faced is that, rock-based as it is, the vast majority of its bread-and-butter audience of rock fans, dedicated as they are, know no musical languages outside of rock, finding most of the rest of what he's doing sailing high over their heads. I can't tell you how many times, in conversation with gleeful Zappa fans, I've discovered that what I hear as his most rigorous, strictly organized, through-composed work is heard by most of his own fans as chaotic, freak-out, free blowing. As FZ himself said in disgust, and in partial explanation of the breakup of the original Mothers of Invention in 1969, "These kids wouldn't recognize real music if it came up and bit 'em on the ass."

As far as critical commentary goes, look: No one who isn't a pretty serious Zappaphile already is going to take a chance, on my say-so or no, on dropping $34 on one of these three sets, or $20 on the import-only Humor CD. And if I wasn't getting these gratis, I'd have to do some serious budgeting to be able to afford everything Zappa's released and re-released just this year alone. Zappa releases more records in a year than many listeners buy. Suffice it to say that all of this music is played by rock bands that are probably better players, together and separately, than anyone else in the studio or on the road; regardless of what you think of Zappa's music—not to mention his lyrics—you can be assured of hearing some of the best, most exhilarating playing ever. Just a general note in advance, then: The two YCDTOSA volumes are important, necessary additions for anyone who's bought more than one FZ album in the last 15 years; others might try the sampler, which excerpts from the entire series. Guitar is for more rarefied tastes, primarily guitar players; it lacks some of the variety of its predecessor, Shut Up 'n' Play Yer Guitar, so be cautious; again, there's an LP sampler for less than half the price. Humor and Broadway are souvenirs of the '84 and '88 tours, respectively; attendees will know what to expect. All others: Humor emphasizes instrumental music, Broadway is composed entirely of entertaining political polemics. Take yer choice. For the hardcore: I rest my case, you've got 'em already. Just keep in mind that everything reviewed in this month's survey is new material: no reissues of back catalog here.

In the YCDTOSA series, as FZ takes some pains to point out in the liner notes, there are no overdubs (he's notorious for 'em), all material is previously unreleased, and the entire collection is determinedly not chronological. For example: Disc 1 begins with "Once Upon A Time" and "Sofa #2" from 1971, segues into a 1982 "The Mammy Anthem," then takes a baby step back to a 1980 early digital (PCM 1600 direct-to-two-track) "You Didn't Try To Call Me." Then, after a rundown of the band's diseases ca 1979 (24-track analog), it's way back to the 1969 Mothers via 7½ ips 2-track analog. This goes on for 2½ hours. It's a hell of a lot more enjoyable to listen to in that order than to write about; I've unscrambled Vol.1 for you—we'll take it year by year.

Those original Mothers are represented by four tracks: a medley of "Let's Make the Water Turn Black," "Harry You're a Beast," and "Orange County Lumber Truck," plus "Plastic People," "Sweet Leilani," and "Oh No." "Leilani" sums up much of what was so attractive about this group of mostly musical illiterates—it's the sort of junk Hawaiian love-song in the deliberately sleazy style that only this group seemed able to pull off. It's often been said that you have to be an excellent musician to play with this kind of inspired awfulness, but sometimes it helps to actually be that bad. I've gotta say that I've never heard lounge-lizard tenor sax played better than by Bunk Gardner. The rest is of primarily archival value, although "Oh No"'s out-chorus of horn noodling is interesting.

The '71 Turtles band—so-called because three of its members were from that now legendary group—contributes another four tracks, only one of them a "song" per se, but including an almost entirely different variation on Live at the Fillmore's "What Kind of Girl Do You Think We Are?", here called "The Groupie Routine." This X-rated dialogue is the sort of thing FZ feels you can't do on stage anymore. Tasteless? You bet. And so much fun! Another age might have called this a "party record." (Remember the Hot Nuts?) Oh, yes—this band performs the FZ rewrite of Genesis that began this article.
WHY IT TAKES A 20-BIT CD PLAYER TO APPROACH TRUE 16-BIT LINEARITY.

If human ingenuity could build the perfect 16-bit digital-to-analog converter, there would be no need for Denon’s new 20-bit approach to building CD Players. Unfortunately, 16-bit players have always been susceptible to distortion-inducing non-linearities and quantization errors. This means they can’t maintain accurate spacing between all of the 65,536 amplitude levels available from the 16-bit samples of the Compact Disc.

Enter Denon’s “Delta” system. It combines the world’s first 20-bit 8x resampling digital filter with the first true 20-bit linear converters to process each 16-bit sample to four additional digits of accuracy. (That’s something like using 3.141593 as the value of “π” when everyone else uses 3.14.)

This is no mere computational trick: Denon 20-bit CD Players literally extract more music from the Compact Disc. They exhibit better dynamic range, lower noise, and lower distortion during quiet passages. In the process, Denon 20-bit machines reveal more of the low-level detail that defines musical timbre. On well-recorded CDs, you’ll hear more of what makes a French horn sound like a French horn.

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With Super Linear Converters, the 20-bit “Delta” circuit, and Denon refinements in power supply, laser transport and chassis design, the new Denon DCD-3520 and DCD-1520 elevate digital playback to a new level of musicality. In the process, they achieve the closest approach yet to true 16-bit linearity.

This oscilloscope trace confirms the even spacing of amplitude levels in Denon’s 20-bit system.
The '73/'74 band (one of his best; see YCDTOSA II, below) sings the previously unreleased "Babette" (a '50s love-ballad to a poodle), and "Ruthie-Ruthie," yet another retread of "Louie Louie," which FZ has managed to reference on virtually every one of his 60-odd records. But there's more substantial music as well. The big-band chart of "Big Swifty" gets a brisk, speed-through rearrangement; thick, dense music, meatily played. The '77 band, which included Adrian Belew, Patrick O'Hearn, and Terry Bozzio, takes "The Torture Never Stops" out for a 15-minute spin (primarily a guitar vehicle), and the '79 Sbeik Verbouti band's 20-minute "Don't Eat the Yellow Snow" extravaganza is a breakneck reading of the Apostrophe! suite, with lots of audience participation (including a drunken poetry reading, accompanied by the band, by one Angus O'Patrick O'Reilly McGinty), FZ's algebraic riffs piled thick and fast, fast, fast, and an entirely new closing section reminiscent of the choral recitatives of 200 Motels.

The '80 band delivers a mock-heroic "You Didn't Try To Call Me," and the '81 lineup plays a suite from one of FZ's less listenable albums, You Are What You Is. "Dumb All Over," "Heavenly Bank Account," and "Suicide Chump," all attacks on the retrograde religious right, are far superior here to their horribly overproduced studio cousins. Zappa stops the action to saintorily intone "Tax the churches! Tax the businesses owned by the churches!" Amen. There's also a great Michael Brecker-style sax solo by Bobby Martin on "Suicide."

Most of the rest of the selections, from the '82 and '84 tours, add less to their originals, with the exception of "The Deathless Horse," one of the most densely musical guitar solos FZ has ever written or performed. This is a more thickly textured version than the one found on Shut Up 'n' Play Yer Guitar. (Axesmen: other substantial FZ guitar solos are found on "Big Swifty;" "Zomby Woof;" and "Torture;" "Tell Me You Love Me" has some screaming fills.) YCDTOSA Vol. 2 is a complete two-hour concert from Helsinki, Finland, in 1974, with Napoleon Murphy Brock on vocals and sax, George Duke on keyboards, Ruth Underwood on percussion, Tom Fowler on bass, and Chester Thompson (who later went on to Weather Report) on drums. This and the Turtles band get my votes for Most Enjoyable of all the Zappa bands, probably because they most obviously had the best time on stage. (FZ's more recent bands might play a bit better, but there's more of a hired-hand feel, more anonymous virtuosity. Their predecessors were bands.) The sound lacks something in clarity, but has a warm, round, healthy, straightforward texture that I associate with their gusto in attacking and humanizing Zappa's often clinical arrangements.

After a preview (five years in advance) of "A Token of My Extreme" from Joe's Garage, here called "Tush Tush Tush," we come to "Stink-foot," with some of Zappa's best slash-and-burn guitar. The "Inca Roads" guitar solo is nearly identical to that of the studio version on One Size Fits All, and might well be the same one; a note on OSE tells us that that solo was recorded in Finland. There immediately follows what I'd hoped would be a treat—"RDNZL," as close as we'll get for a while to the great Studio Tan version until that's re-released on Laifer next year. Or the next. Half of this one is guitar solo, there are some incomprehensible lyrics, and George Duke's—probably the single best player ever to grace a Zappa band—crazed piano solo.

The next 21 minutes replicate side 2, and then some, of Roxy & Elsewhere, but at speeds almost double those of Roxy—and those were hardly slow. Schizoid tempo changes and Brock's frenzied sax breaks pervade "Village of the Sun," "Echidna's Ark (Of You)," "Pygmy Twylite," and "Don't You Ever Wash That Thing?" FZ solos with riveting dramatics on the last, against nightmarishly difficult percussion and bass parts. "Twylite," taken at half speed, has one of the most lyrical, unironically guitar-slinger FZ solos on record, owing much, alternately, to Hendrix and Clapton. "Room Service," a throw-together road song obviously never intended for album release but included here as part of the document, has Sly Stone polyrhythms and throwaway lyrics; it's followed by a straightforward "Idiot Bastard Son" and a breathless-sounding "Cheepnis," much inferior to the Roxy version.

The highlight of disc 2 is the 24-minute "Duppee's Paradise," which we've heard before in a chamber-orchestra arrangement, performed by Pierre Boulez and his Ensemble InterContemporain on The Perfect Stranger. This more-than-twice-as-long version has more astounding Duke keyboard work, Brock's taut flute solo, and, those rarities of rarities on Zappa albums, bass and drum solos. The 16-track
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sound is particularly good in these passages, "live" in all the best ways, the band well placed in the soundstage (kickdrum is right in your lap, though). There's a quiet drum/percussion duet, Thompson and Underwood trading off, with tympani played as you've likely not heard them played before. This gamelan goes on for a good 10 minutes of some of the more intelligent high-energy rock drum improvisation I've heard. Listen, too, to Thompson filling furiously on the traditional Finnish tango "Saturnaa."

There follow some brief excerpts from Uncle Meat in essentially unchanged arrangements, and "Montana (Whipping Floss)," so subtitled because a Finn had called out a request for the Allman Brothers' "Whipping Post," of which FZ had, at that point, never heard. (It's since become a standard Zappa encore; see Humor, below.) However, his ignorance of the tune hardly prevented him from rewriting "Montana," on the spot, to include as many references as possible to a whipping post and its paraphernalia.

In a phrase, this is solid music throughout; the CDs of both Vols.1 and 2 are better — fuller, deeper, more "live" — than the few cuts from each excerpted on the Sampler. I couldn't get hold of a copy of the (slightly abridged) 3-LP boxed set of Vol.2 by press time, but I imagine its sound is identical to that of the Sampler.

Guitar, recorded between 1979 and 1984, half-digital, half-analog, all live, all guitar solos, has hardly the variety of Shut Up 'n' Play Yer Guitar, recorded over twice the number of years and with a far greater variety of styles and sidemen. We find here, for the most part, FZ in his heavy-metal guitar maven pose in terms of tone and volume; in that, Guitar is harder to listen to. As far as musical content is concerned, of course, Zappa plays in realm of musical sophistication that heavy-metalers can barely dream of, and would likely call nightmares if they did.

There's nothing here like Shut Up's serene "Stucco Homes" or the eerie "Canard du Jour," but there are a few reflective moments, like "Do Not Pass Go." We can also hear the original guitar solo for "Outside Now" from Joe's Garage, recorded in '79 and the oldest track here. The 4-track analog of this cut is boxy and rolled-off in the highs, but truth to tell it's a lot more listenable than the rest of the album, with FZ's by-now trademark, overemphasized high end and attenuated bass.

Zappa seems unique in his exploration of the guitar's E and A strings, sometimes devoting entire solos to those low, gutty tones. Listen to "Republicans" for this, a bizarre, minor-modal, Night of the Living PAC melody. Throughout, FZ displays his obsession for torturous ornamentation rather than "clean" lines, consistently seeking out the most difficult ways to get from chord to chord, implying as many other keys as possible on the way.


The medleys, too, are striking: "In-A-Gadda-Stravinsky" melds the Iron Butterfly chestnut, the opening bassoon solo of Le Sacre du Printemps, and "Taps"; and the combination of "It Ain't Necessarily So" with the "St. James Infirmary Blues" is deeply felt, not always the case with the cerebral Zappa.

Most of the pertinent accompaniment is provided by the rhythm section of Scott Thunes (bass) and Chad Wackerman (drums), who listen well and fill with solid creativity. Wackerman, in particular, impresses in the Chester Thompson/Terry Bozzio tradition of endlessly melodic rock drumming that owes very little to jazz. Try "When No One Was No One" for Wackerman's chops, with expert ornamentation from percussionist Ed Mann. And Thunes's bass work on "GOA" turns a standard FZ solo into an ominously looming dirge. Keyboardists Bobby Martin and Alan Zavod lean toward celesta/xylophonic filigree throughout.

But not all of these concert edits cry out for release. Enough of them are similar enough that only hard-core fans need apply. But then, Charlie Parker's alternate Savoy and Dial takes are similarly "similar" to one another — and what Birdhead would want them reconsigned to the vaults? For serious guitar students only, then; most others should check out Shut Up
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'n' Play Yer Guitar, or the much-abbreviated LP Guitar sampler (which includes most of the tunes I've mentioned).

Does Humor Belong In Music? is spliced together from nine different 1984 tour dates. The notes for "Let's Move to Cleveland" are typical: "intro from Los Angeles, piano solo from St. Petersburg, drum solo from Vancouver, guitar from Amherst College, out chorus from Los Angeles." Abrupt tempo and key changes abound, but no more than is usual for an unspliced Zappa tune. FZ long ago established rigorously consistent mike placements to facilitate such cutting and pasting. Still, no overdubs.

"Hot-Plate Heaven at the Green Hotel" attacks Republicans and Democrats alike for massive unemployment and the problems of the homeless, while "Trouble Every Day" and "Penguin in Bondage" are little changed from their Roxy versions. "Tinsel-Town Rebellion," full of quotes from the last three decades of TV and pop music, is a hilarious improvement on the already good version from the album of the same name, and "Zoot Allures," too, is far more listenable here than on its own eponymous LP! This seven-piece band also vastly improves upon the rather lean Synclavier original of "What's New in Baltimore?", from the Mothers of Prevention album, and "Whippin' Post" features Dweezil Zappa playing a decidedly teenage, Ned Nugent-style guitar solo with his dad over yet basic "Mannish Boy" riff, with a perfectly straight, impassioned, convincingly sincere—and virtuosic—vocal by Ray White.

"Cock-Sucker's Ball" covers an uncredited Clovers acapella bootleg, according to the notes. It's a Gay '90s (so to speak) delight, bracingly hard-core, medleyed to an abbreviated "WPLJ" in similar style. Seldom remarked on about Zappa's various bands is the fact that, with all their awesome technical chops, the players are invariably good enough singers to comprise a Manhattan Transfer-style band. That's proved in these two short pieces. The instrumental centerpiece, however, is "Let's Move to Cleveland," actually yet another perversion of the classic "Peaches En Regalia" from Hot Rats, the melody here totally inverted, with quotes from Peer Gynt. Alan Zavod's extended electric piano solo is in the inspired George Duke vein, and very welcome—it's seldom that FZ has featured keyboards at length in his bands—and Chad Wackermann's drum solo is so heavily MIDI'd that it's barely recognizable as drumming.

Actually, the drums take more of a back seat than is usual in a Zappa release. Perhaps this is because the bass, in general, seems pretty lightweight in this extremely dry, tight, harsh recording. And—oh, yes—recommended. Hard to find, though; I got mine through Maximum Compact, (800) 234-4268.

Broadway the Hard Way, an LP's worth of political ditties released a week before Election Day, is Zappa's 1988 contribution to the democratic process. Heavy on social comment, light on musical substance, these excerpts from the 1988 tour (still in progress as I write this) are occasional, topical pieces that won't sound near as fresh in a few years, but are clever enough for now.

Side 2 is devoted to a "Republican Medley" which takes on a Democrat or two as well. "Dickie's Such An Asshole," a 1973 tune resurrected from Watergate days, laments the missing Watergate Tapes (remember that 18-Minute Gap? Ah, the easy villains of yesteryear) and the gummint's creeping invasions of privacy that continue to this day. "When the Lie's So Big" can even pass as poetry ("They got lies so big they don't make a noise") if you don't listen too hard, and equates, by implication, Republicans with Nazis—hardly a novel conceit. "Rhymin' Man" is a delicious lambasting, Johnny Cash style, of Jesse Jackson's preference for impassioned agit-prop doggerel over positions reasoned from principle. "Promiscuous" takes on, Rap-wise, Surgeon-General Koop for his recommendations against anal sex and fellatio. Come on, Frank—how about commending the guy for his willingness to seriously, publicly discuss AIDS issues at all? And "The Untouchables," sprinkled liberally with the theme from the TV series, has Ike Willis tight-lippedly telling all our beloved Irangate principals and other assorted political crooks that "you're meat, you're dead, you're history, baloney without the mayo." But FZ's most important statement is his exhortation, at the end of the previous side, to "Get your buns out there and register to vote" at the League of Women Voters registration booths set up in the lobby.

But how did this album begin? By attacking Elvisolatry, which has grown to epidemic proportions of late (a midwestern radio station recently announced its new "All Elvis, All The Time!" format). "Elvis Has Just Left the Building" is savage, tasteless, thoroughly nasty, and
After silence, that which comes nearest to expressing the inexpresive is music.

—Aldus Huxley
absolutely enjoyable: "So what if he looks like a warthog in heat? He knows we all love him—we'll just watch him eat." I bet Albert Goldman plays this one all the time. Just a note about tastelessness: any satire or parody worth the name must, by definition, exceed the boundaries of "good taste." Its function is to disturb, hopefully in ways that inspire the hearer to alter the status quo.

"Planet of the Baritone Women" and "Any Kind of Pain" attack two poles of women's current status. Part 1 of this "American Womanhood" update, 20 years later, is, unfortunately, virtually incoherent in its spluttering apoplexy over what FZ, rightly or not, considers the irony of women finally entering the business world only to adopt the worst attributes of men. Part 2 musically replicates a late-'70s Motown love anthem as it lyrically demolishes contemporary female sex-objects who continue to live vicariously through men, Vogue, and Cosmo. The first line is the wisest: "You are the girl somebody invented in a grim little office on Madison Ave." Born to shop, indeed; Zappa seldom evinces sympathy for the victims. While he displays ample, if clinical, sociological comprehension, he prefers to address the victims of social injustice directly, demanding that they change their lives. He drives a hard compassion.

The most fun of all is the nine-minute "Jesus Thinks You're A Jerk," another potshot at everybody's easiest of targets, Jim and Tammy Bakker. Complete with musical quotations from The Twilight Zone, "Rock of Ages," and "The Old Rugged Cross," and set to a basic melody reminiscent of a children's Sunday-School song, it starts out like this: "There's an ugly little weasel 'bout three-foot nine, face puffed up from cryin' n' lyin' 'cause her sweet little hubby's suckin' prong part time (in the name of The Lord)." Then it gets nasty.

The 12-man band is flawless, and all this vitriol is recorded with the best digital sound yet from Zappa, warm and clear and direct, impeccably mixed. So far, Broadway is on LP only; a much-expanded 2-CD version will be available sometime later this year.

What a glut! I think I better stop now. Next time: The Old Masters.

Parts 1 and 2 of this Zappology magnum opus appeared in Stereophile Vol. 10 No. 8 and Vol. 11 No. 5. Back issues are available; see the advertisement in this issue.

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C.P.E. BACH: St. Mark Passion
Kristina Laki, soprano; Ursula Kunz, alto; Peter Schreier, tenor; Andreas Schmidt, bass; Constanze Backes, soprano; Dietmar Keitz, bass; Christopher Wagner, bass; Gachinger Kantorie, Bach Collegium, Stuttgart; Helmut Rilling
CBS M2K 42511 (2 CDs only). Richard Hauck, eng.; Teije van Gest, prod. DDD. TT: 122:15

Here is a live performance that comprised this work’s premiere. It took place in 1986, one year after the score was discovered among maps and military writings in the basement of the Kolin University Library. As the informative notes accompanying the release point out: “It is known that [C.P.E. Bach] composed 21 passions based on different gospels. All...were lost during the Second World War.” Thus, this discovery proves especially important, if only for historical reasons.

We have here a large-scaled work, which, with its many recitatives, chorales, choruses, and arias echoes the St. Matthew Passion of C.P.E.’s illustrious father. But such similarities ultimately prove superficial, the style of this later piece being more homophonic, narrower in its harmonic range and, consequently, in emotional intensity, and generally more suggestive of a musical language that anticipates the cooler Classicism of the later 18th century. But it lacks the rich expressivity and dramatic heat that Haydn and Mozart were to generate.

Indeed, it is drama that, more than anything else, seems wanting here. Take, for instance, the chorus’s sudden exclamation, “Crucify Him!”: none of the grim magnitude implicit in such an imperative is suggested in C.P.E.’s relatively refined music. And here, perhaps, is mirrored the prime shortcoming of the entire work: as the drama of the text unfolds, the music fails, in effect, to keep pace with it, remaining through-out on one relatively pleasant emotional level. And however one views this story, “pleasant” does not seem an apt interpretation.

Having said this, I should add that the music, qua music, boasts lovely touches in melody and, despite a relatively small instrumental ensemble, imaginative use of orchestral colors in the accompaniments of many arias.

Furthermore, hearing the work permits a fascinating walk into history, revealing a link between the markedly different styles of, on the one hand, J.S. Bach and, on the other, Haydn and Mozart. Interesting, too, is to think of how Haydn, say, could take what was in his time an already old-fashioned genre (the oratorio) and compose two masterpieces — The Seasons and The Creation — in which he made an old tradition new. In contrast, the less-gifted Carl Philippe, for all of his obvious familiarity with his father’s music, simply lacked the imagination to build significantly upon the past when trying to revive it.

Helmut Rilling’s seems a distinguished interpretation. (If my choice of verb suggests equivocation, it is simply because I had neither score nor another recording to use for reference.) The singers throughout are excellent, partic-
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ularly Peter Schreier, and Rilling moves things along with clarity and dispatch, avoiding even a hint of sentimentality. This is especially true of the pacing in recitatives, where the conductor obviously recognizes their prime function is not to stop the action but, rather, to keep it going. Technically, too, the recording is admirable: close but not claustrophobic in perspective, it suggests an intimacy and preserves a transparency that are requisite traits in such music. All timbres are natural throughout, with no trace of harshness.

This release will probably not have wide appeal, which is all the more reason why CBS deserves praise for bringing it out. Beyond question, it belongs on the shelves of every university music department and public library. If it remains a work that one is unlikely to return to often, it nonetheless deepens our understanding of musical history. For that alone, it has great value. —Mortimer H. Frank

BEETHOVEN: Symphonies 1 & 6
Roger Norrington, The London Classical Players
EMI CDC 749 7462 (CD only), Mike Clements, eng.; David R. Murray, prod. DDD. TT: 66:06

BEETHOVEN: Symphony 3; Coriolan Overture
Roy Goodman, The Hanover Band
Nimbus NI 5122 (CD only). DDD. TT: 54:39

BEETHOVEN: Symphonies 4 & 8; King Stephen, The Ruins of Athens Overtures
Roy Goodman, The Hanover Band
Nimbus NI 5130 (CD only). DDD. TT: 68:30

When the "authenticist" movement began to gather momentum, many people were skeptical of its validity; surely every performance would sound the same, especially when such period-instrument bands as Norrington's London Classical Players, Hogwood Academy of Ancient Music, Goodman's Hanover Band, and the independent Orchestra of the Age of Enlightenment shared so many players among them. Hopefully, such doubts have already been quashed, but if not, the two orchestras reviewed here will demonstrate as great a sonic and interpretative contrast as you could hope for.

Roger Norrington's performance notes for this issue are as scholarly and enlightening as those to his previous discs of Beethoven's Symphonies 2, 8, and 9. He lays his philosophy on the line: "The point about playing Beethoven on old instruments... is to make him sound new; to recapture much of the exhilaration and sheer disturbance that his music certainly generated in his day." There is no question that Norrington does this, not only by creating an individual tone color (and I do think he commands the most original sound of all the orchestras), but also through the most carefully considered range of speeds, dynamics, bowing styles, and phrase lengths. In the almost neutral ambience of the venue, details are presented with the utmost clarity. The Hanover Band, by contrast, has the massive reverberance of a famous English church venue to contend with, and what Beethoven's textures stand to gain by the group's leaner orchestral numbers and meeker instruments, they have lost in the fug of the recordings.

And then there are the performances themselves. Perhaps if the Hanover Band's discs had heralded the authenticist movement, I would have been more excited by them. As it is, they seem strangely colorless beside Norrington's interpretations; they lack that incisiveness and precision, instruments tend to struggle and falter just at the places where the London Classical Players are so strong (ie, in faster passage work). The "Eroica," and the Coriolan Overture are dramatic enough, but I wanted them to be revelatory; they simply are not. Norrington's "Pastoral," on the hand, is breathtakingly fresh, "a voyage of aural discovery," as a fellow reviewer has so aptly remarked: horns whoop and rasp with infectious frivolity, the gently pastoral woodwinds are earthy and basic, the strings dry-toned and nimble, never Romantically indulgent, finely painting the programmatic elements of this work—the Storm is quite the most wonderful I have heard, its claps of thunder from those small leather-headed drums punctuating the swirling torrents of rain with threatening intensity. Coupled with the sparkling and witty performance of Symphony 1, this disc is unmitigated delight. So what of the Hanover Band? Well, Norrington hasn't recorded Symphonies 3 or 4, or the three overtures yet!

—Barbara Jahn

BEETHOVEN: Symphonies 4 & 5
Georg Solti; Chicago Symphony Orchestra

Karajan nowadays gives his concerts in battered, comfortable clothes; something of a workshop atmosphere prevails. With Solti they are much more formal affairs. Offstage he looks a little frail, quiet, insular. Yet on his brisk way to the podium there's an appreciable gain in stature; the stiff bow to the audience, the sweeping radial gestures, bobbing and lunging, leaning over to his players while conducting, reflect a degree of coursing, nearly daemonic energy almost indecent in a man of 76. At the end, he turns, holding the baton more like a precious violin, with both hands across his chest. Acknowledging the applause, his formality prevails: though the manner suggests a certain humility. It looks strangely effort-
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less for him—he hasn’t changed in 30 years.

Perhaps this is why a Solti concert (and recently I’ve been attending an intense Bartok orchestral series with the LPO) leaves one admiring, rather than moved by the occasion. Richard Lehmann described in detail Solti’s Beethoven, old and new, in his March 1988 review of the digital Chicago Ninth. Much of what he says applies equally here. These recordings were made at Orchestra Hall and Medinah Temple, the Fourth sounding lighter, the acoustic modern and impersonal; the velvety richness of Medinah Temple suiting the grand treatment Solti affords the Fifth well. On CD, a good sound. I haven’t heard the LP, but with sidelengths of 36:53 and 34:33 . . . ?

I confess, too, that I haven’t listened to any of the older Chicago versions since they first appeared on LP, boxed as a set (essentially for the reasons outlined by RL). Both of these two Symphonies Solti had recorded before that cycle—4 many years ago, with the LPO. As I’ve said already, in IIFN/RR, these new versions strike me as the happiest of Solti’s Beethoven recordings to date. There’s nothing eccentric, not much that is heavily accented; nor is the evenness remorseless, as it was in the earlier all-repeats set. Repeats are observed here, too, but not the extra material in 5 (iii) heard in the identical L’Oiseau-Lyre Hogwood coupling with period instruments (and before that on LP with Loughran and Boulez). The Fifth is a very grand conception, and as a consequence the fermatas are sustained a little longer than one would wish, yet consistent with the scale attempted. For their very controlled consistency, these are satisfying readings.

I cannot see the need for the dismissive sting in the tail of the November ’88 Gramophone review. Broader in tempi throughout, this isn’t the Szell Fifth, nor is it as poetically flexible as the Furtwangler readings (with which it might more reasonably be compared). Nor will you find the individuality and warmth of the best Krips or Jochum performances of the Fourth. Nevertheless, as I say, these are careful, accurate, “formal,” Beethoven readings that will withstand a good deal of repetition.

—Christopher Breunig

BRITTEN: Paul Bunyan
Philip Brunelle, Soloists, Chorus & orchestra of The Plymouth Music Series, Minnesota
Virgin VC VCD 790710-2 (2 CDs). Preston Smith, eng.; Steve Barnett, prod. DDD. TT: 112:38

I find it interesting that fellow reviewers have spent so much time debating whether Britten was justified in rejecting this work after it was condemned by the critics following its first performance in New York in 1941. We are all aware of the damage that can be done by the likes of us (!), but if damning judgments are made on the basis of anything but musical reasons, then I feel they should be ignored—and there were probably many reasons why Paul Bunyan was found to be unacceptable, not least the fact that it was written by a budding English composer and his equally youthful English poet friend, W.H. Auden, who were living in America at the time, and who chose to use an American folk-myth that asked some very disturbing questions about the nature and development of the continent. But, taken on its own merits (and yes, the work is given here in its revised form of 1974), I find it a wonderfully vibrant work, not typical Britten by any means, but a highly enjoyable hybrid of the Broadway musical, cabaret, country and Western song, and the spiritual; Britten himself, in his many letters during the time of its composition, was unable to settle on a name that justly described the genre of the piece, but it seems to me that it does work if you can accept its ironies and humor and its largely atypical style.

Given, fittingly, by an all-American cast and conductor in his first-ever recording, both the performers and the new Classical branch of Virgin Records must be heartily thanked for such a fine issue of the work. It is excellently performed by a clearly spoken, enthusiastic cast of speaker, soloists, and chorus alike: James Lawless provides the offstage, non-singing role of Paul Bunyan, Pop Wagner sings three neatly timed ballads to keep us up to date with the plot, and a truly virtuosic, vivacious, and attractively voiced band of soloists play roles of varying importance ranging from Johnny Inkslinger, the bookkeeper, and Hel Helsen, the foreman, to Moppet and Poppet the two cats and their “friend” Fido, the dog. Philip Brunelle’s Plymouth Music Series Orchestra, which he founded and has directed since 1969, is exemplary; unobtrusively supportive, its perfect timing and intonation run the risk of going unnoticed, so immaculately does it blend with the vocal contributions of this score. And the recording? One of the finest I have heard this year. For those of you who relish the discovery of new pastures, I believe you will be the richer for investigating this one.

—Barbara Jahn

CHOPIN: Piano Music
Military: Polonaise; Ballade No.3; Sonata No.2; Etudes, Op.10 Nos. 5 & 12; Waltzes, Op.64 Nos.1 & 2; Nocturnes, Op.9 No.2 & Op.27 No.2; Scherzo No.2
Jon Kimura Parker, piano
Telarc CD-80147 (CD only). Jack Renner, eng.; James Mallinson, prod. DDD. TT: 68:09

Parker, the first Canadian to win top prize in the Leeds International Piano Competition (1984),

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had previously recorded respectable if not revelatory interpretations of the Tchaikovsky Piano Concertos 1 and 3 before this, his first solo album. The selection of Chopin, all fairly popular, is a nicely varied one, and the pieces play well in sequence. Performance-wise, there are some very commendable things here, notably the sensitivity shown in such poetic works as the slow Op.10 No.3 Etude, the C# Waltz (in which even inner voices are subtly brought out), and the two Nocturnes. There are some extraordinary moments of brilliance, extraverted as though jet-powered, as in the final Scherzo No.2 (and a nice touch of characterization to the questioning main theme of that piece). Much of the program, however, I find played with too much rhythmic regularity, insufficient temperament (again excepting certain pieces—that Scherzo is a real powerhouse!), and a lack of awareness of harmonic tension and where the piece in question is going. These problems are nowhere better illustrated than in the very bland heroics of the opening Military Polonaise, which spends much of its 5½ minutes conveying little impression of nobility or pride. The Third Ballade is placidly played with perfectly valid musical expression, but seldom does one become aware of the rising pitch of musical excitement, of phrases relaxing from recently achieved climaxes. Similarly, the Funeral March from the Second Sonata is very understated. Forward flow all too often seems impeded, and, from a tonal standpoint, a good bit more variety in color and dynamics, especially on the quiet end, would have been a decided asset. As implied, there is something enigmatic here, for a good third of this program is quite marvelous, the rest leaving relatively little lasting impression (and these comments are based on several hearings). The absence of top-heavy brilliance in this natural-sounding piano reproduction, warm and clean, is a great relief after being exposed to some recent overly cluttery piano CDs.    —Igor Kipnis

DVOŘÁK: Trios for Piano, Violin, & Cello, Op.65 & Op.90 (“Dumky”) Emanuel Ax, piano; Young Uck Kim, violin; Yo-Yo Ma, cello
CBS M 44527 (LP), MK 44527 (CD). John Newton, eng.; James Mallinson, prod. DDD. TT: 72:27

Dvořák’s chamber music doesn’t get the respect it deserves. In the latter half of the 19th century, no one but Brahms was in his class, but for too many people, Dvořák is still remembered chiefly as the “New World” Symphony composer. In fact, nowhere in his music is there anything so original or beautiful as the Op.90 “Dumky” trio. The definitive performance of this work was—and is—that of Heifetz/Piatigorsky/Lateiner from RCA’s late ’60s series called the Heifetz/Piatigorsky Concerts. That recording is no longer in the catalog, but now we have an alternative that comes surprisingly close to it in passion and technical polish.

Emanuel Ax and Yo-Yo Ma have chaled up many big sellers, and now CBS brings them together again, this time with violinist Young Uck Kim for the “Dumky” and Op.65 trios. Previous recordings by the Ax/Kim duo have left me rather cold, their note-for-note perfection shielding a spiritual blandness. But with Kim in the “Dumky,” they dig to the heart of the music. Voluptuous, almost idiosyncratic phrasing gives the work an irresistible mystical cast. The sensitive dynamic shadings and wonderfully rich lyricism make the work vivid and full-colored.

The superiority of this performance and its recording quality over that of the Francesco Trio on Wilson Audiophile is not subtle. The Suk Trio’s effort on Denon is also much better than the Francesco, and is a worthy shelfmate to the Ax/Kim/Ma and Heifetz/Piatigorsky/Lateiner readings.

The beauty of the Ax/Kim/Ma “Dumky” is equaled in the first two movements of Op.65: the playing is noble and impassioned. But that old feeling of perfunctory correctness haunts the last two movements, making them cool and pretty, as artificially slow tempos stretch the melodic line to near impotence. Overall, the performance of so anonymous a group as the Yuval Trio on DG (also discontinued) is more satisfying.

Recommendation of the CD over the vinyl version of this release is a fairly easy decision. Not only does the LP album cover lack timings, it reverses the key signatures of the two compositions on the back (listings on the front are correct). Add to those flaws an enormous— and I mean enormous—pre-echo on Op.65, inner-groove distortion, and the constricted dynamics caused by cramming in more than 72 minutes of music, and the LP begins to seem like a mere byproduct, which it probably was.

The nicest thing about the CD is its overall smoothness and lack of grit or glare. The image is very natural, the instruments all gathered spacious around the center rather than spread out to extreme left and right.

But it is the “Dumky” performance that is the real drawing card here; it’s a performance you shouldn’t be without.    —Robert Hesson

HAYDN: Symphonies 45 & 81
Orpheus Chamber Orchestra
DG 423 376-2GH (CD only). Wolf Erickson, recording supervisor; Stephan Schellmann, balance eng.; Steven Paul, prod. DDD. TT: 50:13

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Several of us have pointed out in these pages that DG has issued some remarkably good-sounding releases lately, and if this disc of Haydn symphonies is any indication of things to come, we may soon be referring to the company as an audiophile label.

Having a superb ensemble like the Orpheus Chamber Orchestra on board certainly doesn’t hurt DG’s prospects. This conductorless group of 25 musicians captures the exuberance of Haydn in all its limitless originality and diversity. And we hear the composer’s work free of the bloat and overripeness of today’s larger orchestras.

The Orpheus musicians unabashedly charge into the music, displaying a fresh and engaging enthusiasm. The opening movement of Symphony 45, the “Farewell,” virtually dances with vigor; its razor-sharp rhythms and emphatic phrasing give the music a compelling momentum. The lonely, solitary nature of the second movement is complemented by the orchestra’s limpid texture and sensitive expressivity. Throughout, an impetuous flair permeates the symphony but also contributes to the only weakness of the reading: It doesn’t fully capture the darker side of Haydn’s “storm and stress.” For a deeper understanding of this aspect, turn to Daniel Barenboim with the English Chamber Orchestra on DG, or to Antal Dorati’s effort with the Philharmonia Hungarica on the old Decca/London series of the complete Haydn symphonies.

Symphony 81, a lighter piece, is also played with ebullience and high spirits. The orchestra’s deft manipulation of harmonic tension and relief, as well as its uniformly coherent vision of how the work should sound, belie the fact that there is no conductor. The performance is irresistible.

A great deal of the success of this disc is due to the clarity of the individual sections of the orchestra. Listening, we realize how important the wind instruments are to Haydn, and how severely they can be masked by larger string sections. DG gives us an intimate-sounding environment in which none of the instruments is lost and none is thrust under our noses. There is good ambience and spaciousness around the musicians, but not too much of it: This is a chamber orchestra, and its sonic surroundings are appropriate to its size. Creating the illusion of a large orchestra in the home is, of course, hopeless, but in this recording of a small group, one hears less disparity between the sounds of concert hall and listening room.

The preservation of tone colors is also remarkable. The violins have that real-life balance of body and feathery sheen so seldom captured on tape. The oboes are penetrating, as they should be, but never glaring. That wonderful phrase of Sam Tellig’s—“palpable presence”—is inescapable.

Musically and sonically, this is one very impressive piece of work, and we can only hope for more like it. —Robert Hesson

LISZT: Complete Lieder
Donna Brown, soprano; Gabriele Schreckenbach, alto; Ernst Haefliger, Guy de May, tenors; Philippe Huttenlocher, baritone; Cyril Huve, piano
ADDA Colection Cluni 581084 (4 CDs), Alain de Chambure, Alain Duchemin, recording supervisors; Monique Burqui as pianists, Agnes Wargnier Schnit, engs. DDD, TE: 286:48

With the inexplicable decline of the Liederausgabe, a generation of concertgoers is being denied some of the most enjoyable musical experiences possible. The relatively infrequent efforts of the recording industry to plug this gap do help, but, with the obvious exception of those few vocal superstars whose marketing ensures capacity houses at sports stadiums, vocal recitals just don’t make those cash registers play sufficiently lucrative music for concert management. I wish, therefore, that this review could be more positive.

The people behind this release obviously have the most honorable intentions. They deserve the gratitude of music lovers for making available—for the first time, I believe—this integral release of all of Franz Liszt’s songs. Attention to musicological detail is estimable. Each song is performed in the original language and key by the vocal category prescribed by the composer. This obviates transpositions that invariably alter the color and/or melodic character of a song. Furthermore, as Liszt often wrote two or even three different versions of a specific song, all variants are included except when the alterations, particularly of the vocal line, did not substantially change the music.

It’s not that long since the vocal recital was a financially viable proposition. Even then, Liszt’s songs never approached the popularity of those by Schubert, Schumann, Brahms, Wolf, etc.; with some notable exceptions. The poignant, evergreen “Liebestraum” often surfaced, as did such audience pleasers as “Oh! quand je dors,” “Es muss ein Wunderbares sein,” and “Kennst du das Land,” among relatively few others. Liszt exhibited certain disadvantages in this compositional medium. His impulse was to dramatize a lyric poem; some of the musical settings fall a little uncomfortably between pure art song and operatic aria. In addition, being a virtuoso pianist he found it difficult to restrain a natural tendency to write extravagantly elaborate accompaniments. In

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any event, he remains a much underrated songwriter. The gems of his output—I would add The Three Sonnets of Petrarch in the later, baritone version to those previously mentioned—certainly deserve to be heard more often.

Unfortunately these performances do little to encourage a let's-resurrect-Liszt's-songs insurgency. The subtleties of art-song phrasing, tone coloration, and poetic expression are in rather short supply here. Instead, the soloists, especially the men, substitute precious, affected undersinging for communicative vocal projection. The distinguished Swiss tenor Ernst Haefliger—who might have made a memorable contribution 15 years ago when he was in his mid-fifties—while displaying professionalism and sensitivity, understandably cannot compensate for waning resources. His considerably younger tenorial colleague, Guy de Mey, purveyor of a wimpish, Gallic beat, just isn't a very engaging song stylist (despite study with Sir Peter Pears and Eric Tappy). Similarly, Philippe Huttenlocher, whose previous Erato recordings failed to impress this reviewer, offers a pretentious interpretative approach in a less-than-opulent baritone. The ladies' vocal endowments are on a higher plane, although neither of them succeeds in etching a song's substance in the listener's psyche. The one accompanist, Cyril Huve, provides admirably herculean support.

Despite the impression of a cramped, sterile studio, the engineering is adequate. The useful booklet sets out complete texts, bios, and notes in three languages, albeit with some distinctly odd English translation. Examples: "Write Ernst Haefliger's biography would be the same as to go through major musical events..." Apropos Gabriele Schreckenbach, we read that she received first prize (sic) in Berlin Academy.

—Bernard Soll

LISZT: Piano Music
Teddy Tierup, piano
Sonata in B minor; Two Legends: St. Francis of Assisi, preaching to the birds, St. Francis of Paola walking on the waves; Consolation #3 in D-flat; The fountains at the Villa d’Este (from Third Pilgrimage Year)
Water Lily Acoustics WLA-WS-02 (LP only). Kavi Alexander, Bill Lewis, prods. AAA.

Kavi Alexander of Water Lily Acoustics must have been perplexed when, while in the middle of making a perfectionist recording of the Liszt Sonata, he found that Reference Recordings had released its own audiophile issue of the Sonata, with Minoru Nojima as pianist (see my review in Vol.11 No.4). One can easily imagine a creeping dread at being beaten to the market.

There isn't much duplication, though, for three reasons: the Liszt pieces Tierup chooses to fill out the Sonata record are different from Nojima's choices; Tierup's playing is consistently inferior, both technically and expressively; and the Water Lily sound, while good, reflects a different recording philosophy.

Tierup's performances may be dispatched quickly. He burdens himself with a program of the most opposite aspects of Liszt's piano art: the prototypically Faustian Sonata, and works from Liszt's introspective later period, notably St. Francis of Assisi and Fountains, which anticipate the sensibility and performing difficulties of later Impressionist music. Tierup fails to play either period convincingly. He lacks the chops to play the Sonata; that the recording team had only four hours to tape is cause for sympathy but not excuse: few would tolerate so many wrong notes even in live performance. Tierup also appears not to grasp the Sonata's line. Right-hand figures are rushed and smeared, especially the gruppetos of the central passage marked dolcissimo con intimo sentimento. The reading as a whole wants backbone, the music tending to emerge in one- or two-bar morphemes.

The lack of flow also defeats Tierup's efforts at the impressionistic works, his right hand too upright to portray Assisi's whirlwind of birds. Compare his playing of Fountains with Alfred Brendel's (Philips LP 9500 775, an album of late piano works which remains for me the acme of Brendel's Liszt playing). Brendel preserves line, along with a sense of thoughtful meandering; Tierup produces choppiness.

Only in the Schumannesque Consolation does Tierup play with character, his legato singing sweet melancholy, suggesting that he might have done better to tackle one of the many technically less demanding pieces which cry out for perfectionist treatment: say Schubert D.958 or 960, or Schumann Op.17.

Sound is notably different from the Reference record. Preference will rest upon the type of "classic" sound one prefers. The Water Lily sounds paradigmatically tube-like, the result of a pure-tube recording chain from microphone to cutting-lathe amp. In contrast to the airy, laid-back treble of the Reference, treble on the Water Lily is present and liquid, almost viscous, and perhaps just a bit rolled-off on top (I thought it a lot rolled-off until I read that Tierup plays a Hamburg Steinway rather than its brighter-toned American cousin). Midrange is remarkably characterful. Bass is deep and distinct for tubes, getting murky only on the deepest, fastest passage work of Paola.

The small-hall recording venue is not at all reverberant; playback reflects this in sounding close-up, with little sense of air or decay. There
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is a clear (and in my view realistic) portrayal of piano size and location of right and left hands. Neither pps nor ffs survive the close recording quarters. All of this is quite different from, though hardly inferior to, the distant, nuanced sound of the Reference Nojima.

It's a pity that slipshod playing makes this well-made record hard to recommend, even without comparison to Nojima's release, which rates among the great performances of the Sonata on record. Tierup and Water Lily should be encouraged to try again, with less formidable, though hardly less nourishing, material.

(Dealer distribution is through May Audio Marketing, P.O. Box 1048, 76 Main St., Champaign, NY 12919. Mail-order direct from Kavi Alexander, Water Lily Acoustics, P.O. Box 91448, Santa Barbara, CA 93190.) —Kevin Conklin

**MOZART: Piano Concertos 20 in d, K.466, & 24 in c, K.491**

John Gibbons, fortepiano; Frans Bruggen, Orchestra of the 18th Century

Philips 420-823-1 (LP), 420 823-2 (CD). Dick van Schuppen, eng.; Gerd Berg, prod. DDD. TT: 64:31

These performances may not appeal to all tastes, but they have much to recommend them. For one thing, there is Philips' intelligent in-concert engineering, which is exceptionally clear and well-balanced. This is most apparent in the spotlighted fortepiano, whose sonority is never unduly magnified. As a result, the instrument does not sound larger than it might in the hall, a very important issue in performances such as these that strive for 'authenticity.' Then, too, freedom from harshness preserves naturalness of timbre in the vibratoless strings so that they do not acquire the unpleasant edge they often have in other period-instrument recordings. Ultimately, the effect of such engineering is to shed light on the music. This is most noticeable in the middle section of the slow movement of K.466, where the filigree of the soloist never obscures the essential woodwind writing that defines harmonic motion.

In both performances, John Gibbons and Frans Bruggen strive for low-keyed, almost understated presentations. This robs K.466 of its demonic intensity, suggesting instead a gentle dreaminess lacking the Sturm und Drang fire projected by Malcolm Bilson and John Eliot Gardner in another recent period-instrument recording of the work (Archiv 419 609). Moreover, even though the fortepiano is obviously more restricted in its tonal and dynamic range than a modern concert grand, Bilson manages to produce far more varied levels of volume and color, and his rhythmic inflections seem more pointed and dramatic than those of Gibbons, whose use of rubato sometimes sounds arbitrary and artificial. In contrast to Bilson, however, Gibbons does not fill in portions of the slow movement with improvisational decorations, a wise choice that preserves the music's stark delicacy.

Gibbons's preference for understatement seems better suited to K.491. Here his style lends the work an eerie, otherworldly gloom heightened by the pure string tone and prominent, piquant winds. Here, too, Gibbons's use of rubato is better judged, particularly in the slow movement, where his tempo modifications impose just the right amount of tension on the music's haunting tenderness. Interestingly, the character of the entire performance is epitomized in the execution of the resounding six-four chord that precedes the first-movement cadenza; instead of attacking the chord incisively, Bruggen articulates it with an almost loving tenderness, thereby underscoring the melancholy that pervades the entire reading. Mozart, incidentally, left no cadenzas for either work, and Gibbons plays those of Beethoven in K.466, and his own reasonably stylish ones in K.491.

For anyone who likes these concertos executed with breadth and understatement, this release may well prove attractive.

—Mortimer H. Frank

**PALESTRINA: Mass for Pentecost, Motets**

Christ Church Cathedral Choir, Stephen Darlington, dir. Nimbus NI 5100 (CD only). DDD. TT: 54:31

From time to time, particularly during the current Presidential campaign, I get the notion that America may actually be a rather benighted country. I mean, here we have a recording of a choir that was founded in 1526, and has been performing more or less continuously for the last 450 years—and the English just take this for granted. Without question, there is a distinctively British style of choral singing, and it shows to advantage in this recording. Without going into detail, it tends to be rounder and more smoothly integrated than Continental choirs, the tone that is sometimes called "plummy." It is as effective as any in shaping the flow of musical ideas that distinguishes Palestrina's Mass setting, evolved from the motet Dum compleretur in a fashion which appears simple but is most emphatically not.

The Christ Church Cathedral Choir sings beautifully for Stephen Darlington, no less than for his illustrious predecessor, Simon Preston. The give and take of the complex harmonic structure is elucidated with care, and the aforementioned English tone is often quite ravish-
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ing. The motets, which usefully include the one which provided the theme for the Mass, are given very individualistic performances which demonstrate the composer's ability to concentrate on the sense of the texts rather than the showy ornamentation which characterizes the later Italian sacred school.

Nimbus's absolute adherence to strict one-point miking (using the Calrec Soundfield microphone) is not always the best answer to the problems presented by specific performances and venues. Here, however, it works to perfection. It is a shame that the engineers responsible receive no credit for what must be as fine a choral recording as any available. The most common complaint against Nimbus's use of the Ambisonic system is that imaging is too diffuse (in stereo at least), and that the reverberance of the soundfield is exaggerated. No such problems here. Individual voices are precisely located, and ambiguity is strongly present without overwhelming.

Fine liner notes by John Wilson of Gramophone lend additional value to this, the first Renaissance recording from Nimbus and the Christ Church Choir. I only regret that Nimbus no longer makes their marvelous 45rpm analog LPs, so that confirmed digiphobes could enjoy this as well.

— Les Berkeley

PROKOFIEV: Lieutenant Kije
STRAVINSKY: Song of the Nightingale
Fritz Reiner, Chicago Symphony
Chesky RC-10 (LP), Lewis Layton, eng.; Richard Mohr, prod. TT: 42:10

Here is a new lease on life for one of RCA's most successful classical recordings, one which remained in the full-price Red Seal catalog for nearly a quarter century. Early shaded dogs command a high price, but few observers have acknowledged the fact that RCA maintained a quite respectable standard for this recording with regard to relacquering and restamping over the years, though quality control at the pressing stage became a too-well-known problem. Both works have been available on RCA CD for approximately two years, and were most likely taken from two-channel back-ups. In presenting this edition to the public, Chesky maintains its advantage, even its raison d'être, in cutting directly from the original session three-channel master, using their own customized equipment, and employing the services of RCA's ablest and most cooperative technicians.

Prokofiev drew the music of Lieutenant Kije from his 1933 film score. The suite was a favorite of Reiner's; he conducted it on his numerous engagements as a guest conductor, and revived it often enough in Chicago for it to appear in two different television concerts from the "Great Music from Chicago" series. The work is scored for full orchestra used lightly, its black comedy deftly understated. This sort of mordant wit was right up Reiner's alley, and he had an orchestra of highly polished, supremely confident soloists to bring it off. Chief among them was principal trumpeter Adolph Herseth, who played the offstage calls at the beginnings and ends of the opening and final movements, in addition to an extended solo in the polka-like Wedding March. Another CSO brass principal worth mentioning is tuba player Arnold Jacobs, whose supporting role in the Wedding March gives the very epitome of Prokofiev's send-up of the stereotypical band-tuba part. We have Dick Mohr and Lew Layton to thank for the original recording which made it possible for us to hear this magnificent playing in a natural and unexaggerated context.

Stravinsky's 1918 Song of the Nightingale is a one-act ballet adaptation of his 1908 opera The Nightingale, based on the well-known Hans Christian Anderson tale of The Emperor and the Nightingale. Working for Diaghilev, Stravinsky took the opportunity to enlarge and recolor the orchestration. But there is more to this work than the real nightingale's mellifluous flute cadenzas and the mechanical bird's mock-sour oboe licks. Nightingale is an extremely complex work for large orchestra, filled with solo and combined ensemble passages of unsurpassed delicacy and finesse. It was reported that Stravinsky was so impressed by Reiner's recording that he declined to record the work himself within the then-ongoing project by Columbia Masterworks to record all of his orchestral music under own his direction. Stravinsky did, however, record the earlier operatic version.

RCA's original Red Seal appeared to do justice to both recordings, although there were some congestive moments in Nightingale. Many listeners who have heard the Chesky edition consider it their best so far. Chesky isn't arguing, and neither am I. In this case, original tapes in truly excellent condition may have played a key factor.

Has anyone ever heard of a "soft transient"? This is the sound of a struck percussion instrument, its sound decaying softly and evenly, simultaneously reverberating into and being absorbed by the hall space. One can hear this effect in a good concert hall, and RCA's best efforts hinted at it. A few really well-processed CDs rumor its possibilities, but it has been an obvious common factor in each of the Chesky "Living Stereo" revivals, and is nowhere more evident than on this recording. The ability to

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clarify and consistently place the highly colorful percussion section in Nightingale carries over to the rest of the orchestra as well. The original shaded dog is a magnificent piece of history, but the Chesky is revelatory of performance and recording.

RCA's own CD versions are successful on CD terms, eminently listenable. They possess clarity and vitality, but do lack the Chesky's incredible depth, timbre, and placement. The true analog fanatic will never own, let alone listen to, the CD versions; only the Chesky will do. Chesky has maintained a remarkable batting average in the quality of its releases both on vinyl and CD. What could they possibly come up with next? —Richard Schneider

**PUCCINI: La Bohème**

Angelina Reaux, Mimi; Barbara Daniels, Musetta; Jerry Hadley, Rodolfo; Thomas Hampson, Marcello; James Basterud, Schaunard; Paul Plishka, Colline; Joseph McKee, Benoit; Gimi Beni, Alcindoro; Don Bernardini, Parpignol; Coro e Orchestra dell'Accademia Nazionale di Santa Cecilia, Roma; Leonard Bernstein


I wouldn't want to place any bets, but I'm pretty sure that this is the slowest Bohème available. Not that any of us expected Leonard Bernstein to zip through what is undoubtedly the most gorgeously sentimental opera in the world, mind you, but to lag behind von Karajan's 1973 epic with Freni and Pavarotti is quite an accomplishment. What it does allow us to do is listen intently to many of the orchestral niceties which all too often are buried under swiftness, and we should be grateful for that. But there's another problem or two to deal with: the singers and the sound.

Angelina Reaux is not a great Mimi; she is a barely passable one. Her sound is fresh and clean but with an unappealing edge; she sounds unfinished and novice-like. Her Italian diction is also questionable, and while she sings fervently, she makes very little of the text. Hers is the first "Addio senza rancor" I have heard in a long time which left me cold. Jerry Hadley is a fine tenor, overparted here as Rodolfo. He was marvelous in the recent Anna Bolena on London with Joan Sutherland, but Puccini is very different from Donizetti, and Bernstein is a very different conductor from Bonyngs. The slow tempi make him force (as they do the others), and at times he leans toward shouting. He sings "Che gelida manina" like a spinto, which he is not, and the result is that he sharps occasionally and is too busy getting the sound out to focus on the role's poetry. It doesn't strike me as his fault that his Rodolfo doesn't make it— with a different conductor and approach, I'm sure that Hadley would impress.

Barbara Daniels's Musetta is well-drawn, but she is too broad, over sing in the Cafe Momus scene. She also sounds too much like Reaux in the third-act squabble. Thomas Hampson, on the other hand, is a terrific Marcello—this is a gorgeous voice, used with intelligence, which somehow escapes the pitfalls the others fall into. Plishka and Basterud are sincere in their parts, but unmemorable.

Needless to say, the orchestra plays divinely and the chorus works equally hard, to fine effect. The recording, particularly on CD, is far too bright. It brings out the harshness in the women's voices and allows us to hear precisely what Hadley lacks—vocal weight — with great clarity. On the other hand, as mentioned above, every instrument in the orchestra is clear. The overall effect is of an abnormal ambience, something you'd never experience in the opera house. My impression is that this is just what Bernstein wanted: an orchestrally gorgeous Bohème, with every bit of feeling squeezed from the orchestra. Unfortunately, it's an opera, and the singers are either not up to their roles at all (Reaux), or are being pushed over the edge (Hadley). And a Bohème without singers doesn't exist.

—Robert Levine

**PUCCINI: La Bohème**

Mirella Freni, Mimi; Gianni Raimondi, Rodolfo; Hilde Gudgen, Musetta; Rolando Panerai, Marcello; Giuseppe Baddei, Schaunard; Ivo Vinco, Colline; Orchester & Chorus of the Vienna State Opera, Herbert von Karajan


This is another of those extended-play CDs which require either an A-B switcher or moving the balance knob either to the left or right. Acts I and II are on the left channel, the last two on the right. There are 16 cueing points—some for each channel. Would that Rodolphe had had the sense to package this in a one-CD format; while this is supposed to save space, Rodolphe decided to put it in a regular, two-CD jewel box, leaving one slot empty. But who am I to bicker with technology when four million angels are dancing on the head of one laser beam?

This is a Bohème for enthusiasts, and I don't mean that left-handedly. Here are the spontaneity, energy, real interaction between characters, extraneous stage noises, a strained high C from the tenor at the close of "Che gelida manina," a chorus that sounds as if it has never met the orchestra or conductor at the start of the second act, and audience applause occasionally interrupting the flow of the drama. In other words, it's a live performance and has the feel of one—both negative and positive. The sound is not for stereophiles—it's not bad, slightly
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thumpy mono, but it won't make the decision as to whether or not you want this in your collection.

The singing is uniformly outstanding. Raimondi was a good, poetic Rodolfo, and if anything stopped him from entering the absolute front ranks of lyric tenors, it was that extra bit of pathos and morbidezza that great Rodolfos should have. (Just listen to Carlo Bergonzi for the comparison.) Freni was at the start of her international career when this was taped, and she's positively lovely here—guileless, fresh, and lustrous of tone. The good news, of course, is that she still is. Rolando Panerai is a wonderfully sympathetic Marcello with a more handsome voice than I normally associate with him, and he's particularly impressive in his Act III confrontation with Rodolfo. Hilde Guden is the best Musetta on disc; she'sassy without distorting the vocal line—in other words, musical in the extreme, rhythmically right on the mark. Teddei is an extra luxury; Vinco is good.

By the time von Karajan entered the recording studio with Pavarotti and Freni 10 years after this performance, he had decided that *La Boheme* was a symphony with voices and chorus, sort of like the Beethoven Ninth. His tempi were also far slower, with, I must admit (as much as I love that recording), not that much gained dramatically. The present reading returns the opera to a more intimate scale, and it works beautifully. And for some reason, the fact that the chorus mutinies during the second act is somehow endearing. Von Karajan's later absolute perfection has occasionally devalued his performances; this one, warts and all, is the real ticket. This is a good gamble—not a first *Boheme*, not a *Boheme* to change your life, but one for those, like me, who love the opera, and can't quite get enough of it—or of Freni, for that matter. —Robert Levine

**RACHMANINOV: Piano Concertos 1 & 2; Rhapsody on a Theme of Paganini**

Sergei Rachmaninov, piano; Philadelphia Orchestra; Eugene Ormandy (Concertos 1 & 4), Leopold Stokowski (Rhapsody).


All three of these familiar performances rank as classic recordings of the highest importance. The Fourth Concerto bears the latest date, 1941, while the First was made at the end of 1939 and beginning of 1940, both with Eugene Ormandy. The 1934 Paganini Rhapsody, with Stokowski conducting, is one of the composer's greatest works, something that cannot be said with quite the same degree of enthusiasm about the revised first and last piano concertos, but all are most welcome as reissued on this well-filled CD (I have not heard RCA's newest CD incarnation of this disc's mate, the Second and Third Concertos). Equalizing here has been reasonably well done, although I find that a stiff bass boost helps the recording immeasurably (many companies tend to overdo that bass boost in an attempt to make an older recording sound more impressive in CD reincarnation, but in this case not enough was done in the first place).

There also has been a fair amount of low-pass filtering to remove 78rpm surfaces, though slightly lower-frequency surface noise is still apparent, letting one know that these are anything but state-of-the-art recordings. Even at the time of original issue, these were never exemplary of the best available sound, but what counts are the golden performances themselves. Tracks are provided for all movements, even for each of the 24 variations in the Rhapsody. Now, RCA, what about a CD reissue of Rachmaninov's solo piano music?—Igor Kipnis

**RIMSKY-KORSAKOV: Scheherazade, Russian Easter Overture**

Uri Pianka, violin; Israel Philharmonic Orchestra, Zubin Mehta

CBS M 44559 (LP), MK 44559 (CD). Michael Sheady, eng.; David Mortley, prod. DDA/DDD. TT: 61:01

**RIMSKY-KORSAKOV: Scheherazade, Russian Easter Overture**

Bradley Creswick, violin; George Ives, cello; Philharmonia Orchestra, William Boughton

Nimbus NI 5128 (CD only). DDD. TT: 58:32

Neither of these *Scheherazades* are, I feel, entirely ideal, at least not in comparison with the sinuously flexible, classic account of Beecham (Angel), the sensuously colorful and atmospheric versions of Stokowski (Victrola and London), or the sonic vividness of the much more recent Dutoit (London). Indeed, personality and excitement, not to mention romantic dash and sparkling rhythmic vitality, are in fairly short supply here, perhaps most apparent in the respective opening movements. Mehta tends to be broad-gestured but also pokey, with not much tonal shading or refined articulation to be noticed in the relatively bland orchestral playing. The British conductor, William Boughton, steers a more eventful and overall slightly faster course, but his first three movements, though providing a greater detail, are emotionally very low-key. It is not until the finale that the tension of the Baghdad festival and the lowering sea of Sinbad's ship causes the performances to leave the realm of blandness and really sit up, but very much more so for Boughton than for Mehta. The *Russian Easter Overture* receives a good performance at the hands of Mehta but one still without the resplendence of any one of Stokowski's four recordings (none

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available on CD). However, Boughton's version has admirable thrust and excitement; his chant motifs have far more rhythmic flexibility (the solo trombone section is really vocal in character), and, overall, I found this impressive performance a most rivetting and enjoyable experience. CBS provides its best sound here for the Russian Easter Overture, which is more vivid and has somewhat more timbral bite than in its indifferent Scheherazade pickup. Nimbus emphasizes a leaner, more transparent, and consequently better detailed orchestral canvas; one hears the slightly distant orchestra as though in an empty hall, a not unpleasant listening sensation but one that I find not too realistic either. It sounds at its most impressive at a fairly high playback level.

—Igor Kipnis

**Sousa: Great Marches & Incidental Music**
John Wallace & The Wallace Collection
Nimbus NI 5129 (CD only). DDD. TT: 60:08

Petit-maître Sousa took a minor, disposable musical form that no-one had ever bothered to actually listen to much—the march—and elevated it to the level of art. But a band playing Sousa forgets the parade-ground at its peril—not every wind ensemble can play this music sitting down. The swing and strut of a marching band on the hoof blaring out one of the great Sousa marches is one thing; concert—even chamber—groups like The Wallace Collection, no matter how carefully conducted, no matter how lovingly molded and fine-tuned their nuances of phrase and sonority, too often lose the gung-ho, kick-ass profluence that makes a march march. Just as the ultimate measure of a great waltz is how irresistibly it invites one to dance, so the test of a great march (and band) is whether or not it makes you want to get up and join the parade.

The Wallace Collection, a British group, is not a great marching band, though it is a satisfying wind ensemble. Under John Wallace, they lack the requisite bite and crispness of attack, the heft of brass, to make this music fly. There are some delicious moments in the marches ("Manhattan Beach," "King Cotton," "El Capitan"), but most of the interest is restricted to the non-march selections, and that interest is more historical than vital. A few of Sousa's concert and novelty pieces, and selections from some of his many forgotten (justly so; this music isn't called "incidental" for nothing) operettas are recorded here for the first time. This is pavilion music, of more interest to the stroller than to the marcher or listener. The fey, unromantic waltzes of "La Reine de la Mer," the well-crafted scene-painting of "Chariot Race," the grinning Latins condescendingly depicted in "Under the Cuban Flag" (with John Miller's embarrassingly sloppy cornet solo), Sousa's awkward little leap onto the ragtime bandwagon ("With Pleasure"), and the long selection from the operetta El Capitan—none of it is any more than unimportant music played well.

The marches themselves are treated in kind, but deserve better. Wallace is too polite, too restrained for my tastes, his balances of band voices too refined, too interested in subtle nuance at the expense of the robustness that can burst the seams of these marches. All one need do is grab down any old US Decca (now MCA) recording of Richard Franko Goldman (a Sousa Band alumnus) and his band to hear just how much music these marches can hold. There is real drama and edge-of-the-seat excitement in Goldman's readings, still the best I've ever heard (Frederick Fenell isn't bad either).

The recording is superbly natural, the soundstaging pinpoint-accurate when checked against the session photo from Watford Town Hall (I see only one mike), and entirely free of digital glare or harshness of any kind. In fact, like most Nimbus CDs, this one errrs on the side of softness, the attacks blunted and muffled, sounding carameled-over. Snare and bass drum are immensely satisfying, though the woodwinds and brass (and, in a wind ensemble, what else is left?) are too fruitily rich. Nimbus's usually excellent editing is sloppy here, with abrupt fade-ins and cut-offs of hall resonance at beginnings and ends of tracks, and what sounds like Wallace dropping his baton onto his metal music stand at the end of each take.

All in all, a pretty convincing argument for single-mike recording, and for restricting the recording of Sousa's music to bands that lose a lot of shoeleather to the asphalt.

—Richard Lehnert

**Strauss: Symphonia Domestica, Till Eutenspielgel, 2 Songs**
Felicity Lott, soprano; Neeme Jarvi, Scottish National Orchestra
Chandos CHAN 8572 (CD), ABRD 1267 (LP). Ralph Couzens, eng.; Brian Couzens, prod. DDD. TT: 65:51

This fourth recording in Jarvi/SNO's cycle of the Strauss Symphonic Poems bears as many riches as the three previously reviewed in the February and June '88 Stereophile. The Caird Hall, Dundee, has again proved a marvelous recording venue for these huge, late-Romantic works, with their immense ranges of timbre, dynamics, and textural detail: all are captured with admirable clarity and presence on an impressively spacious soundstage. Slightly sharper definition gives CD the edge over LP, but both formats are excellent.
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The commitment and intensity of the SNO’s readings throughout this series have been unfailing and, with Jarvis’s fine ear for textural balance, some wonderful playing from both woodwind and brass sections is given ample room to register in the two strongly characterized orchestral works given here. With the voice placed well forward again there is, however, less clarity to the orchestral contribution in the two songs, the miniature “Zueignung” and an orchestral conceived setting of the Epiphany, “Die heiligen drei Konige auf Morgenland,” with as full a complement of colorful word-painting as witnessed in its companion works. Felicity Lott is splendid here, her considered weighting of tone and fluid phrasing meeting every technical demand and proving her to be a fine Strauss interpreter.

—Barbara Jahn

TALLIS: Lamentations of Jeremiah; Mass for Four Voices; Motets
The Hilliard Ensemble; Paul Hillier, dir. ECM New Series 1341 (833 308-1, LP; 833 308-2, CD).
Anthony Howell, eng.; Manfred Eicher, prod. DDD/ DDA. TT: 54:16

Unlike many Early Music ensembles, the Hilliard is the genuine article: a group of performers who have remained essentially intact since the mid-’70s, with a long and distinguished series of recordings and public performances. Their director, Paul Hillier, is even more prolific, and may hold the title of most-recorded baritone in Early Music. His direction is undoubtedly informed by his wide experience and familiarity, as performer and scholar, with the idiom of Renaissance music.

This recording represents as fine and varied a selection of Tallis’s work as will be found in the catalog. There is no question that this is music with which the Hilliard Ensemble is intimately familiar, and they perform it in simple and affecting fashion. There are other excellent performances of the Lamentations: The Tallis Scholars have received almost universally favorable reviews, and there is a fine performance at budget price from Pro Cantione Antiqua; nevertheless, the Hilliard recording can be recommended without reservation. Of particular interest here is the Mass for Four Voices, which is not nearly so widely performed or recorded, but which represents the composer’s style at its simplest and purest. (I am indebted here to David Fallows of Gramophone, who called my attention to the very Anglicized Latin pronunciation used in the Mass.) If the Mass is not among the greatest of its kind, the Hilliard Ensemble makes a very strong argument in its favor.

In this recording, the Hilliard exemplifies the best of the current trend in performance of Renaissance sacred works: the absolutely seamless blend of voices; the careful attention to text, even to appropriate “nonstandard” pronunciation; and the absence of any style except that of the composer and his period. I am glad that ECM paused in their concern with contemporary music to issue this performance.

The name of Anthony Howell must be nearly as familiar to Renaissance music collectors as that of Paul Hillier. His recordings for Hyperion set the very excellent standard for that label, and he has followed the peripatetic Kirkby/ Rooley duo through at least three label changes. With one unfortunate exception (Olympia’s Lament), he has always produced recordings that are entirely sympathetic to, and supportive of, the performers. This is one such, in both CD and LP formats. Focus on individual voices is sharp and steady, and the acoustic character of All Hallows Church, London, is perfectly preserved. If I had to choose between the formats, I would plump for the CD, if only to keep the dead-silent background even with headphones. I hesitate to give blanket recommendations, but if you see any other discs with the names of Hilliard and Howell together, go ahead and buy them.

—Les Berkeley

TCHAIKOVSKY: Violin Concerto, Marche Slav, Andante Cantabile (from Quartet No. 1 in D), Capriccio Italien
Itzhak Perlman, violin; Alfred Wallenstein, London Symphony Orchestra (Concerto, Marche Slav); Massimo Freccia, London Philharmonic Orchestra (Andante Cantabile); Alexander Gibson, New Symphony Orchestra of London (Capriccio Italien)
Chesky CD-12 (CD only). Kenneth G. Wilkinson, eng.; Charles Gerhardt, prod.; David & Norman Chesky, exec. producers. TT: 63:00

TCHAIKOVSKY: Piano Concerto 1
DOHNANYI: Variations on a Nursery Song, Capriccio in f
Earl Wild, piano; Anatole Fistoulari, Royal Philharmonic Orchestra (Concerto); Christoph von Dohnanyi, New Philharmonia Orchestra
Chesky CD-13 (CD only). Kenneth G. Wilkinson, eng.; Charles Gerhardt, prod.; David & Norman Chesky, exec. producers. TT: 60:00

Thanks once again to the brothers Chesky for resurrecting a couple of estimable recorded interpretations; this time, of the two popular Tchaikovsky concertos. Parenthetically, it should be remembered that in any art form, especially one that synthesizes the creative with the interpretive, there cannot be an absolute. There are just too many variables; the most significant being subjectivity of individual appreciation regardless of that individual’s qualifications. This is no cop-out. It’s just my way of saying that there is no single recording of the violin or piano concerto, including these, that I unreservedly recommend over all others. Both
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Natural Sound
of these releases will now join a largish number of others in my Tchaikovsky concerto collection that I enjoy replaying when gripped by the urge to wallow in the sensual delights of Russian Romanticism.

This 1967 recording of the Violin Concerto, the first of three so far that Itzhak Perlman has recorded commercially, blazes with youthful impetuosity and attractive insouciance. The then-21-year-old virtuoso was in the midst of what he has admitted was his Jascha Heifetz period, notable for brisk tempi, a light, fast vibrato, and pyrotechnical ebullience in bravura sections. Unable to parallel his idol’s distinctively glorious string tone (who could? who can?), he came closer to that aesthetic apo- gee than one has a right to expect from so young an artist. Despite Wallenstein’s servile conducting, this is a galvanizing performance which would be welcome on my proverbial desert island. Perlman’s third recording of this concerto—with Eugene Ormandy and the Philadelphia Orchestra—now digitally remastered on EMI CD, offers a more mature, deeper, expansive reading with just as many spectacular fireworks. Also available is the Heifetz version, now on RCA CD.

Of considerably lesser artistic value are the orchestral fillers. The Capriccio Italian, rather roughly played, is superficially interpreted; similarly the more homogeneously played yet pedestrian reading of Marche Slav. Both pieces enjoy finer performances and engineering, both analog and digital, from a large number of vinyl and CD sources. One recommendation is the London release of the Montreal Symphony conducted by Charles Dutoit. Nonetheless, Perlman’s youthful étain makes this Chesky album well worth the purchase price.

Tchaikovsky composed but one violin concerto, although he wrote three for piano and orchestra. However, the B-flat minor concerto is the work generally referred to when one hears of the Tchaikovsky Piano Concerto. As a result of its immense popularity, the list of great (and not-so-great) pianists who have recorded it looks like a keyboard Who’s Who. Choice, therefore, between Horowitz, Rubinstein, Richter, Gilels, etc. must be the epitome of subjectivity. Earl Wild, a highly respected pianist, especially among his peers, is justly famous but has never quite achieved the superstar charisma suggested by his laudable talents. As this 1962 recording of the concerto proves, he is second to none of his confreres in idiomatic, expressive mastery of Romantic music. Not having heard this in its original vinyl incarnation, the intensity of his impassioned playing—very capably supported by Pistoulari and the Royal Philharmonic—almost took my breath away. With enough technique to qualify as a super-virtuoso, Wild’s control is exemplary, his color range kaleidoscopic, and he reveals an insightful musical intellect. Just sample the purring sensuality and liquid phrasing of the andantino semplice. The engineering sounds a little rough in the climaxes and favors the piano excessively for my taste, but with Wild’s pianism front and center, who’s going to quibble?

In the Dohnanyi Variations—a charming set of eleven variations on the nursery tune of “Baa, Baa, Black Sheep,” by the pianist-composer sometimes called the Hungarian Brahms—Wild again exhibits a similar blend of digital wizardry and sensitive artistry. Even compared with the composer’s own playing of the piece (he was an internationally acclaimed concert pianist who died in 1960), which was available on an EMI mono LP, Wild, though more extrovert, is also more accomplished and interesting. The composer’s grandson at the helm of the New Philharmonia provides admirable orchestral backing.

Some hiss is discernible, but from this standpoint its intrusion is negligible. However, the overall impression of Chesky’s remastering is that they have extracted the maximum musical value from the master tape, although, as mentioned earlier, some roughness in orchestral tuttis is discernible.

—Bernard Soll

THOMAS WEEKES: Ninth Service; Evening Service a 5; Anthems

Christ Church Cathedral Choir, Stephen Darlington, dir.; Laurence Cummings, organ

Nimbus NI 5125 (CD only). DDD. TT: 50:42

Thomas Weelkes (1575-1623) is not one of the best-known composers of the English Renaissance; nor is this relative obscurity entirely undeserved. Originally a madrigalist (and a very gifted one), his sacred works are more strongly in the popular idiom than those of his contemporaries Byrd and Gibbons. Because of this, they may well appeal more strongly to the modern listener than many other religious works of the period. If the reader wishes to become familiar with the sacred tradition in Jacobean music, this is as good a place as any to begin.

The singing here is as fine as in the first Renaissance release from this ensemble (Pales- trina, NI 5100, reviewed above), but considerably more vigorous, as befits the nature of the writing. All of my comments on that recording apply here as well, down to the excellence of John Milsom’s notes. One point made in those notes bears repeating here: the versions of Weelke’s music used in this performance are frequently conjectural. Missing parts have
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been supplied, and in one case the entire score has been reconstructed from the version transcribed for organ. It is a tribute to the present level of musical scholarship that these reconstructions are almost entirely convincing. Worth hearing.

—Les Berkley

**Classical Collections**

**TOSCANINI Conducts Light Classics**


Arturo Toscanini, NBC Symphony Orchestra


These justly famous performances, frequently reissued in a variety of recouplings on LP, derive from a number of different sources and recording venues. The earliest is the high-gear 1945 Stars and Stripes from the Infamous Studio 8-H, the latest the Brahms and Rossini from Carnegie Hall in 1953. Other recordings from Studio 8-H are Toscanini's second version of The Sorcerer's Apprentice (his 1929 first disc with the NYPO is still one of the most amazing renditions ever), a Danse macabre (with a hair-raising ending), and a fine, if not very atmospheric Moldau, all from 1950. The Carmen Suite, in a somewhat idiosyncratic version by the conductor himself, dates from 1952 and Carnegie Hall. To anyone familiar with Toscanini and his repertoire, it should come as no surprise that the Maestro often programmed lighter and more popular classics, sometimes, as in a few of his summer NBC broadcasts, even devoting a whole program to such works. Indeed, he was apt to lavish as much care in preparing these scores as he would a Beethoven or Brahms Symphony. If this reissue on CD doesn't really represent his most important recorded contributions, it is nevertheless a welcome release, both for the light it sheds on this most important conductor's work, and—very frankly—for its sheer energy, the impact of this most dynamic of interpreters, and just plain listening enjoyment.

The sound of Toscanini's NBC Symphony in RCA's commercial recordings, whether in the drier but not really so unpleasant ambience of Studio 8-H or the airier Carnegie, has seldom been reproduced so well as here; the mono sound (nowhere stated as such in the package) emerges exceptionally listenable, naturally equalized, almost always clean, and remarkably and surprisingly without the stridency of the LP versions. In playback I found that I preferred a moderate bass boost, especially to reveal some of the lower percussion (ie, Dukas). To be sure, dynamics, considering the period of the original recordings, are restricted, but the effectiveness of this reissue deserves both compliments to RCA and buyers' patronage for a job well done.

—Igor Kipnis

**Show Music**

**THE BERNSTEIN SONGBOOK: Music by Leonard Bernstein**

CBS SM 44760 (LP), MK 44760 (CD*). Original recordings produced by Goddard Lieberson, John McClure, Robert Lewis Shayon. Digital remastering by John McClure; Larry Keyes, eng. ADA/ADD. TTs: 70:05, 73:14 •

In compiling this collection of songs from Bernstein's shows, the people at CBS have managed to put together a selection that is bound to appeal to (almost) everyone. For the Bernstein neophyte, there is a full range of numbers, providing a good introduction to the differing musical styles that Bernstein's theatrical works have encompassed. Those who have some familiarity with Bernstein's popular hits (eg, West Side Story) are offered other, still highly accessible pieces (eg, On the Town), and the real Bernstein fan is provided with some off-the-beaten-path material (eg, "The Plank Song" from Peter Pan), as well as an opportunity to hear old favorites in digitally remastered form. The CD has a "bonus track," Frederica von Stade singing a song from one of the few Bernstein flops, 1600 Pennsylvania Avenue.

When a recording contains so many wonderful pieces of music, it is difficult to pick favorites, but I was pleased that they included "A Simple Song," from Mass (perhaps Bernstein's most underrated work); the West Side Story selections ("Maria," "Tonight," "Somewhere," and "America") are exactly the ones I would have chosen, and the selections from Candide made me decide to get the CD replacement for my ancient mono LP. (The performances of the original Candide cast, especially Robert Rounseville and Barbara Cook, have not been surpassed on either of the two more recent recordings, but I'm really excited by the news that there is a new complete recording.

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in the works, with Bernstein himself conducting, and with a cast featuring Jerry Hadley as Candide, Christa Ludwig as the Old Lady, and possibly Kathleen Battle as Cunegonde. The casting sounds ideal, so the results should be much better than the Carreras/Te Kanawa West Side Story.)

Given the variety of sources, the sound on both LP and CD is generally fine (and very similar, except that my review copy of the LP has unusually noisy surfaces), but comparison with the original reveals some intriguing inconsistencies. The very first number, "New York, New York," sounds rougher on CD than on the original LP equivalent, but the numbers from Wonderful Town sound considerably better than on the original LP. Most puzzling, "A Simple Song," again on CD, has less of a sense of space and ambience than the original LP or the digitally remastered CD set of the entire score. I would assume that both CD versions are derived from the same digital master. And I thought digital copies were supposed to be identical...

—Robert Deutsch

THE SOUND OF MUSIC

Frederica von Stade, Maria; Hakan Hagegard, The Captain; Eileen Farrell, Mother Abbess; Lewis Dahle von Scholarbusch, Max; Barbara Daniels, Elsa; others; Cincinnati Pops, Erich Kunzel

Telarc CD-80162 (CD). Robert Woods, prod.; Jack Renner, eng. DDD. TT: 70:00

With Carousel and South Pacific getting new operatic-style studio recordings, it was inevitable that Rodgers and Hammerstein's greatest popular success would be subjected to the same treatment before long. I applaud Telarc's decision to expand their interests into this repertoire; I only wish I could be more unequivocally enthusiastic about the results.

On the audiophilic front, things are just fine. Vocal and instrumental timbres sound realistic, and there is an excellent illusion of depth, especially in the sequences featuring bells and the nuns' chorus. The famous "Telarc drum" is present; personally, I find it too loud, but this may be partly a problem with my room/system.

This recording of The Sound of Music is certainly the most complete one available. Songs from the movie version are included along with the songs they replaced, and there are various bits of previously unrecorded incidental music and extra verses. The score has some outstanding individual songs, but also ones whose charm seems too calculated (eg, "So Long, Farewell"). Overall, I think Rodgers and Hammerstein's achievement here is not quite in the class of Oklahoma!

Frederica von Stade has a lovely voice and shows considerable affinity to this material, but she often sounds tentative, as if not quite sure of what she's doing. She makes at least one slip that betrays her relative inexperience with these songs: at the end of "Do Re Mi," she sings "Sol" rather than "So," thereby rendering the line "a needle pulling thread" rather, uh, pointless. With stronger musical direction, I think she might have made an outstanding Maria, but she gets little help from Erich Kunzel, who conducts with insufficient rhythmic and dynamic flexibility. Hakan Hagegard doesn't get to do much real singing in the role of Baron von Trapp; perhaps wisely, he scales down his voice, but ends up sounding too close to crooning. The great Eileen Farrell, retired from an active career, was persuaded to sing the role of Mother Abbess. She sings "Climb Ev'ry Mountain" down a tone, but with great power and dignity. The children in the cast are students at a performing arts school (Jeanne Menke, playing "Sixteen Going On Seventeen" Liesl, is actually sixteen), and they manage to avoid the kind of TV-sitcom-kid cuteness that would want to make me send them to Miss Hannigan's Orphanage. Lewis Dahle von Scholarbusch and Barbara Daniels make strong impressions as Max and Elsa.

This recording brings currently available recorded versions of the show to at least four. The Broadway cast recording, with Mary Martin, is now available only on CD (for shame, CBS!), but at least the transfer is good. RCA's digital transfer of the movie soundtrack has not fared as well sonically, but Julie Andrews's exuberant performance surmounts the sonic limitations. First Night has recently re-released the Original London Cast recording; it's a competent job, but Jean Bayless's Maria lacks the star quality that Martin and Andrews bring to the role.

—Robert Deutsch

Jazz

GROVER WASHINGTON, JR.: THEN AND NOW

Grover Washington, Jr., sax; Igor Butzman, tenor sax; Herbie Hancock, James "Sid" Simmons, Tommy Flanagan, piano; others

Columbia C44256 (LP). Joe Tarsta, Fernando Kral, engs.; Paul Silverthorn, prod. coordinator. DDD. TT: 57:18

So-called "blowing sessions"—where little is worked out in advance except for tones, keys, and tempos—are deceptively difficult to bring off unless the players work together regularly. Even then, minus such helpful accoutrements as interesting ensemble voicings, background

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riffs, and imaginative harmonic substitutions, the results will hinge solely on the improvisational prowess of the individual participants and their ability to react to each others' flights of fancy.

Such challenges pretty well set the stage for what you'll encounter on this LP, and although it contains more than a little first-rate playing, musical interest wanes and wanes from cut to cut depending on which group of players is at work.

This is definitely saxophonist Washington's showcase, however, and he is featured throughout. Alternating between soprano, alto, and tenor, he displays a strong and personal voice that, while taking into account the legacies of Charlie Parker and John Coltrane, has found its own expressive temperament. As often as not this includes breathless flurries of notes that are, nonetheless, firmly rooted in the blues. At times he gets hung up on stuck-groove repetitions, but more typically (as in Ron Carter's sultry "Blues for D.P." and his own "Lullaby for Shana Bly") he spins out marvelously supple lines that push the changes to their tonal limits without ever going over the edge.

The remarkable Herbie Hancock appears on only three pieces and is not given a lot of time to stretch out. But he clearly stands out. On his sensuous ballad "Just Enough," and Washington's "Lullaby," he forges choruses memorable for their thoroughly unmanufactured sense of spontaneity and economy of means. During the "Lullaby," in particular, his baroquish development of small melodic cells and displacement of meter (which drummer Marvin "Smitty" Smith picks up on with radar-like keenness) are totally absorbing.

Less involving for this listener are the keyboard contributions of James "Sid" Simmons and Tommy Flanagan. Simmons's approach is boppish yet sparse, while Flanagan's melodic ideas and stride bass—fine in themselves—seem curiously anachronistic in this setting.

It is difficult to imagine bassist Ron Carter, who lends his talents to three cuts, being out of place in any setting. Quite simply, he is the quintessential session player who invariably finds all the "good" notes and combines them in ways that elevate time-keeping and harmonic underlining to a melodic art.

Perhaps Columbia's engineers agree. In any case, his efforts are more prominently etched in the final mix than those of electric bassist Gerald Veasley. There are also a few sonic annoyances in evidence, such as Smith's wandering cymbals in "Lullaby," the compressed sound of the drum set at several junctures, and an occasional vagueness as to which way the piano is facing. Overall, however, the recorded ambience is convincing, in part due to a well-defined soundstage and a generally realistic presentation of instrumental timbre and placement.

—Gordon Emerson

BOBBY KING & TERRY EVANS: Live and Let Live!
Rounder 2089 (LP), CD 2089 (CD), Larry Hirsch, eng.; Ry Cooder, prod. AAA/AAAD. TT: 44:42

If you've heard a Ry Cooder album in the last 12 years, you've heard Bobby King and Terry Evans—they're the gorgeously voiced gospel/R&B singers who've backed up Ry while he's learned to sing in public—and from whom he can't help but have learned a lot. To crib from the liner notes, King is from a Louisiana gospel background, while Evans sang R&B in Mississippi. Their music together is a seamless blend of the best of both sides of the churchyard gate, smack dab in the middle of the strongest undercurrents of American music. Virtually every tune is a gem, but "Let Love Begin," so warm and lovingly sensual it'll melt your speakers, and the best version I've ever heard of "Dark End of the Street," are instant classics. "Saturday Night" has a hint of sprung Cajun rhythm, and "Let Me Go Back to the Country" has that vital feel of a pick-up band one by one sitting down to sit in, music made for the sheer joy of singing and playing. Only "Bald Head," another misogynistic Cooder tune, falls flat, though not for lack of trying by King & Evans.

I find myself thinking of this one in the same mental breath as John Hiatt's Bring the Family, and no surprise: Ry Cooder and drummer Jim Keltner play here as well. Ry's flawless, instantly recognizable slide guitar work adds power and melancholy to all nine cuts, and drummer's drummer Keltner, with dues-all-paid-up pianists Jim Dickinson and Spooner Oldham, make up a rhythm section of all-the-way-down rhythmic integrity. This combo can lay down a simple, inevitable gospel/funk groove faster, and with more authority, than anyone I know.

The immediacy of this record's appeal is primarily due to the naked emotion of King's and Evans's voices and the raw tone quality of Cooder's guitar, but it certainly isn't hurt by the recording quality, which has enough presence to make you look behind your speakers for the band. Cooder, who produced Live and Let Live!, by now has a seemingly infallible knack
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for the job, audible in the first five seconds of "Just a Little Bit," the very first cut: the kick drum and snare which lay down the rhythm sound like a drumkit in a wooded-floor ginmill, not the usual disembodied, 18-miked, perfect "thud." As far as I can tell, this friendly, gutsy record was recorded live in the studio, no overdubs. The sounds of LP and CD are as close as any I've heard lately; so go for the LP—please. Music this real gets rarer every day.

—Richard Lehnhertz

LITTLE FEAT: Let it Roll
Warner Bros. 25750-1 (LP); 25750-2 (CD). George Mas- senburg & Bill Payne, prods. DDD. TT: 50:18

If you're the type of person who reads the first sentence of a review and then skips to the end to see what the writer really thinks, don't bother — here's the last sentence: "This is the best rock album of the year—you must run out and buy it if you don't already own it! Play it a lot when you get it home!!"

With that out of the way, here's the rest: Little Feat was formed in the year of Woodstock by guitarist/songwriter Lowell George, bassist Roy Estrada (both formerly of the Mothers of Invention), keyboard genius Bill Payne, and drummer Richie Hayward. Their first of many wonderful albums was released two years later, a blend of New Orleans jazz, Delta blues, and shit-kickin' Southern rock. Despite some very heavy "freeform" FM radio airplay, sales were unconvincing. Some members of the band left, new ones were added. But the group's pattern was already set in stone: great songs on great albums with superb musicianship, backed up by fabulous live concert work and lots of FM airplay. . . but lukewarm record sales.

In 1978, their live album Waiting for Columbus was released. If you don't own that 2-record set, it's really worth buying to get an idea of what the Feat of the '70s were all about. Buy the LP version . . . they cut two songs on the CD (one of which, "Don't Bogart That Joint," is a personal favorite) to make it all fit on one disc! To quote JA (from Hi-Fi News, April 1986, talking about the Mobile Fidelity recut of Waiting): " . . . the live album of all time. . . . Little Feat, the band that played with time the way others play with Dinky Toys." The set includes the Little Feat classics "Pat Man in the Bathtub," "Dixie Chicken," "Rocket in My Pocket," and "Willin." Great stuff.

That brings us to the present, almost. Lowell George left the group, at the end of the last decade, for a solo career. He passed away of a drug overdose a few years later. That seemed to be the end of Little Feat, until recently when the rest of the group decided to try it again. They added Craig Fuller, formerly of Pure Prairie League, to sing vocals, play the button accordion, and sometimes guitar (he's terrific — really does sound bizarrely like Lowell George), and have come up with 10 original rockers: the best all-round album of 1988.

Just as Waiting for Columbus started off with a bang, the live audience singing along to "Join the Band" (again, quoting JA, "getting an adrenaline rush"), Let it Roll begins with Paul Barrere's funky guitar in the left channel of "Hate to Lose Your Lovin," answered by Richie Hayward's authoritative drum strokes on the right. You know musicians are in command.

There's soulful rock ("Changin' Luck," "One Clear Moment," and "Long Time Till I Get Over You"), New Orleans pop ("Cajun Girl"), a ballad ("Voices on the Wind"), hard-drivin' rock ("Let It Roll"), and a tribute to Lowell George ("Hangin' On To The Good Times"). Each cut is terrific, and all 10 together make for an enjoyable 50 minutes of listening.

Get the CD — the recording is all digital, and quiet as can be.

Once again, for those who skip to the end of reviews: "Best rock album of the year — run out and get it!"

P.S. If you can get to see Little Feat live, do so. They were great at their NYC stop in Fall, 1988. [As they were when they opened the tour in Santa Fe in the summer—JA.]

P.P.S. Thanks to JA for letting me write this enthusiastic review; he wanted to do the same.

—Gary S. Krakow

U2: Rattle and Hum (Soundtrack)
Island 91003-1 (2 LPs), 91003-2 (CD). Jimmy Lovine, prod.; various engineers. AAA/AAD. TT: 72:18

The Irish group U2 is an acquired taste. Their music is very deep. They use open fifth chords to set a serious mood. The lyrics sometimes deal with important issues of the day (Northern Ireland, South Africa, teen angst, etc.). Sometimes I think I've acquired a taste for their music. My wife is sure she hasn't, and says she never will. She prefers not to hear them at all, not even from two or three rooms away.

This brings us to Rattle and Hum, over an hour of U2's music and the soundtrack for their movie of the same name. There are the usual "deep and meaningful" ballads, with open fifth chords, but this album is half live (from their last American tour) and half new studio cuts. The band says the set pays tribute to the American influences that abounded during their tour.
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That's why they start off with a live version of the Beatles' "Helter Skelter" (in the spoken introduction to the song, there's a mention of U2's rendition being a method of stealing the song back from Charles Manson). Bono, the lead singer, whose full name is Bono Vox, shouts the lyrics. He also shouts on "When Love Comes to Town," a studio cut on which B.B. King sings. There is also a version of "All Along the Watchtower." For the most part, these songs are embarrassing for U2.

The high point of the album is a live version of their huge hit "I Still Haven't Found What I'm Looking For," this time performed, with the help of The New Voices of Freedom choir, as a gospel ballad (see...there's that American influence). The cut is wonderful, and proves that the group does have some talent (if only they'd stop using those ponderous and repetitive open fifths).

Recording quality is very good on both the studio and live tracks. One CD is also much more convenient than four LP sides. Soundwise, there's no clear choice.

Now, whether one or two cuts on the record (the Bob Dylan collaboration, "Love Rescue Me," is also worth hearing) are worth spending money on is up to you. Unless, of course, you're into deep and meaningful rock punctuated with open fifths. —Gary S. Krakow

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Stereophile, January 1989
The Mod Squad Line & Phono Drives

Editor:
First of all, I would like to offer my sincere thanks to John Atkinson for this carefully considered review. I have put a great deal of time and energy into the design of the Line Drive and Phono Drive, and it means a lot to me to see a similar sense of dedication and attention to detail in the review process.

There are two issues raised in this review which I would like to address. The first, noise in the MC stage, has been a dilemma since the inception of the Phono Drive design. To make a long story short, the quietest circuit topologies tested were not the best-sounding ones, and vice versa. Ultimately, I felt I had to balance my decision in favor of sound quality, with what I see as being acceptably low noise. If I understand the review correctly, JA was more concerned with the measurement of the noise, rather than his actual perception of it. I often listen here with the Rowland Complement, which is the best-sounding cartridge I have heard. It has a very low, 0.2mV output. During very quiet passages, or between cuts, the noise floor is audible but I do not find it objectionable. Individual sensitivity to noise does vary, but with typical MC cartridges, where output is 0.3mV or higher, it should not be a problem.

The other issue is cable capacitance and our Line Drive. As JA accurately pointed out, and the owner's manual reiterates, cable length (and, therefore, capacitance) should be kept as short as conveniently possible. The total value probably should not exceed 800pF. Check with the manufacturer of your cable if you are unsure of its capacitance. Cable capacitance usually will be specified as pF (picofarads) per foot or meter. Multiply this figure by the length of your cable to determine the total value. Most cables are reasonably low in capacitance and can be run for quite a long distance if need be. Remember, though, the rule for passive systems is to keep the output cables as short as conveniently possible in your setup. When the Line Drive and Phono Drive are combined, then the system may be driven by the Phono Drive's active line amplifier, thus eliminating the concern over capacitance.

Kinergetics SW-100

Editor:
I found Dick Olsher's article on subwoofers fascinating. We at Kinergetics have spent much time, energy, and R&D on this topic. The complexities of the subject, as Olsher points out, are diverse and complicated as well as, from a commercial viewpoint, very, very difficult to rationalize.

One part brought out in the discussion and tests was that KI was the only system flat to 20Hz, but we had higher distortion at 20–40Hz. This is, unfortunately, one of the hard tradeoffs. Bass distortion is difficult (and expensive) to avoid, as Olsher well points out.

I would differ a little bit in the assessment of what SPLs are necessary in the lower bass regions. For music with an average power of 100dB SPL (which will peak at about 100dB SPL), the bass output in the octave centered around 30Hz will be about 85dB. Significantly less than this is required below, and it is not clear that output below 30Hz is really particularly important per se in music. For accurate reproduction of all bass transients, however, a cut-on frequency in the region of 20Hz or less is really a requirement. The acoustic explanation for this is a little bit complicated; it can be stated that a small loudspeaker (all loudspeakers are small) cannot accurately reproduce the bass-transient sound produced by a large instrument (eg, a piano), or one from a musical in-
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instrument having a steady flow of air (e.g., the human voice, horns) without introducing an auxiliary note. This note will be centered around the resonant or cutoff frequency of the speaker.

This same tradeoff influenced the crossover design. We tried 6, 12, 18, and 24 dB/octave systems. The first just sounded better. We believe that this is true due to the "size" problem discussed above. The same spurious signals are generated at each speaker (at or near its resonance) if crossovers are used that are not transient-correct. It may be that eliminating the audibility of the effect in the subwoofer enables a more critical evaluation of the region around 100–200 Hz to be made. The original statement stands: We thought the 6 dB/octave sounded better.

We experimented at great length with the placement of the cut-on frequency and the total distortion-free output of the system. The combination we arrived at sounded best. It was definitely better to extend the cut-on frequency when judged by the musicality, even though lower-frequency distortion was increased. All other speakers in the survey took the other routes, terminating response upward of 40 Hz.

The difficulty of reducing distortion in the extremely low-frequency audio regions is, as Olsher notes, difficult and costly. We have been working hard in this direction, but the tradeoffs are difficult.

Kenneth W. Cowans
Kinergetics, Inc.

Cogan-Hall ContraBass 12

Editor:

We thank Dick Olsher for reviewing the ContraBass 12 and for providing a learned overview of the rather esoteric area of bass reproduction.

We are most pleased with Mr. Olsher’s observation that the ContraBass 12 is tight, fast, gutsy, and even “scary.” He suggests in his introduction that such areas of midbass finesse may be the most important performance criteria for a bass system. We certainly agree; the whole design of the ContraBass is meant to produce these qualities, which we feel are essential to approaching the live event.

Regarding our preference for Q = 0.5 damping, sometimes called the non-resonant condition, we plead innocent as charged. The final degree of tautness we sought in the ContraBass deteriorated somewhat with any higher Q-loading.

We suspect that Mr. Olsher’s choice of unusually high crossover points—up to 260 Hz—will surprise many audiophiles, who prefer to cross over between 60 and 80 Hz with a steep roll-off, thus preserving the character of the upper-range system with the least intrusion from the woofer. Although the ContraBass can indeed operate well up to around 200 Hz, most ContraBass owners use crossovers in the 60 Hz range with a passive high-end filter. Some use no high-end filter, taking advantage of the natural roll-off of the upper-range system. This approach has yielded excellent results with such upper-range speakers as Spicas, Quads, and Magneplanars for ContraBass owners, and we believe that it eliminates the worst pitfalls—especially matching problems—of subwoofing. Further, for many listeners, adding a woofer system is easier, sonically more satisfying, and even less costly than finding the right wider-range speaker.

So far, so good; but Mr. Olsher measures and hears too little deep bass from the ContraBass 12. I don’t know why his and our results using the Keele near-field technique differ so. Be that as it may, what is more important to me is that Mr. Olsher does not bear enough deep stuff from the ContraBass 12.

Consider: most ContraBass owners use the Bass Contour in the intermediate position (+3 dB boost), and some—including one confessed pipe-organ fan—do not use it at all. Nevertheless, they all report satisfying levels of deep bass. Perhaps the difference is, once again, in the 60 Hz crossover point our customers use. This permits them to boost somewhat (at the crossover) the level of the ContraBass’s output, thus compensating for the roll-off Mr. Olsher describes, without exaggerating the midbass. For those who find the deep bass inadequate for any reason, we can provide a simple active bass-contour circuit, capable of substantially more boost at 20 Hz than the passive bass contour.

We offer two other ContraBass models. The ContraBass 12-100 uses the Dynaudio 30-W-10 12” driver with its larger, 4” voice-coil. This system exhibits stronger deep-bass performance, and even greater transient impact, for example, but should not be used above 100 Hz due to its less nimble upper-range capabilities. The ContraBass 12-100 has a suggested retail price of $1020 ($1095 west of the Rockies). We also manufacture the ContraBass 10, which has a smaller cabinet and uses a slightly

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smaller ScanSpeak driver. The ContraBass 10 has a suggested retail price of $695.

We also provide two bi-ampling/passive high-end crossovers for use in ContraBass systems. These are the MFA Systems Magus and Mantra. The Magus has a suggested retail price of $340. The Mantra features the variable crossover points that Mr. Olsher recommends, and has a suggested retail price of $660.

Cogan-Hall Instruments offers a three-week in-home trial purchase for all of its products. Kenneth L. Cogan
Designer & President, Cogan-Hall Instruments

Vendetta Research TPC-1

Editor:
The TPC-1 electronic crossover was discontinued in October 1988, as we found its price point did not allow us to implement everything we have determined to be important to achieve maximum fidelity.

We have some doubts, however, that steep-slope crossovers are the best means to achieve ultimate sonic quality, because of their poor transient response.

In future, we hope to manufacture a more sophisticated "transient perfect" design to give state-of-the-art electronic reproduction, while exhibiting good transient performance for use with systems where this is important.

John Curl
Vendetta Research

Audio Concepts Saturn

Editor:
Congratulations to Dick Olsher for his comprehensive and thorough evaluation of the art of adding subwoofers to a system. While we agree with most of his conclusions, we do disagree with his statement that "Aficionados of organ music will be clearly disappointed, as will most folks when listening to high-powered orchestral music." While I would concur that there are a few subwoofers available that will play louder at extreme low frequencies, they are all much larger and more costly than the Saturn. Numerous Saturn owners have commented on the quality of organ reproduction.

Few audiophiles can afford the cost or space for subwoofers that meet Dick's ideals for bass reproduction. Yet many audiophiles can enjoy the major improvement in performance offered by subwoofers such as the Saturns. Since we guarantee buyer satisfaction on all our kits, we invite audiophiles to audition them in their own systems and decide for themselves if the improvements are worthwhile.

Mike Dzurko
Audio Concepts

Spectrum 208B loudspeaker

Editor:
Thank you for John Atkinson's excellent review of our Model 208B speaker system. We are pleased that it earned top honors in four of ten performance categories, against formidable (and more expensive) competition.

We appreciate Mr. Atkinson's taking a great deal of time and effort to optimally set up the speakers reviewed. He correctly pinpointed the design axis of the 208B as being just above the woofer. We also commend JA both for admitting his bias against reflex systems, and for being able to ignore that bias and give a good review to a reflex system meriting one. This is the hallmark of a great reviewer.

Our view is that audio progress is impeded by biases, but that by recognizing them they can be overcome. This approach has led us to discover that progress is most often made by evolution, not revolution. Witness the evolution of tube amplifiers in the last ten years, from euphonic signal processors to the musically accurate devices we have today. While our systems rarely have any flashy "breakthrough" techno-whizbangs, they are the results of pain-taking refinements, with the aim of providing the consumer with the best overall sound obtainable at a given price point.

We would like to point out that the 208B has increased only $100 from the November 1986 price of $349 on the 208A. For the extra money, the consumer receives a removable cloth grille with anti-diffraction mounting, which replaces the former glued-on foam type, an improved viscous-damped woofer incorporating 75% more magnet, a heavier, more acoustically inert cabinet, a more sophisticated crossover, a new tweeter, and 5-way binding post connectors. There's not much about the speaker that hasn't been upgraded since JGH's original 1982 review of the 208A. Overall, we're extremely happy with the results, and we feel that the 208B represents better value in today's market than the 208A did in 1982. That its "best buy status" did not come across clearly in the review may be partially due to the reference system.

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speakers were both optimized for much lower impedance loads than the 208B provides. This caveat is not from our personal experience, but comes from an amplifier-designer friend of mine, whose designs are highly regarded in these pages. He stated that an amp will sound hard and strident if used with a load which is much higher impedance than it is designed to drive. The average impedance of 10 to 12 ohms which makes the 208B a great match for affordable equipment may well cause problems when used with $3000 super amps. As you know, the Krell will drive 1-ohm loads with ease, and the VTL's transformers are tapped for 5- to 7-ohm loads. Circumstantial evidence confirming this hypothesis is that sonic problems were heard exactly where the 208B has its highest impedance. Our suggestion is that future reviews be done both with the reference amps, and with amps more appropriate to the price of the speakers. Please note that we are not implying that our speakers are perfect, merely that in a more typical system the problems noted may be greatly reduced.

Late-breaking news: All of the above may well turn out to be moot in the case of the 208B, as we have just been informed that the tweeter may not be available to us any longer. We apologize for the inconvenience and frustration this causes Stereophile and its readers. Your only consolation is that we are the most frustrated of all. We will submit the new version for review as soon as possible. Thank you for your patience.

Eric Johanson
President, Spectrum Loudspeakers, Inc.

Lexicon CP-1
Editor:
Undertaking a review of a product as complex as the CP-1 is a rather daunting task. The plethora of configurations and operating modes that make the CP-1 so flexible and musically useful represent a gargantuan review project. What I am most impressed with is Bill Sommerwerck's ability to report not only what the product does and how well it does it, but more importantly, his understanding of the philosophy behind the product.

Digital signal processing holds enormous potential for music lovers. While we have come a long way since the introduction of the first "perfect sound forever" machines, dramatic and profound improvements lie ahead. Many of these advances will have implications for analog technologies as well, particularly as the boundaries defining pro audio vs the high end are removed. Keith Yates's article on audio minimalism and knob surfers (Vol.11 No.11) was very thought-provoking. Bill Sommerwerck's review of the CP-1 continues in this direction of looking at what can be done with signal processing now and in the future. This makes for exciting, interesting reading.

I guess getting a great review doesn't hurt either. Thanks again. Buzz Goddard
Consumer Products Manager, Lexicon

Infinity IRS Beta
Editor:
First, we would like to again thank Gordon for his initial rave review of the IRS Beta loudspeaker. However, it initially seemed somewhat confusing to us how a product review could begin with "In short, I love these speakers, and I cannot imagine anyone not being absolutely blown away by their performance. If you can afford them, and have the space, buy them. If I could, and had, I would." Then, on further comment, JGH uses the word "dreadful." However, in retrospect, we can try to piece together what happened.

With regard to the obvious mechanical flaws that Gordon found in the Betas, we have to plead guilty. In any system as complex as the Beta, it seems ridiculous that such apparently simple ideas, such as keeping the potentiometer knobs properly attached to the control unit and the input terminals from rotating, were under-designed. We, like every other perfectionist company on the planet, try to do the right thing the first time, but, alas, are not perfect; and considering the myriad of complex issues that we have successfully dealt with in the IRS Beta's development, it is not unheard of that a few details might have been conducted in a better way. Each time we find an apparent defect, we institute an engineering change in order to correct the problem. Current Beta Systems now have two screws to properly secure the knobs and a stronger, reinforced anti-rotation plate on the input terminals.

With regard to the sonic problems encountered by Gordon, the original system which earned the rave review appearing in Vol.11 No.9 (Sept. 1988) was, in fact, a factory-checked production system. Indeed, when Leon Kuby and I left Santa Fe, we were convinced that what we had heard was not only representa-
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tive of the IRS Beta’s capabilities, but we also thought the sound to be glorious (especially on some tapes made by JGH and JA). I must confess we thought the imaging and sonics were fine, and were confident that everything was in good order. About two weeks later, Gordon did indeed call and complain about an imaging shift due to an apparent difference in the Beta’s midrange/tweeter panels. He claimed it was extremely subtle but there, and he could not measure any difference in the panels. At this point, I should have left well enough alone. I knew that his Beta System was thoroughly factory-checked before it was shipped to him. I also recalled that Leon and I did not detect the problem during our visit. But then I was overcome with nagging doubts. What if something had really gone wrong with the Betas? What if something else in the system went awry? On the other hand, JGH was still overjoyed with the Beta’s sonic performance.

It was at this point that I believe we made a series of poor judgments. Instead of leaving well enough alone, we elected to embark on a series of “patchwork” repairs which we should have known would probably be a losing proposition. The IRS Beta System is extremely complex, and requires very careful quality control, including the measurement of each component and checking the final product using sophisticated equipment such as Fast Fourier Transform analysis for very sensitive frequency and phase response. The point being that it requires all these techniques to ensure that the system’s performance falls within the factory specifications. And, surely as JGH quickly found out, such measurements as are able to be performed with even good “field-type” equipment will not adequately explain all the subtle information that can be discriminated by the human ear. It is clear, in retrospect, that this series of ad hoc repairs was the incorrect approach to the “‘problem,” and should not have been attempted by us. The only other proper approach (if we felt that there was something genuinely wrong) would have been to replace both upper end panels, again a pair that had properly gone through our factory QC process. In fact, that is what we ultimately did, with the fortunate result that JGH commented “The system now sounds just as magnificently rich and powerful as the first samples I reviewed, but with even better imaging.”

If we have caused Stereophile, and in particular JGH, any additional hardships, we apologize for them. I truly could not believe that there was a problem of the magnitude he described, and therefore I overreacted.

There is a lesson to be learned from this unfortunate incident: Never attempt “patchwork” field repairs on systems of this complexity.

Again, we thank you for the excellent review you have given the IRS Betas, and hopefully we at Infinity are a little wiser.

Arnold Nudell
President, Infinity Systems, Inc.

GSI Musical Electronics
Editor:
Most recently GSI was faced with an almost instantaneous doubling of our rent. I regret waiting until the last month to discover what a charming landlord I had. As reports of our death have been greatly blown out of proportion, I have sent this note to the major publications in which much of our business is found.

As we evacuated as though our building was facing demolition, I am almost certain orders may have been lost or misplaced. I presently have an entire audio company in a garage (floor to ceiling), and am hoping to have space by the time you read this. Mail to 622 Bloomfield Avenue will be forwarded to my home. If you do not have our form-letter mailing yet, please drop us a note with a copy of your order, a photocopy of your canceled check if possible, and give us a bit of time to sort things out.

I also wish to use this forum to point out that GSI will no longer be producing any manufactured products. (Mods and service and rebuilds will continue.) We are currently hammering out an agreement with Mondial/Aragon for the X-1 crossover to join their line, and a tube product line in the future is under serious consideration. Parts and service will still be available from GSI for our products and for NYAL/Futterman products as in the past. A new address and phone number will be published as soon as possible.

On a more positive note: On September 20, 1988, God graced Annette and I with Andrew Anthony, 7 lbs, 8 oz, 20" (most of which are ears). As the balance appears to be mouth, I am conducting serious research into the effects of Sonex and Tube Traps on cribs. A copy will surely be in the Journal of the AES sometime next year.

Andy Fuchs
GSI
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THE FINAL WORD

"The Better the Advertisement, The Worse the Product"

Quotes like that assure Ken Nelson, *Stereophile's* worthy advertising representative, and his associate, Laura Atkinson, that my secret desire is to drive every advertiser from the pages of *Stereophile*. While nothing could be further from the truth, it does give me pleasure when the big guy throwing around lots of advertising money gets his comeuppance in these pages, while the little guy comes out on top.

This was brought to mind when I went over the "Would you buy this product again?" statistics presented (starting on p.5) so ably by JA. (By the way, those data are a gold mine; if you'd like the whole thing, in all its permutations, combinations, and completeness, sent a check for $10—no credit cards—to Popularity, PO Box 5529, Santa Fe, NM 87502.)

The first thing I did was look for fortunate correlations. A couple of weeks ago I had need of some kind of objective measurement to determine what companies deserve the label "high-end," but could find only "Do I like these guys?" Magically, the survey provided one. It's arbitrary, but at least it makes sense—and what's more, I agree with its results, in almost every case.

First, what's a standard "pretty good" passing grade in school? Most everyone would say "C," usually garnered by a score of 70% or better—it's definitely not too rigorous a criterion. I decided that 70% "would buy again" should be the measure of whether a company is high-end or not. Using that guideline, the "Top 20" of high-end audio, in order of their representation among our readers, reads Nakamichi, Adcom, Denon, Acoustic Research, Shure, Hafler, Monster Cable, Grado, Linn, Magnepan, Thorens, Audio Research, PS Audio, McIntosh, SOTA, Infinity, Dynaco, Vandersteen, Conrad-Johnson, and B & K. Now that sounds like a real top 20. I'll leave it to you to construct the top 5 high-end cable companies (Monster, MIT, etc.), the top 5 electronics firms, and the rest.

Then, lover of numbers that I am, I looked at the "wouldn't buy again" figure as perhaps offering new insights into those companies that singularly satisfy—as well as those who most dissatisfy. The companies best at pleasing their customers are headed by four who had no (!) buyers who wouldn't buy from that company again: Stax, Thiel, Superphon, and Well-Tempered Lab. (I arbitrarily omitted from this top list companies with fewer than 100 respondents, thereby doing an injustice to such as Spendor, QuickSilver, Accuphase, Carnegie, etc. It does, of course, get easier to have no unhappy customers the fewer customers you have!)

Those august four are followed by seven whose unhappy customers were in the 1%-or-under range, still a stunning figure: Magnun Dynalab (0.6%), MIT (0.7%), Spica (0.7%), Celestion (0.8%), Magnepan (0.9%), B & K (0.9%), and Shure (1.0%). These last four are especially notable, as they also appear in the top 20; their ability to please people has been tested by large numbers of users.

Now to the juicy part, which best exemplifies the quote from J. Gordon Holt that titles this column: the companies you didn't like. This group is headed by Fisher, who, at 40.5% determinedly unhappy folks, was the only manufacturer whose wouldn't-buy-agains were greater than their would-buy-agains—almost equalled by number 3, Radio Shack's Realistic/Archer, whose woulds and wouldn'ts were exactly tied at 30.8%. Sanyo, which owns Fisher, apparently follows a company tradition by dissatisfying 32% of their customers, and the rest were BSR (23.2), Hitachi (22.8), ADC (22.5), Bose (22.2), Technics (20.4), Akai (20.2), Sansui (20.1), and Phase Linear (20.0). The standard for inclusion in this rogue's gallery was 20% or worse wouldn't-buy-agains.

Surprisingly, ironically, or tragically, only the BSR brand has disappeared from retailers' shelves. Nor, despite a strong Japanese contingent, is nationality a safe indicator: four of the companies (Realistic, Bose, Phase Linear, and ADC) are wholly American, and two of the top 10 "high-end" companies are Japanese (though, admittedly, there's only one more in the next 40). My point would echo JA's: the companies that most disappointed you are those most noted for heavy advertising and poor delivery of what they promise. The grander the advertisement, the worse the product.

Larry Adinolfi
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VOL. 8, NO. 8, JAN '86
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