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ISSUE NO. 28
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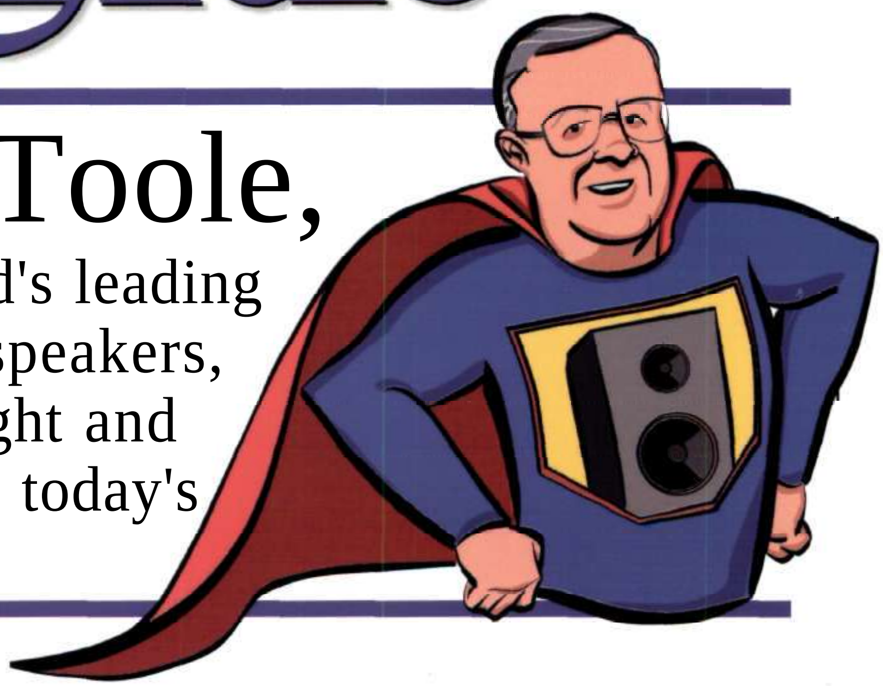
The Audio Critic



Floyd E.Toole,

arguably the world's leading authority on loudspeakers, explains what's right and what's wrong with today's speaker systems.

Also in this issue:

More loudspeaker reviews in depth, by Don Keele, David Rich, and your ever faithful Editor.

Reviews of unusual amplifiers, SACD players, and assorted other electronic components.

Plus our regular features, columns, letters to the Editor, CD/SACD/DVD/DVD-A reviews, etc.

contents

ISSUE NO.28 • SUMMER/FALL 2002

From the Editor

Back to Square One?

At the risk of being hopelessly unoriginal, I must reiterate Murphy's Law. Edward A. Murphy, an American engineer, observed sometime around 1958 that anything that *can* go wrong *will* go wrong. In Issue No. 26 I announced, starry-eyed, our alliance with the Canadian publisher called The CM Group. In Issue No. 27 I hinted, maybe not at anything having gone wrong, but certainly at some delays and slow progress. Now, in Issue No. 28, I have to say that things *have* gone wrong; indeed, the relationship is over. Not with a bang but a whimper. The Canadians were nice guys; we never fought; they just did nothing for the magazine. The partnership never really got off the ground; at this point we haven't even talked to each other for a good many months. It's too bad; I actually thought a huge turnaround was about to take place. Murphy knew better.

So—you can see why this issue has been delayed. I basically did it all by myself, just as in the past, with long interruptions when the next move seemed uncertain. The uncertainties were the reason why Ivan Berger, the former Technical Editor of *Audio* magazine, did not take over as guest editor of this issue as originally announced. He will, however, take over the editing of No. 29, and I plan to retire to a primarily supervisory position. I'll still contribute some writing and I'll OK every word of the final product, but at this point I'm too old and too much of a burnout to do the whole thing alone. Under Ivan's capable hands our publishing schedule should accelerate significantly, since I have been the principal bottleneck. I'm not contemplating any new partnerships at this time, but if a really attractive offer should come along, who knows?

Are we back to square one? I don't think so. The main issue all along, as I see it now, was insufficient delegation of editorial functions, not business partnerships to the rescue. I held on too tightly, I did not let go, and I slowed things down. I have finally decided to let go. Maybe we won't get bigger that way but we'll come out more often.

Peter Aczel

The Audio Critic

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As a consequence of our erratic publishing schedule, we've been getting fewer letters, but that was inevitable. More issues per year will surely bring more relevant letters per issue. Please address all editorial correspondence to the Editor, The Audio Critic, P.O. Box 978, Quakertown, PA 18951-0978.

The Audio Critic:

I am very happy to see that Don Keele is back reviewing speakers; his reviews of the only audio components that actually affect the sound were the best part of *Audio.* And no, they're not too detailed! In fact, I was disappointed that his review of the Monitor Audio Silver 9i did not show a graph of the response with the grille on. One of my pet peeves is how few speakers are designed for optimal performance with the grilles in place. I hope you will take this up as one of your causes; at the very least, you should state how your listening and measuring are done in every review.

Sincerely yours,
Mark Srednicki
Professor of Physics
University of California
Santa Barbara, CA

Some audiophiles want the grilles on, others want them off. It's the neat look versus the "cool" look, and you can optimize the response only for one of them. You 're obviously a neat one, but I know some 'philes who throw away the grilles! Anyway, take a look at Don Keele's review of the Infinity "Intermezzo " 4.1t in this issue; he is doing it the way you want it.

—Ed

The Audio Critic:

I followed up your very interesting review of the Infinity "Interlude" IL40 [in Issue No. 27] with a visit to the Infinity Web site, where I found a technical paper (albeit geared to the general reader) by Floyd E. Toole, "Audio—Science in the Service of Art." *[He uses a very similar title for the totally different lead article in this issue.—Ed.]* In it he outlines many of the results of his academic research prior to joining Harman International. It is very encouraging to see such a solid scientist in charge of technical oversight in such a powerful audio enterprise as Harman International.

One point he raises from his research has a bearing on the audio press, and I wonder what your thoughts are regarding it. His research found that testers with even modest hearing loss were very inconsistent among themselves in their preferences for speakers, whereas testers with good hearing were very consistent. While those with hearing loss agreed with the good-hearing testers about the "good" speakers chosen by the latter, they would also choose "poor" speakers (as judged consistently by the good-hearing testers) as "good." There was also no consistency among testers with hearing loss as to which of the "poor" speakers was good. Listeners with hearing loss were looking for a "prosthetic" loudspeaker that somehow compensated for their disability, each one having a somewhat different disability and therefore liking a different "poor" speaker that just happened to compensate.

Possible conclusions: The comments regarding the sound of speakers in a review article are strongly suspect unless the reviewer publishes his/her hearing acuity test results. Reviewers with tested and proven hearing acuity should be hired to do listening tests by conscientious audio magazines. Could this explain why some of the "Black Hat" reviewers have been so enthusiastic about wacko speakers with obvious sound colorings? Maybe they have a hearing loss (too many rock concerts?), and this particular colored speaker just happens to compensate for their problem.

Maybe it's time for "golden-eared" reviewers to evaluate speakers, but this time "golden-eared" will mean something objective. According to Toole's paper, 75% of the population has "normal" hearing, which is all we are talking about here.

I am so delighted with the new format, the new contributors (Keele in particular), and especially the new higher frequency of publishing. How about more space spent on speakers, as the electronics basically do their jobs these days?

A very happy subscriber,
Gene Banman
Los Altos, CA

Huh? What did you say? Please speak up . . . Seriously, though—to answer your comments in reverse order—we are devoting more space to speakers than anything else, witness this issue. The higher frequency of publishing has not materialized yet but it will. (You celebrated prematurely.) Although I believe that reviewers' endorsements of wacko speakers are more often than not politi-

cally, rather than physiologically, motivated, I am in favor of published hearing acuity tests—I'll be the second reviewer to publish mine if the first can be found under the prevailing political circumstances. Meanwhile a good rule thumb is that flat response over a large solid angle makes a speaker sound good, regardless of the reviewers hearing acuity, and that subjective reviewing without measurements is of very limited credibility.

—Ed.

The Audio Critic:

. . . Congratulations on stabilizing the publication. If advertising is what it takes, so be it. But let me assure you that glossy paper and Garamond are, in themselves, no more major-league than matte paper and tastefully used Times Roman—you had nothing to apologize for in your old layout. Also, I should point out that it would look better—at least I think it would look better—if the new typefaces used for heads and copy were either truly in the same family or markedly different from each other. The close but not quite matching styles are as discordant as two notes a half step apart. This is a separate matter from the additional Gothic you're using for subheads and captions, which is OK if not especially distinguished.

Thanks again for keeping the flame of reason lit in an insane world.

Yours truly,
Richard Kimmel
Bensenville, IL

As far as stabilization is concerned, your congratulations are premature, as our rupture with our Canadian associates and our tardy publishing schedule clearly indicate. Advertising we've had since 1987, or haven't you noticed? As for your comments on our new page design, you may very well be right; I won't debate you. You appear to be a case of "The Princess and the Pea" in typography, whereas I am merely a commoner (well, maybe a baron). Basically, we just wanted a slightly more contemporary image; the old layout had started to look a bit too '70-ish. Than you for your recognition of our fundamental thrust.

—Ed.

The Audio Critic:

First, I must say that I enjoy your magazine and look forward to seeing it grow, as there is a serious need for a scientific bias in the audio field.

However, my main reason for writing is your editorial in Issue No. 27 "Has Tom Holman Gone Off the Deep End?" I would suggest that you're the one who has gone off the deep end. 'Course, maybe you're afraid of the dark? Other than sound quality, I came away with nothing resembling your annoyances.

You seem to have missed what Tom's objective was, although I may have had some insight that you were not privy to. I attended a special after-hours session and was involved in a small-group conversation (mainly listening) with Tom as we waited in line. As I understand it, Tom's objective is to try and nudge the industry into some kind of standard configuration in which DVD-A's can be recorded. As it stands now, as far as I know, we have this extremely versatile high-capacity medium but we don't have any idea what we will need systemwise to enjoy it. His demo was to show what might be possible.

I came away from the demo quite pleased, as I felt it clearly showed the capability of the directional cues, especially to the rear. The soundstage seemed stable even over a large area. We were invited to wander around the room when they later turned on some light. I was especially impressed with the system's ability to handle the theater-in-the-round with the audience at the center. I agree completely with your comments on the quality of the sound. It was not convincing, but that did not seem to me to be that important, although it would have been just that much more impressive if it had had gorgeous sound quality. According to the comments by Tom during the demo, there was a significant effort EQ-wise to straighten out significant bass problems. But they obviously weren't very good at voicing the system. They were using the PMC pro speakers, but with some proper EQ-ing of the mid/highs they could have sounded a lot better in my opinion.

John Koval
Santa Ana, CA

We don't seem to have attended the same demonstration. You apparently attended a breezy, informal one with two-way conversations—am I wrong? I attended a stiff, formal, one-way music demo with my head inserted (in effect) into an unremovable black hood, against my will. I found that to be both intolerable and illegal. Also, I obviously don't have your ability to separate good directional cues from bad sound quality. To me it was just bad sound in an impossibly uncomfortable environment. No, I'm not afraid of the dark but I don't wish to be without the option to leave.

—Ed.

The Audio Critic:

The following excerpt comes from 2000 IEEE President Bruce Eisentein's column in the August 1999 issue of *The Institute:*

". . . there are two ways in which advances can impact companies or organizations: 'sustaining' technologies and 'disruptive' technologies. Sustaining technologies, which can be radical or incremental in nature, are those that improve the performance of established products or services. By contrast, disruptive technologies result in worse performance of existing products, but have value to new (emphasis on new) customers."

(continued on page 39)

By FLOYD E. TOOLE, Vice President, Acoustical Enqineerinq, Harman International Industries, Inc.

Audio Engineering

Science in the Service of Art

This article, in a somewhat different form, was presented by Floyd Toole as his keynote speech at the opening of the Audio Engineering Society's 111th Convention in New York City on November 30, 2001. Unlike most keynote speeches, which say absolutely nothing, this one was mainly about the realities of loudspeaker performance, so in the end it was not really a keynote speech.—Ed.

There is artistic audio engineering and there is technical audio engineering.

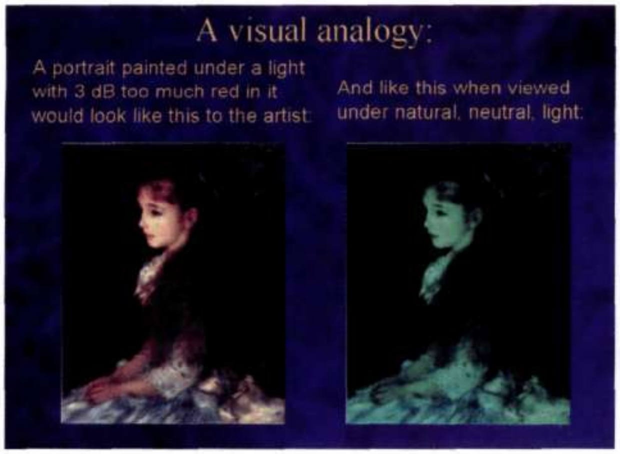
The engineers who work with artists manipulate the audio signals in many different ways in order to create a suitable information or entertainment document. This is a highly subjective activity, but many of these people are also technically knowledgeable.

The engineers who design the hardware used in studios and homes need technical data to do their designs and to evaluate progress toward their performance targets. Although technically focused, most of these people came to the industry with an appreciation of music, good sound, and the artistry within it.

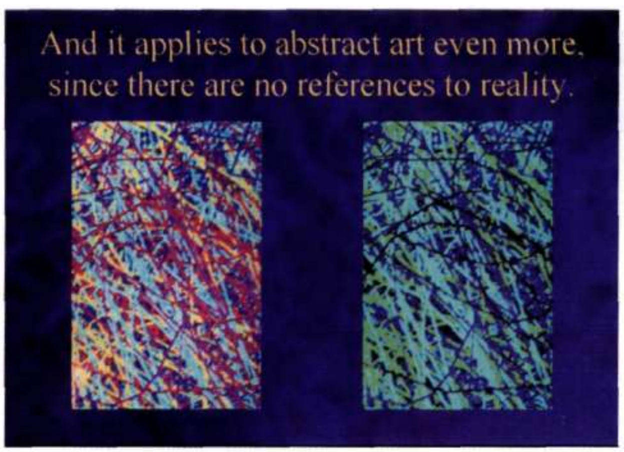
Music and movies are art. Audio is a science. "Science in the service of art" is our business. The final evaluation, however, of any audio product, hardware or software, is a listening test—and that is part of the problem. How do we determine what causes something to sound "good" or "bad"?

The audio industry is in a "circle of confusion." Loudspeakers are evaluated by using recordings . . . which are made by using microphones, equalization, reverb, and effects . . . which are evaluated by using loudspeakers . . . which are evaluated by using recordings . . . etc., etc. Recordings are then used to evaluate audio products. This is equivalent to doing a measurement with an uncalibrated instrument! Of course, professional audio engineers use professional monitor loudspeakers . . . which are also evaluated by using recordings . . . which are made by using microphones, etc. . . . which are evaluated by using professional monitor loudspeakers . . . which are once again evaluated by using recordings . . . which are then auditioned through consumer loudspeakers! Thus the circle of confusion continues. It is broken only when the professional monitor loudspeakers and the consumer loudspeakers sound like each other—when they have the same sonic signature, i.e., when they are similarly good. (Of course, sounding alike also includes the interface with the room and the listener within it.) Then, and only then, can we hope to preserve the art. All else is playing games.

Let us use a visual analogy.



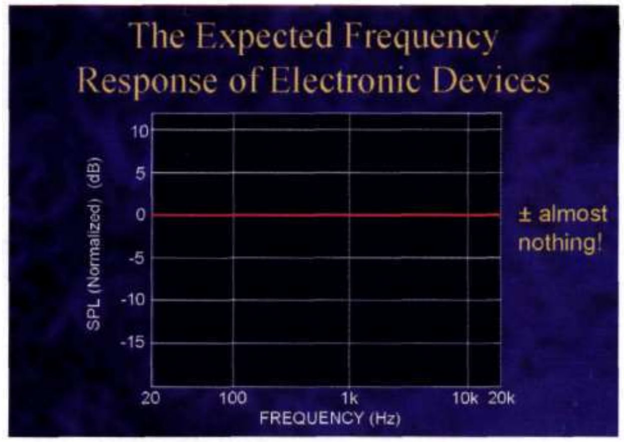
Red happens to be at the low end of the visible spectrum, so this is comparable to having 3 dB too much bass. In this case the artist would adjust the tints in his oils to compensate for the color of the illuminating light. Thus the appreciation of the art will be at odds with the creation of the art. It is a purely technical problem: the color of the light has caused good art to be distorted. A measurement would have prevented this.

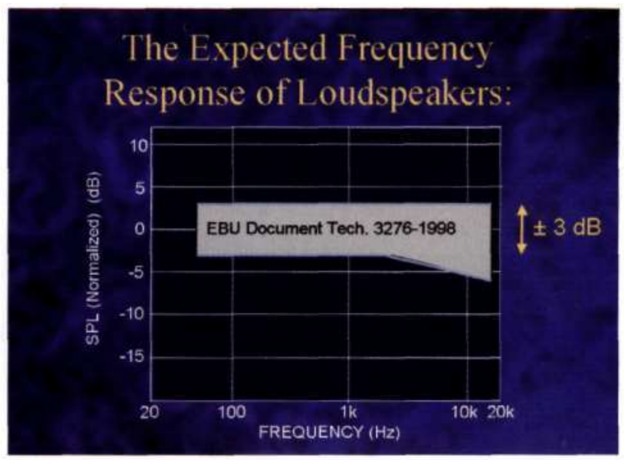


Without skin tone, grass, or sky we have no instinctive way to guess that something might be wrong with the picture. The audio equivalent to this is the multitrack studio creation. The *only* reality is what is heard through speakers in a room.

This is why visual artists seek out studios with neutral, usually north, light, and art galleries display their works under the same kind of light. The viewer should see exactly what the artist created. That's preservation of the art.

In audio, this is a problem to which there is not a single, or a simple, solution. Scientific design requires: (a) carefully controlled listening tests, i.e., subjective measurements, combined with (b) accurate and comprehensive technical measurements, combined with (c) knowledge of the psychoacoustic relationships between perceptions and measurements. For example, let's look at **frequency response**—the single most important technical specification of audio components.





This is an example of the kind of tolerances applied to loudspeakers—and here, to make things worse, it is a steady-state measurement in a room. This is not a single performance objective. It implies that all variations that fall within the limits are audibly acceptable. **Rubbish!** Why do we change the rules for loudspeakers? We shouldn't! The *same* rules apply.

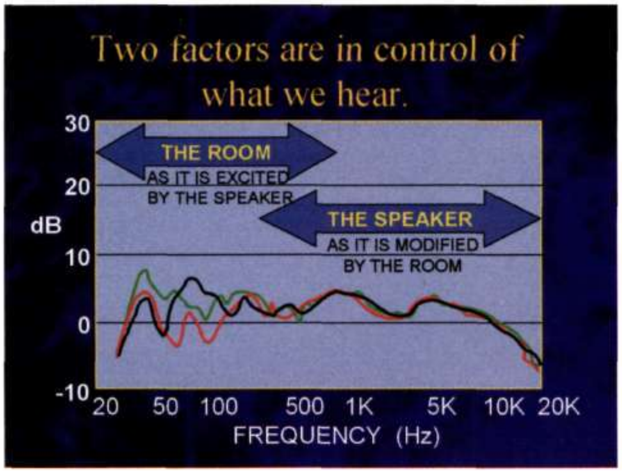
How did we get into this situation?

• Technically, loudspeakers are difficult to measure. Many anechoic, high-resolution measurements and computer processing are needed. That's expensive and time-consuming. Few people in the world are able to do it.

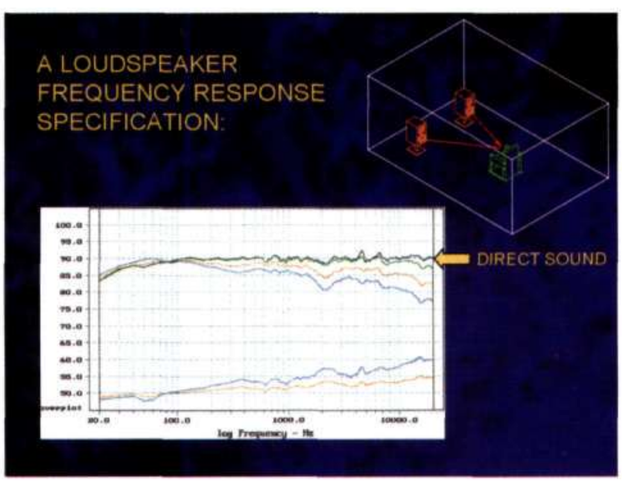
• Subjectively, many factors can introduce bias and variability into opinions. Selecting and training listeners, and controlling the "nuisance variables," are expensive and time-consuming. Few people in the world bother to do it.

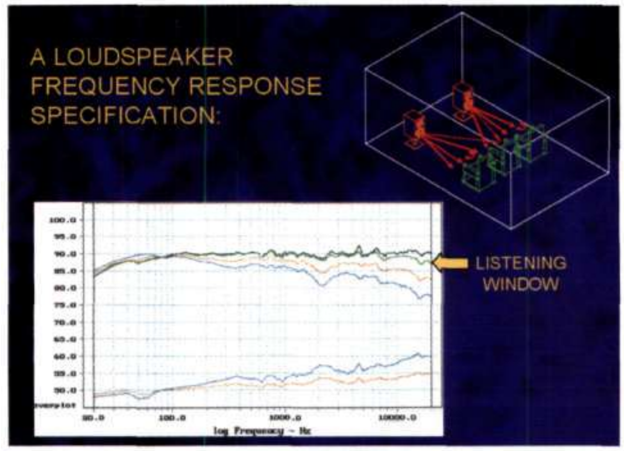
• Practically, the room is the final audio component. Rooms audibly modify many aspects of sound quality. All rooms are different.

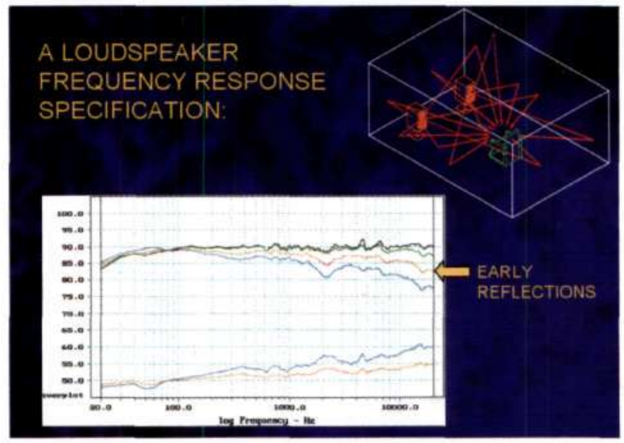
But—does it matter? Is there a problem with things as they are? Let's check out the state of affairs at the "appreciation" end of the chain. What are consumers listening to these days?

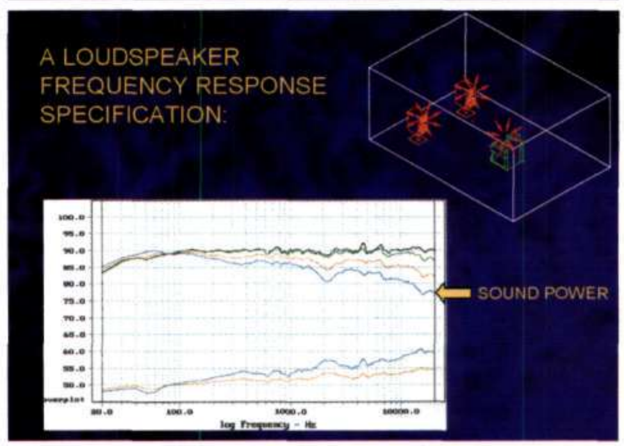


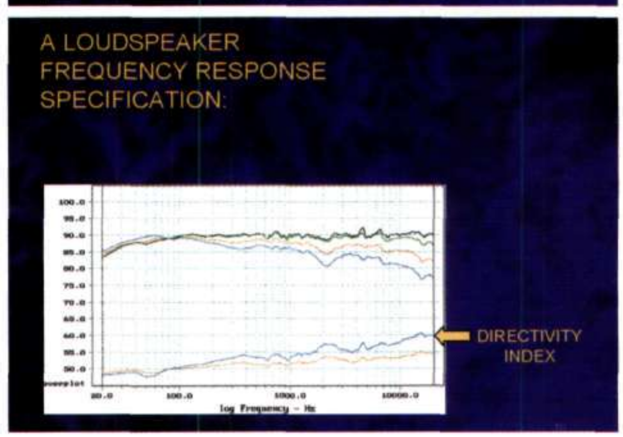
From the science that has been done, we conclude that there are two domains of influence in what is heard in a room. In-room measurements, acoustical manipulations, and equalization can improve performance in the 20 Hz to 500 Hz region. But the *only* solution for the portion above 500 Hz is a loudspeaker that is properly designed. These measurements *must* first be done in an anechoic space. Then, and only then, can we interpret the meaning of measurements made in a room. We need to know what the loudspeaker sent into the room before we can evaluate what the room has done to it. An anechoic chamber is a space without echoes or reflections. From a large number of measurements made in this space, it is possible to calculate predictions of what will be heard in real rooms.

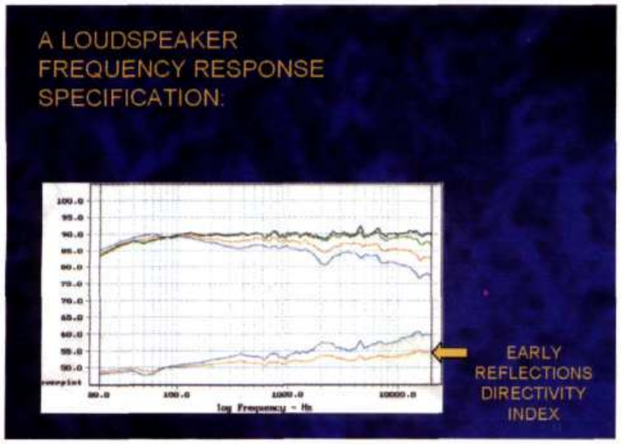




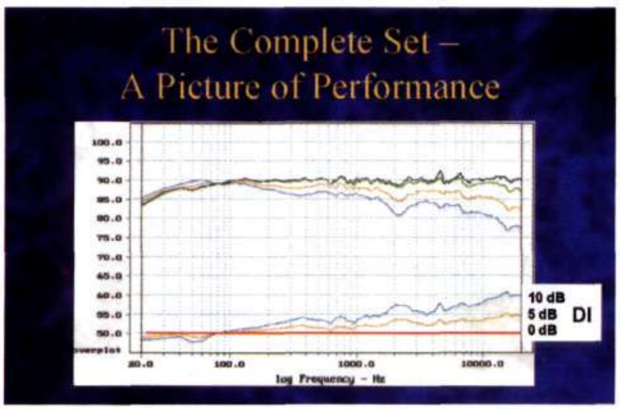




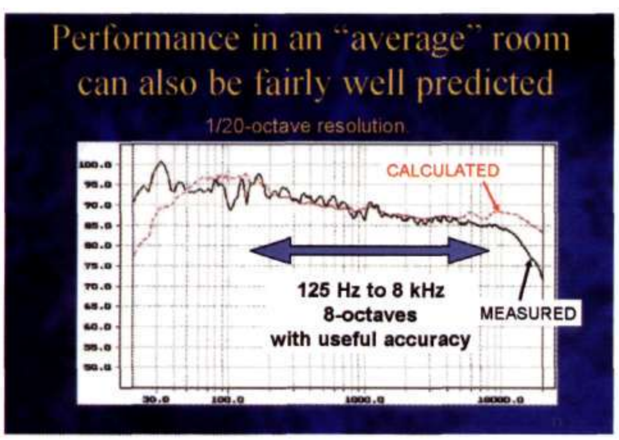




From these anechoic data it is possible to be quite analytical about the individual components of the sound field within a room. It is from data like these that we can learn about the correlations between what we measure and what we hear—the psychoacoustic rules.



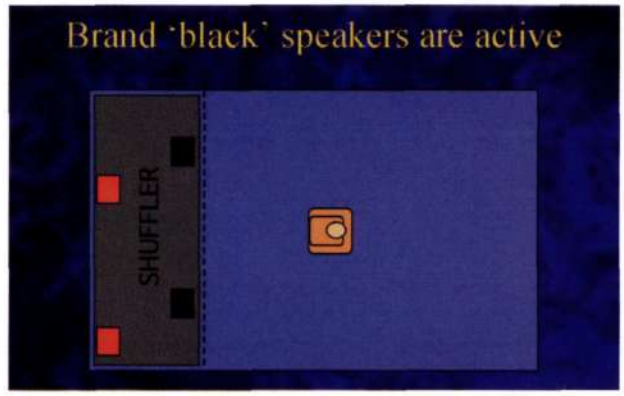
A presentation like this gives us a capsule view of loudspeaker performance as it relates to listening in a room. Differences among the curves indicate conflicts in the timbral signatures of direct, reflected, and reverberant sounds—something that contradicts natural experience, and that listeners react negatively to.

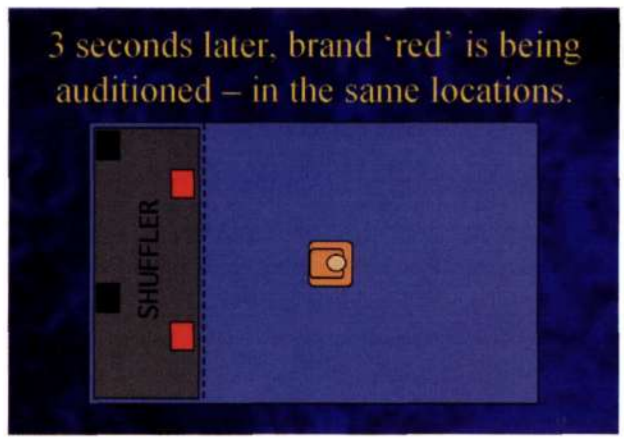


When averaged over a reasonable listening area in a room, the predictions are remarkably good. A little more work would make the predictions even more precise.

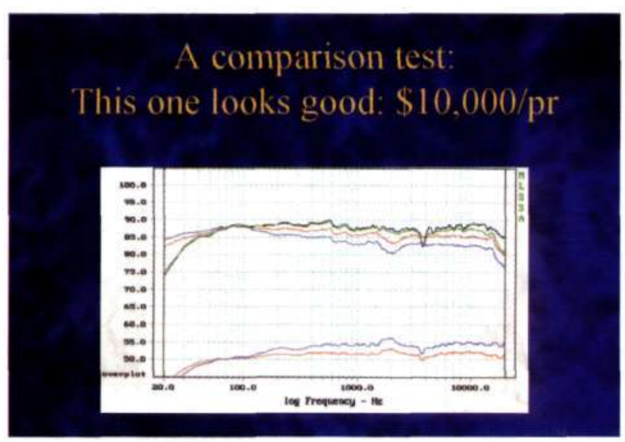
Measurements make a nice story, but can people really *hear* the differences? Let's test them.

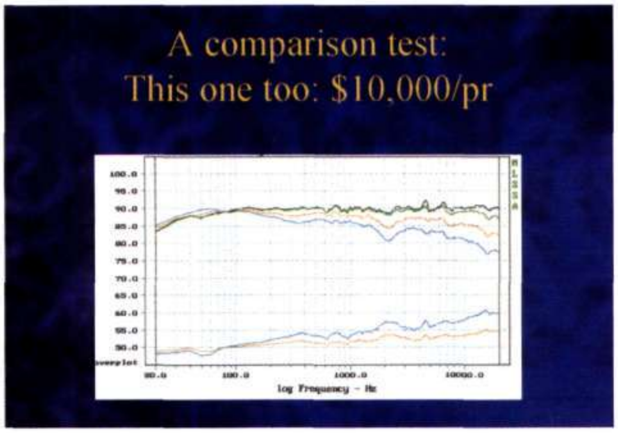
A serious problem with listening tests is that the position of the loudspeaker affects how it sounds. We at Harman International neutralize this with a computer-controlled, pneumatically operated shuffler.

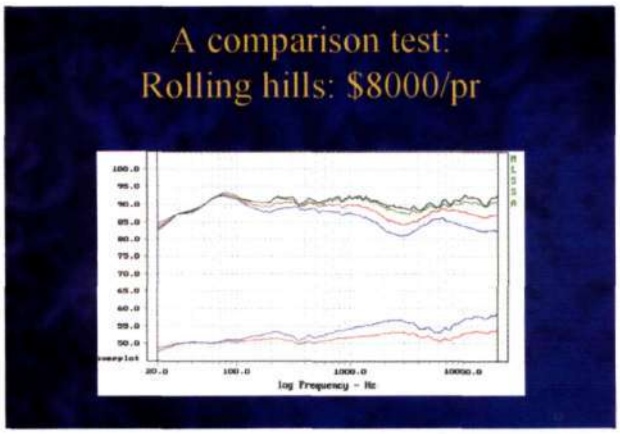


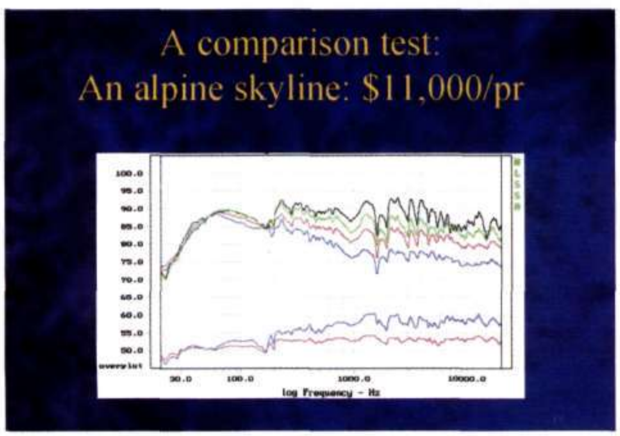


The listener controls the exchanges while forming opinions. The listener sees only an acoustically transparent black screen. The tests are double-blind.





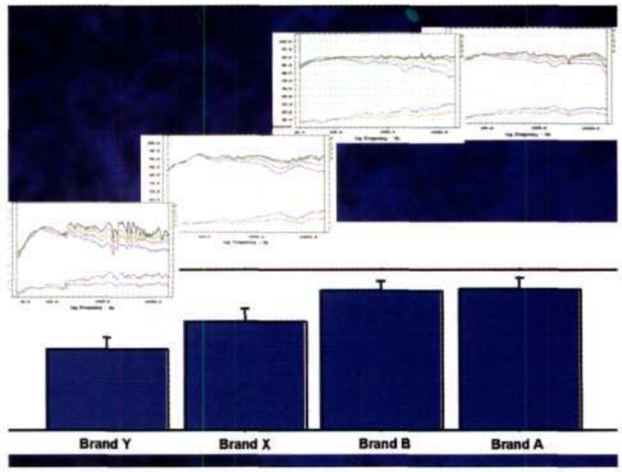


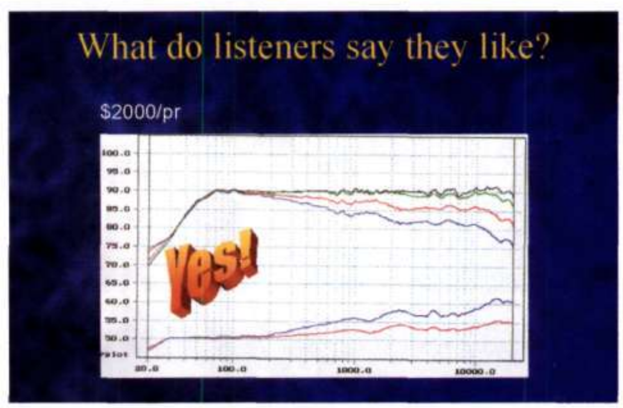


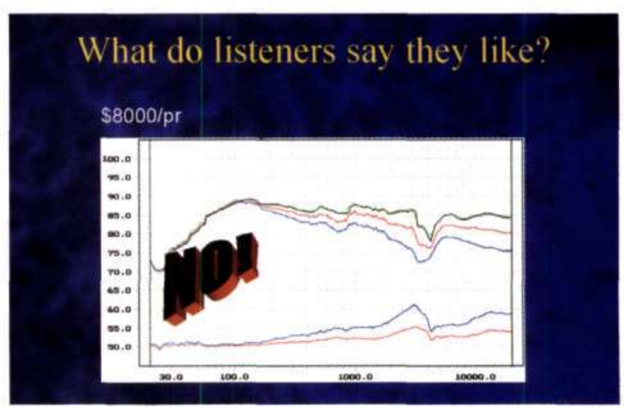
Without listening, it is evident that all of these loudspeakers were not designed to meet the same performance objectives or, if they were, there were differences in the abilities of the engineers to achieve the objectives. The prices, though, suggest "high-end" audiophile aspirations for all.

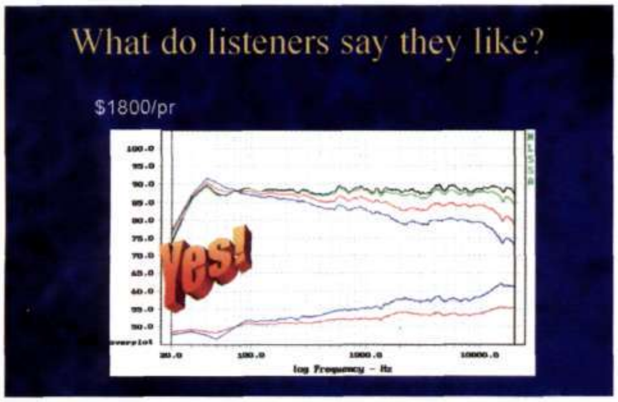
The juxtaposition of subjective and objective data is very convincing. It seems that our technical data are revealing essentials of performance that correlate with the opinions of listeners in a room.

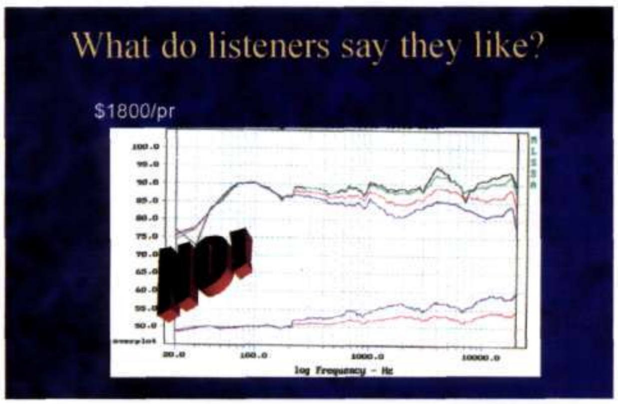
We do tests of this kind at Harman International as a matter of routine, in competitive analysis of proposed new products. The results are monotonously similar.

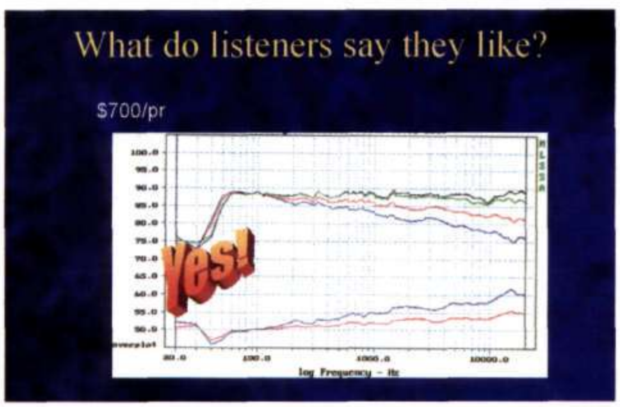


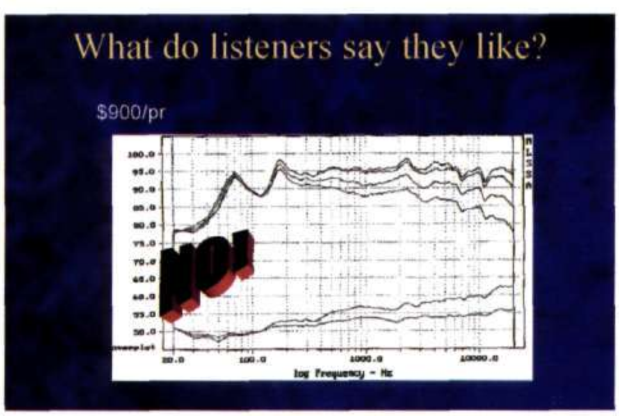




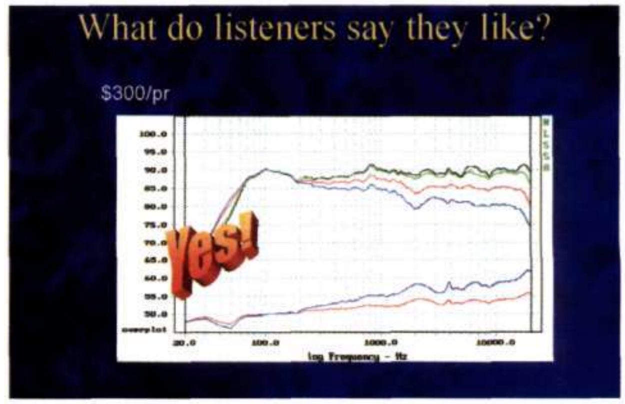




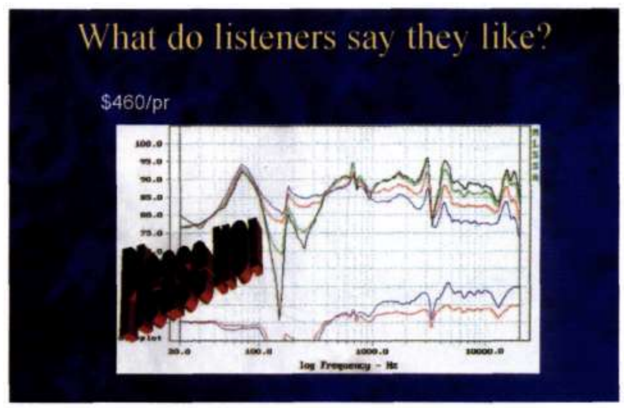




It is clear that good acoustical performance is available at moderate prices—as well as some less good offerings.



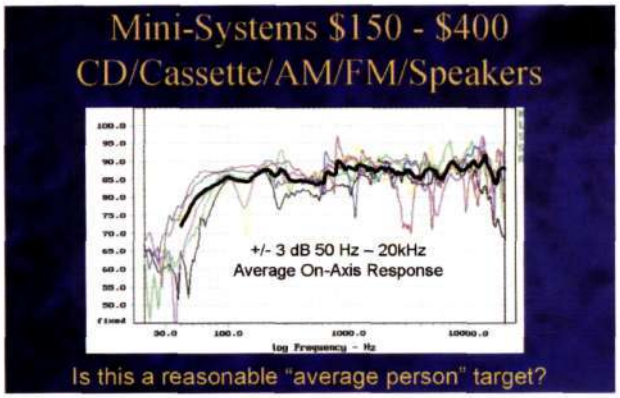
Here is an entry-level product that still has basic integrity. It may not play as loud, or look as elegant, or have the bass extension of more expensive products, but it is doing an honest job at a challenging price.



And then there are companies that seem not to care how their products sound. This is from a very well-known and well-advertised brand, which is also known in the professional audio community.

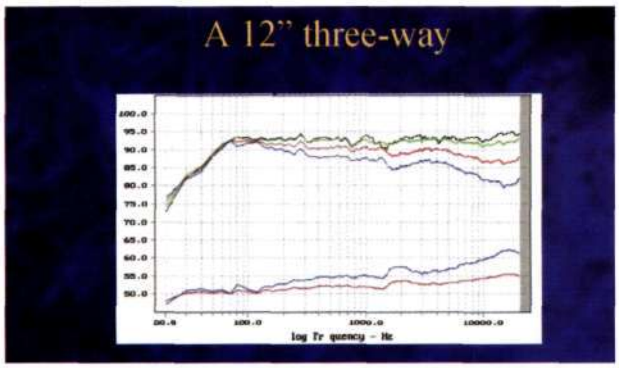
At this stage it is safe to say that we are well on our way to having a reliable relationship between subjective and objective evaluations. It is not perfect. We don't know everything about these multidimensional domains. However, there are amazingly few surprises when we compare the results of technical tests and the results of listening tests. The final arbiter of quality, nevertheless, is *always* the subjective evaluation.

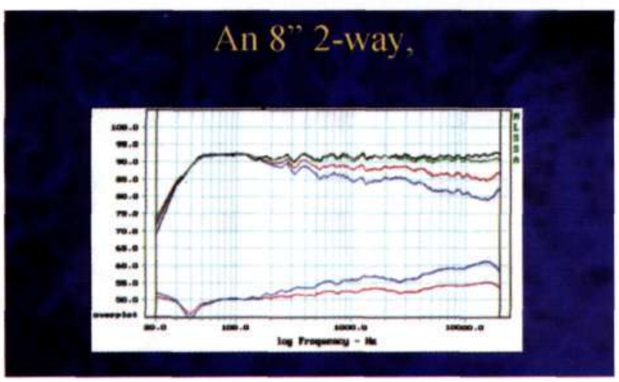
The professional audio community is very sensitive to how average consumers will react to their creations. Consequently, they will take their mixes home, listening to them in the car on the way, and playing it through an 'ordinary' stereo at home, to see how it survives less than ideal reproduction. So, what is 'ordinary'? For a glimpse into the true entry-level product category, here are six mini-systems, containing everything needed, for remarkably low prices. The first thing to note is that no two are exactly alike. In fact, poor sound comes in an infinity forms. It is a moving target.

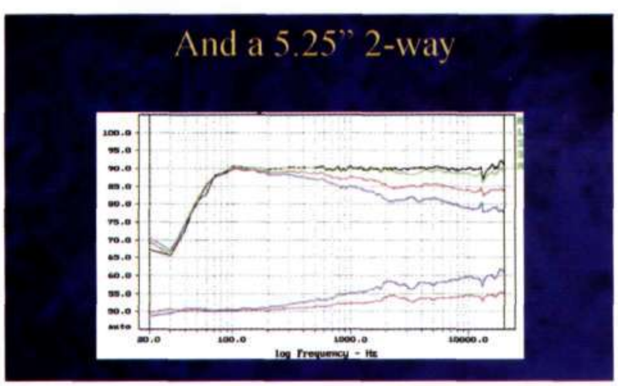


However, in the average of the six systems, we can see that perhaps they were all aimed at smooth and flat but simply failed, in different ways, to achieve it.

With this perspective on consumer loudspeakers, let us look at the status of professional audio monitoring.

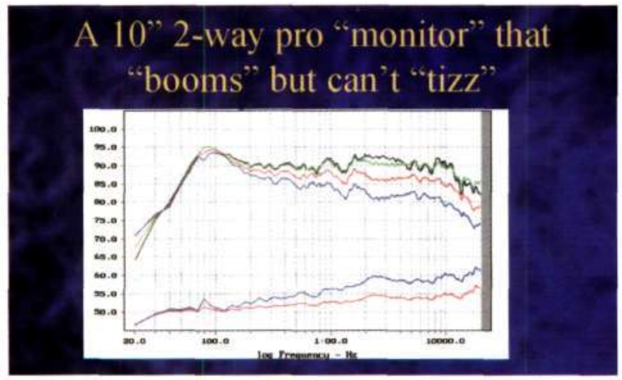






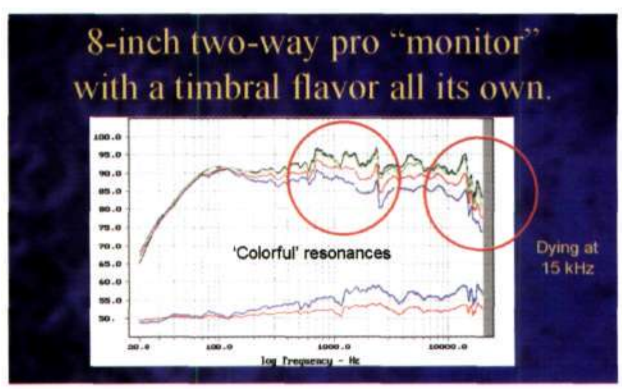
A current good product. Another. And another. These good examples of the breed are competitive in sound quality with the best loudspeakers from the world of consumer audiophiles. And such monitors are also useful references for average consumer "entry-level" systems (when we compare their responses to the averaged six-mini-system response above).

However, "professional" or "monitor" in a product description guarantees nothing in terms of sound quality!

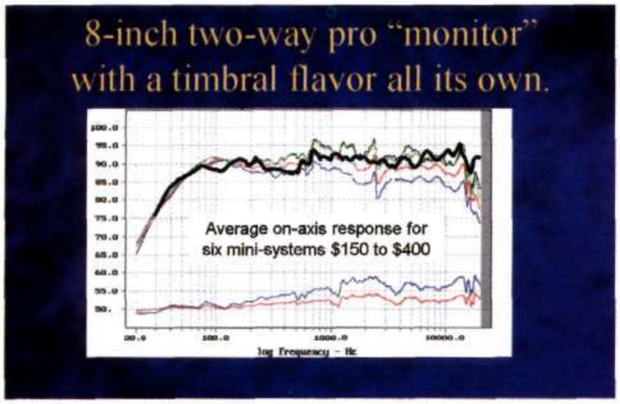


In this age of 40 to 50 kHz bandwidth, here is a speaker that is going south at 10 kHz! The bass bump at 100 Hz is reminiscent of many small bookshelf speakers aimed at the mass market. There is no low bass.

Even the "average" cheap minisystem doesn't fail in these ways.

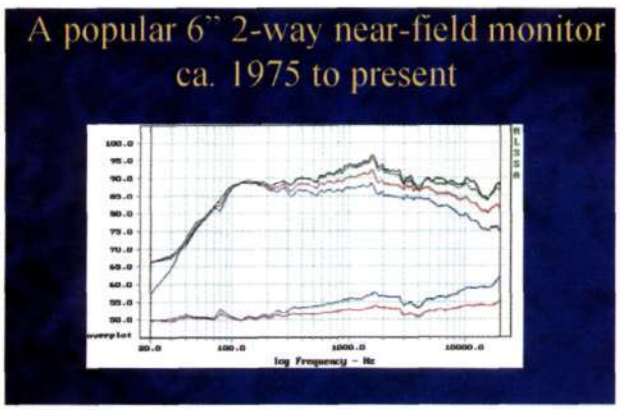


Another well-known maker has editorialized on the sounds in ways that no consumer product is likely to imitate exactly.

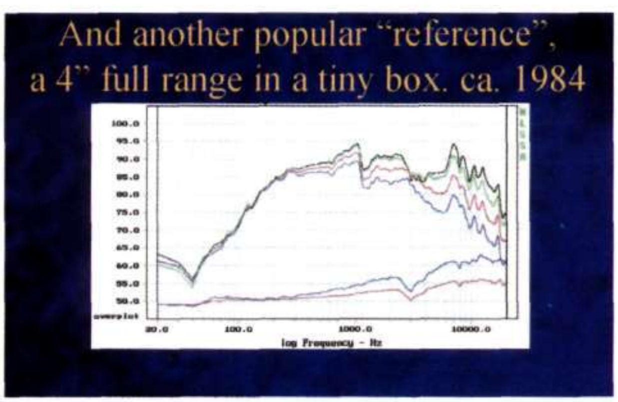


The average minisystem is arguably better.

Other loudspeakers came to be used because it was believed that they exemplified a common form of mediocrity in the lives of the listening public.



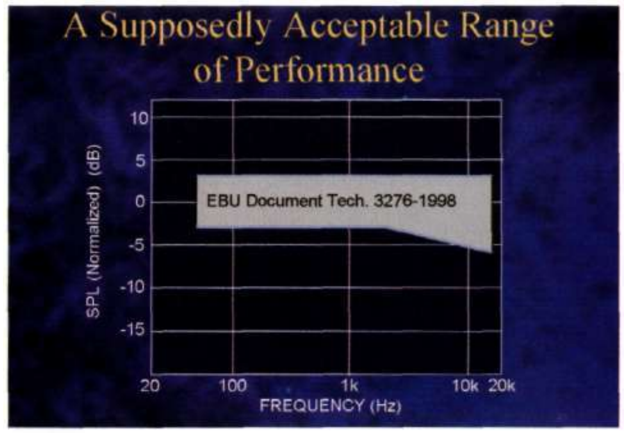
Even Kleenex over the tweeters couldn't fix this.

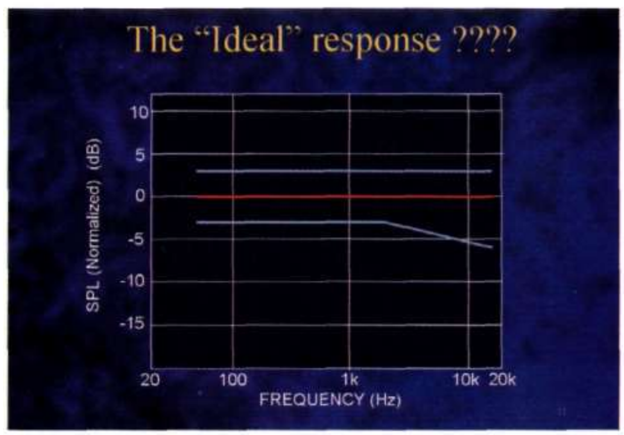


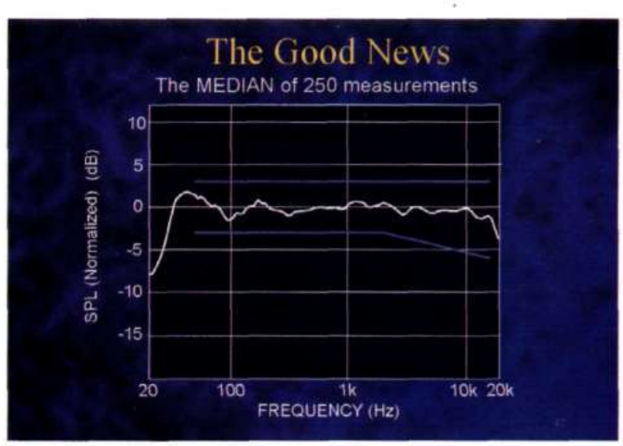
Yup. This one must target the listening audience that uses the clock radios in our hotel rooms.

Speakers like these are no longer relevant to the audio industry. Thanks to progress in the world of consumer audio, the quality bar has been raised!

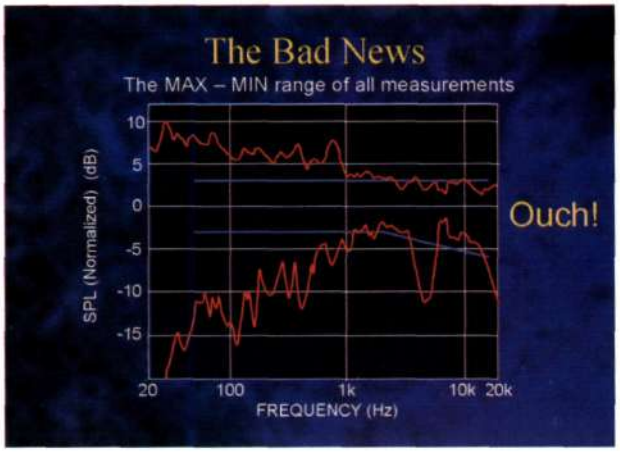
Now, what happens when we add the room to the equation? A study of control-room monitoring conditions was presented at the 19th AES Conference, June 2001, by Mäkivirta and Anet under the title of "The Quality of Professional Surround Audio Reproduction—A Survey Study." Thanks to the considerable efforts of these gentlemen, the industry has been given a special perspective on what is happening in recording studios. The study was sponsored by one of our respected competitors. It covered many loudspeakers in many monitoring rooms. The speakers were all of the same family, all 3-way, and they were measured at the engineer's listening position.



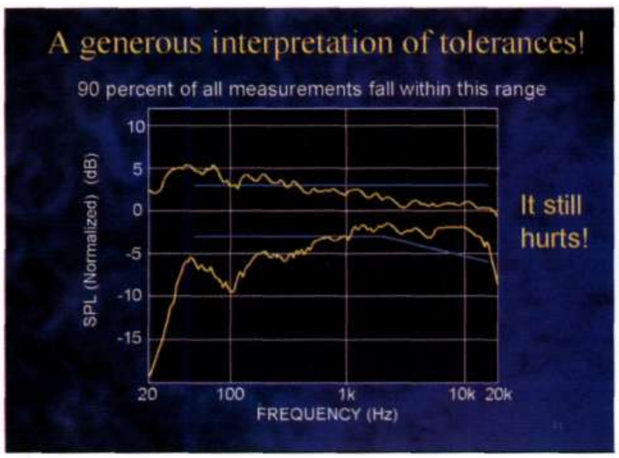




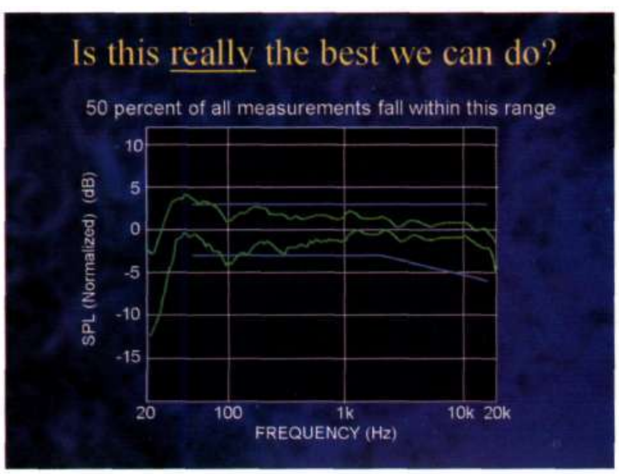
There are lies, damned lies, and then there are statistics. In this we see such an example. The "average" system is actually impressively good.



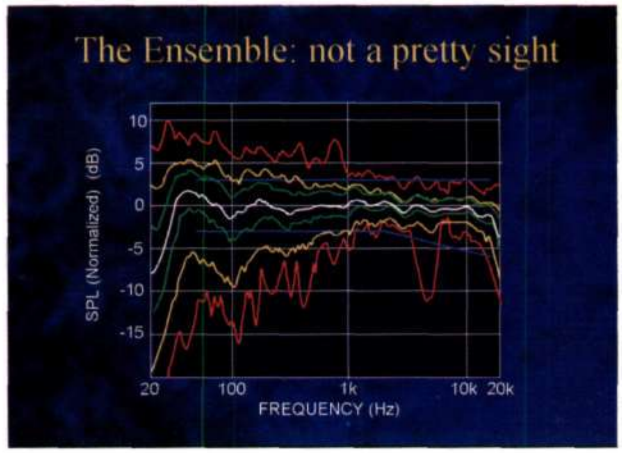
However, some were horribly wrong.



Even 90% included some very deviant sounds.

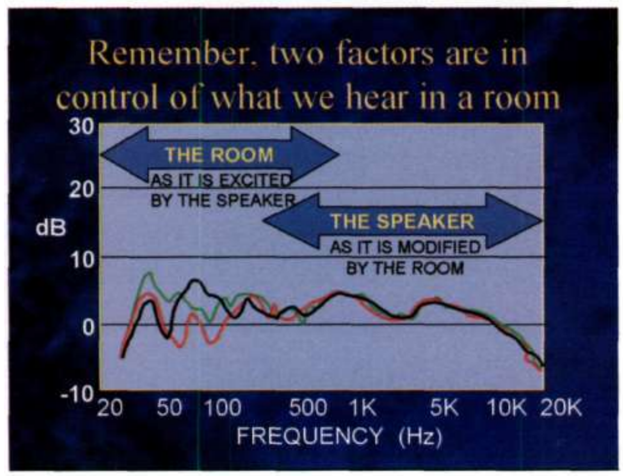


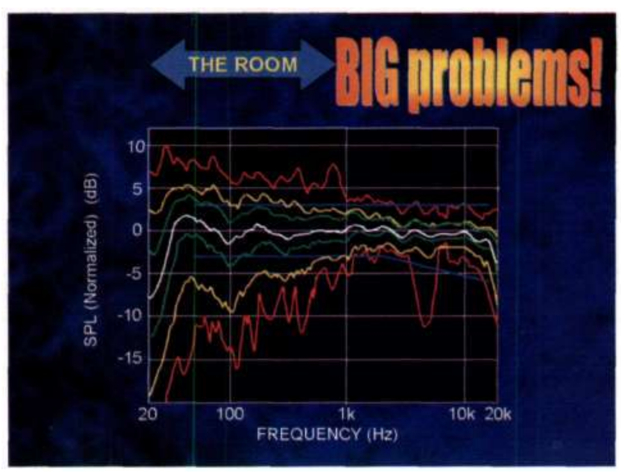
And even half of the population included variations that were not subtle.



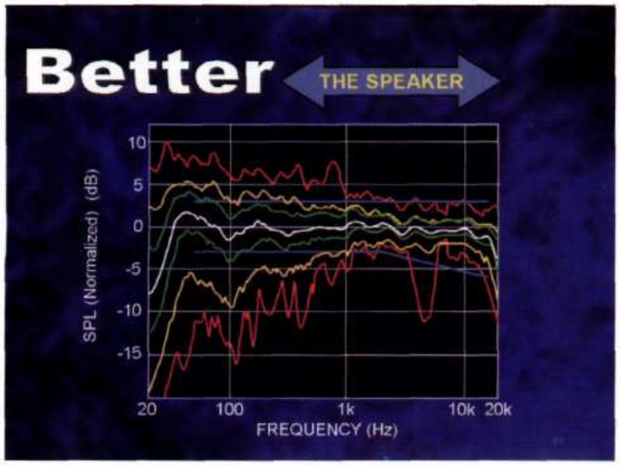
As a picture of our industry, this is frightening.

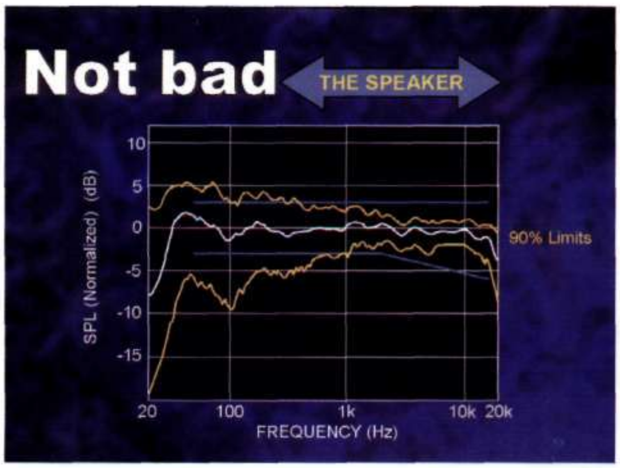
But what is going wrong? What are we measuring here?

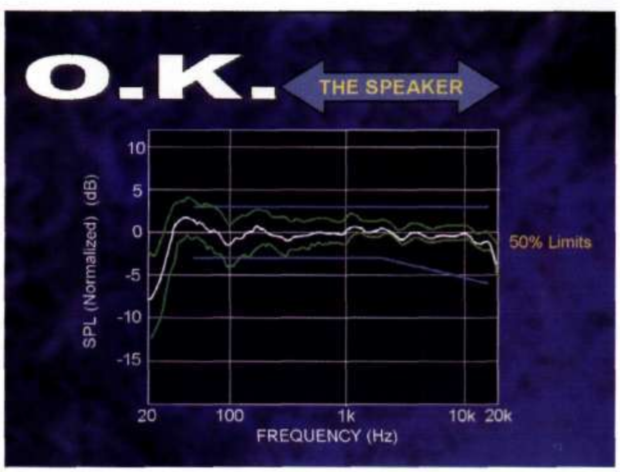




Clearly, the real culprit here is the loudspeaker/room/listener interface.







These are pretty good, suggesting that little or no equalization was done in this frequency range.

In Summary:

• Loudspeakers are ***not*** the biggest problem in the audio industry.

• Numerous similarly excellent consumer and studio-monitor loudspeakers are in the marketplace. Some are even relatively inexpensive.

• In spite of an elevated average quality level, there are still many truly inferior products out there. *Caveat emptor!*

• The **loudspeaker/room/listener interface** is a very serious problem throughout the audio industry, in homes and in music and film studios.

• Accurate, high-resolution in-room measurements, along with acoustical corrections and equalization, are necessary to deliver *truly* good sound to listeners' ears in homes and in studios.

The "traditional" technique of in-room equalization needs to be improved. Measurements must have high resolution; -octave resolution is not adequate, especially at low frequencies. Passive acoustical equalization needs to be combined with "intelligent" electronic parametric equalization.

The key to successful equalization is in knowing what tools to use to address specific problems.

We have most of the science. We need to teach it more widely. And we need to be *much* more diligent about applying it.

Thank you! TAC

Speakers

LOUDSPEAKER REVIEWS

By Peter Aczel, Editor
D. B. Keele Jr., Contributing Editor
David A. Rich, Ph.D., Technical Editor

Two Big Ones, Two Little Ones, and a Really Good Sub.

After three decades of serious technical involvement with loudspeakers, I have come to a startlingly simple conclusion regarding performance requirements. It isn't enough to have the best possible drivers. It isn't enough to have the most solid and least diffractive enclosure. It isn't enough to have the best possible crossover. It isn't enough to have correct spacing between the drivers. It isn't enough to have the most carefully optimized bass tuning. You've got to have them all—and that includes all other requisites I haven't mentioned. Concentrating on one or two aspects of loudspeaker design and neglecting the others, as most manufacturers do, will not result in outstanding performance. That is true even when there is a revolutionary breakthrough in one design area but scant attention paid to the rest.

Am I pointing out the obvious? Then why does nearly every speaker designer fail to cover all bases and leave holes in his design? How many truly complete loudspeaker designs are there today? How many that don't assume about one design aspect or another that "oh, that's nothing, it's not important" or "oh, that's not practical in this design"?

My ideal, or at least something close to it, in the quest for a complete design is represented by the Waveform Mach 17 speaker system (reviewed in Issues No. 24 and 25), which unfortunately is no longer available as a consequence of owner/designer John Ötvös's decision to close shop. It started out with state-of-the-art OEM drivers (probably surpassable today but not at the time of design, in 1996) and had the midrange and tweeter mounted in an egg-shaped enclosure, which is the theoretical optimum for minimizing diffraction. There were no passive crossover elements; the three-way crossover was entirely electronic, with trimming controls for all three channels. The manageably sized bass enclosure was tuned and equalized to be essentially flat to 20 Hz. And so on—this is a very superficial and incomplete summary of the design merely to illustrate my point, namely that no aspect of optimal design was neglected. The recently announced "Helix" by Legacy Audio is another design that holds out some promise of being complete, in an altogether different and perhaps more up-to-date way. (Just guessing; nobody has tested it yet.) Perhaps there are others out there that I haven't even heard of, but there couldn't be many. Even Floyd Toole's top-of-the-line speakers at Infinity and JBL, excellent as they are, are limited to some extent by inevitable tradeoffs of cost and complexity against performance (see Don Keele's review of the Infinity Intermezzo 4.11 below).

—Peter Aczel

10" Powered Subwoofer

Hsu Research VTF-2

Hsu Research, Inc., 3160 East La Palma Avenue, Unit D, Anaheim, CA 92806. Voice: (714) 666-9260. Fax: (714) 666-9261. E-mail: hsures@earthlink.net. Web: www.hsuresearch.com. VTF-2 variable-tuning-frequency 10-inch powered subwoofer, $499.00 each (factory-direct, $45.00 shipping/handling). Tested sample on loan from manufacturer.

Every once in a while a product comes along that is completely polished and perfected, with nothing left to be improved at its price point. I feel that the Hsu Research VTF-2 is such a product. It wasn't always so with Dr. Poh Ser Hsu's subwoofers; some of his earlier products, although invariably brilliant in design and superior in performance, were a bit on the crude side in construction and packaging. Not so in the case of the VTF-2—this is a beautifully finished and integtated subwoofer system, complete in every respect, with electronics and controls, impeccable in performance, and most reasonably priced. My heart is filled with admiration; I didn't really expect such perfection.

The subwoofer system is a compact and almost cubical box, 18½" deep by 16" wide by 16" high (with feet); the heat sinks of the integrated 150-watt amplifier stick out an additional 1½" in the back; the edges are rounded; the finish is black crackle paint, which suggests metal, although the box is made of heavy fiberboard. It is a highly professional look, a far cry from the paper-barrel Hsu subwoofers of years ago. The bass driver is a magnetically shielded 10" unit that fires downward into the cavity formed by the feet, and there are two huge flared ports on either side of the box, one of them plugged up. The foam plug can be removed, thereby changing the tuning from 25 Hz to 32 Hz (manufacturer's specs) and substantially increasing the output between 30 and 50 Hz. Home theater sound can particularly benefit from the two-ports-open mode. There are two controls on the amplifier panel in the back: volume (naturally) and variable crossover frequency from 30 Hz to 90 Hz.

My nearfield measurements in the one-port-open mode indicated classic B4 tuning, both the woofer null and the maximum vent output occurring at 24 Hz (that's close enough to the 25 Hz specified by the manufacturer). The summed nearfield response of the woofer and vent was within +1.5 dB from 100 Hz all the way down to 22 Hz. In the two-ports-open mode, the woofer null and maximum output from the vents occurred at 34 Hz, and the summed nearfield response of the three apertures (difficult to obtain and therefore approximate) was +1.5 dB from 100 Hz to 40 Hz. In other words, the tuning of the box and the resulting

output were pretty nearly optimal and on spec. Beautiful design.

I measured the distortion of the VTF-2 only in the one-port-open mode because the summing junction of the woofer and vent could be much more accurately located in that mode than with two ports open. The nearfield distortion of a 50 Hz tone at a 1 -meter SPL of approximately 100 dB was 0.63%. At 40 Hz and approximately 95 dB it was 1.6%. The 30 Hz measurement was made at a 2-meter SPL of approximately 100 dB because the output appeared to be higher at 2 meters than at 1 meter. The distortion was only 1.7%! These are brilliant results. The subwoofer is not only deep and flat in response but also exceptionally clean.

How does it sound? Exactly as it measures, as I have said many times before. A subwoofer is a relatively simple device that presents no mysteries and hides no subtleties. It has a frequency response, a dynamic limit, and a distortion range—that's it. (Wave launch, dispersion, power response, etc.—so important in the evaluation of full-range speakers—do not enter the picture at all.) Thus the Hsu Research VTF-2 is the equal of any subwoofer, even those costing three to four times as much, down to well below 30 Hz. In the 15 to 25 Hz range, a few 15" and 18" models may exceed it in output and low distortion (at a tremendous increase in price), but those frequencies seldom occur in music and almost never in movies. On a per-dollar basis, direct from the factory, the VTF-2 is best subwoofer known to me.

—Peter Aczel

Floor-Standing 4-Way Speaker with Powered Subwoofer

Infinity "Intermezzo" 4.1t

Infinity Systems, Inc., a Harman International Company, 250 Crossways Park Drive, Woodbury, NY 11797. Voice: (800) 553-3332. Fax: (516) 682-3523. Web: www.infinitysystems.com. Intermezzo 4.1t floor-standing 4-way loudspeaker system with built-in powered subwoofer. $3500.00 the pair. Tested samples on loan from manufacturer.

Editor's Note: *I hasten to point out, before the self-righteous element in the audio community does, that Don Keele is currently employed by Harman/Becker Automotive Systems, which is owned by the same parent company as Infinity Systems, namely Harman International. Harman/Becker and Infinity are totally independent of each other, without any overlap; in fact, they are located 700 miles apart—but they are connected via Sidney Harman's pocket. He, or more precisely his company, owns a significant percentage of the audio industry, so that any one of the limited number of truly qualified audio engineers (like Don Keele) has more than a small chance of falling within his purview. It can't be helped. As I pointed out in one of the earliest issues of* The Audio Critic, *in the late 70s, the alternative is to use reviewers totally unconnected to the audio industry, such as audiophile dentists. Other magazines do. Unfortunately, said dentists don't know the difference between MLS and ETF, and that matters to me more than our reviewers' affiliations. I can assure you, in an event, that no one at the corporate offices of Harman International even knew about this review, let alone influenced it.*

Introduction

Intermezzo: a short musical movement separating the major sections of a lengthy composition or work; or *intermediate:* one that is in a middle position or state. Both terms aptly

describe the subject of this issue's loudspeaker review, the Infinity "Intermezzo" 4.1t, by appropriately tying together function and music. The 4.1t is simultaneously an intermediate speaker in Infinity's home theater lines, positioned between the higher-priced Prelude MTS and the lower-priced Interlude, Entra, and Modulus lines; and at the same time, of course, does an excellent job playing music.

The Intermezzo 4.1t is a tall and relatively narrow floor-standing loudspeaker with built-in powered subwoofer, packaged in a total system that combines first-class industrial design and handsome good looks. The 4.1t system couples a three-way direct-radiator system operating above 80 Hz to a powerful subwoofer using a side-fired very-high-excursion 12" metal-cone woofer operating in a closed-box enclosure, powered by a built-in 850-watt power amplifier.

The upper three-way portion of the design is passive and combines a 6½" cone midbass driver with a 3½" midrange and a 1" dome tweeter, all of which are mounted on the front of the enclosure and crossed over at a rapid 24 dB/octave rate. The bottom half of the system is devoted to a rather sizable closed-box enclosure housing the 12" woofer, amplifier, system controls, and connections. All driver diaphragms utilize Infinity's sandwiched composite metal/ceramic diaphragm material, which is said to be light weight, quite rigid and inert, and allows all the drivers to operate essentially as pure pistons over their respective operating bandwidths.

I last reviewed a set of an Infinity systems similar to the 4.1t for *Audio* magazine back in 1996. These were the Infinity Compositions P-FR systems, which are similar to the current Prelude MTS line. It performed excellently in all regards except for a low-frequency response that did not quite keep up with its upper bass and higher-frequency performance. My measurements of the bass output of the Intermezzo 4.1t, described later, reveal that it quite significantly outperformed the bass response of the P-FR systems. Infinity has been doing their homework! The bass improvements started with the higher-priced Prelude MTS line, whose subwoofer is quite similar to the 4.1t's. The Intermezzo line includes a separate powered subwoofer, the 1.2s, which is equally powerful.

The Intermezzo 4.1t includes a rich complement of controls and inputs on the rear panel of the subwoofer enclosure (see rear panel graphic). The system is equally at home in a complex home theater setup or a simpler two-channel stereo situation. Inputs and controls have been provided for many different operating configurations, from standalone stereo operation driven by an external power amplifier with the system's sub deriving its signal from the speakers terminals, to a complicated home theater setup driven by a Dolby Digital or DTS processor with separate power amplifiers or a multichannel amplifier.

The 4.1t's subwoofer power amplifier utilizes a high-efficiency switch-

Manufacturer's Specifications

Type: 4-way, floor-standing, with powered closed-box subwoofer

Drivers: 12" cast-frame woofer with 3" voice coil, 6½" cone midbass, 3½" cone midrange, 1" dome tweeter, the last three with Ceramic Metal Matrix Diaphragms

Crossover Frequencies: 80 Hz, 500 Hz, 2.8 kHz, 24 dB/octave

Rated Frequency Response: 30 Hz to 20 kHz, ±1.5 dB; 23 Hz to 22 kHz, ±3 dB

Rated Sensitivity: 87 dB at 1 meter, 2.83 V rms applied

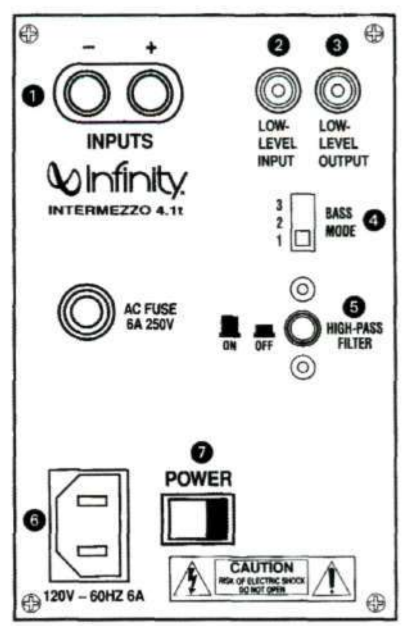
Rated Impedance: 6 ohms, nominal

Recommended Amplifier Power: 25 to 500 watts

Internal Amplifier Power: 850 watts continuous with less than 0.1% THD @ 50 Hz

Dimensions: 51½" (height) x 12½" (width) x 27" (depth) = 1308 mm x 318 mm x 686 mm

Weight: 93 lbs. (42.3 kg) each

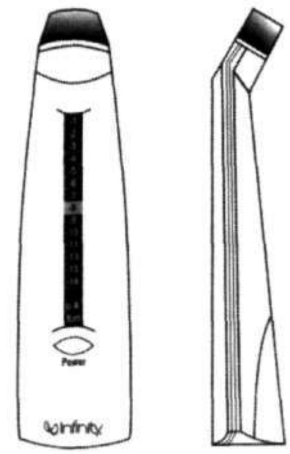


Infinity "Intermezzo" 4.1t rear panel

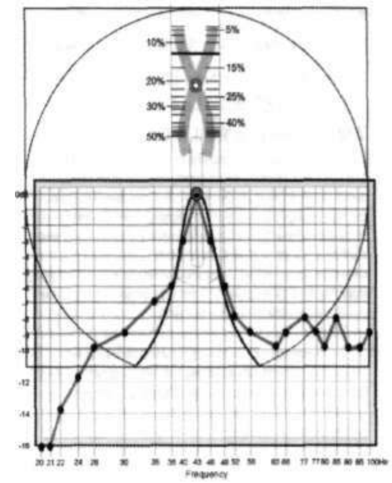
mode tracking power supply powering a class-AB amplifier. The power supply's output voltage tracks the audio signal in such a way as to minimize output device power dissipation. Quoting the 4.1t's owners manual: "The result is an extremely efficient audio amplifier that does not compromise audio performance." The tracking power supply is not unique with Infinity, however; it first started out primarily in the professional audio field (Crown International and Carver were among the first to offer the feature on their amplifiers) and then trickled down to the home market.

The 4.1t includes a single parametric subwoofer equalizer in its bass electronics, intended for smoothing the subwoofer's response in its listening environment. As is well known, the listening room heavily influences what is heard from a loudspeaker in the bass range below 100 Hz. The equalizer, if set properly, can effectively optimize the Intermezzo's subwoofer response to complement most listening environments. The parametric equalizer can provide a variable-width cut or dip of arbitrary frequency and depth, which, if matched to a room peak, can considerably smooth out the system's in-room response. As pointed out by Infinity, this also improves the system's transient response because the low-frequency speaker-to-room response is essentially minimum phase. (Techno-geek comment: If a system is minimum phase and its frequency response magnitude is equalized flat with a minimum-phase equalizer, its phase response will follow and also be equalized flat, and hence its transient response or time behavior will be optimized.)

This theory is all well and good, but how does the user know how to set his equalizer for optimum results? On the one hand he/she could hire an expensive acoustical engineer to come in with his one-third-octave real-time spectrum analyzer, noise generator, and calibrated microphone, and properly set the equalizer after doing some measurements. Or, on the other hand—tuh da!—the user could employ Infinity's slim LED sound level meter (see Sound Level Meter graphic) and the accompanying test CD with detailed instructions, which are supplied with the 4.1t to accomplish the same task. Gee, Infinity thinks of everything! Infinity calls their adjustment system R.A.B.O.S. or Room Adaptive Bass Optimization System (love that acronym!). It comes with documentation and bass response graphs that the user fills in, along with a circular hinged clear-plastic protractor-like gizmo, called a "Width Selector" by Infinity, that allows the user to rapidly determine the Q or resonance width of the dominant peak in the system's response (see Width Selector graphic). Matching a speaker/room response peak by adjusting the parametric filter's notch depth and frequency is relatively easy; however, this is not the case with the Q adjustment. More on this subject later, in the use and listening section.



R.A.B.O.S. Sound Level Meter



Width Selector Graphic

Measurements

The Intermezzo 4.1t's frequency response was measured using two different test techniques: (1) nearfield measurements to assess the low-frequency response of the subwoofer, and (2) windowed in-room tests to measure mid-to-high-frequency response. The test microphone was aimed halfway between the midrange and tweeter at a distance of one meter with 2.83 V rms applied. One-tenth octave smoothing was used in all the following curves.

The on-axis response of the 4.1t, with grille on and off, is shown in Fig. 1, along with the response of the subwoofer. Without grille, the response of the upper frequency portion of the curve (excluding the sub) is very flat and fits a tight 3-dB window from 95 Hz to 20 kHz. The woofer exhibits a bandpass response centered on about 50 Hz and is 6 dB down at about 25 and 90 Hz. In the figure, the woofer's response has been level adjusted to roughly match the level of the upper frequency response. Averaged between 250 Hz and 4 kHz, the 4.1t's 2.83 V rms/1 m sensitivity came out to 86.2 dB, essentially equaling Infinity's 87 dB rating. The grille caused moderate response aberrations above 4 kHz, with a reduction in level between 3 and 11 kHz, a slight peak at 12.5 kHz, followed by a dip at 17 kHz. The grille can be easily removed for serious listening if required. The right and left systems were matched fairly closely, fitting a ± 1.5 dB window above 150 Hz.

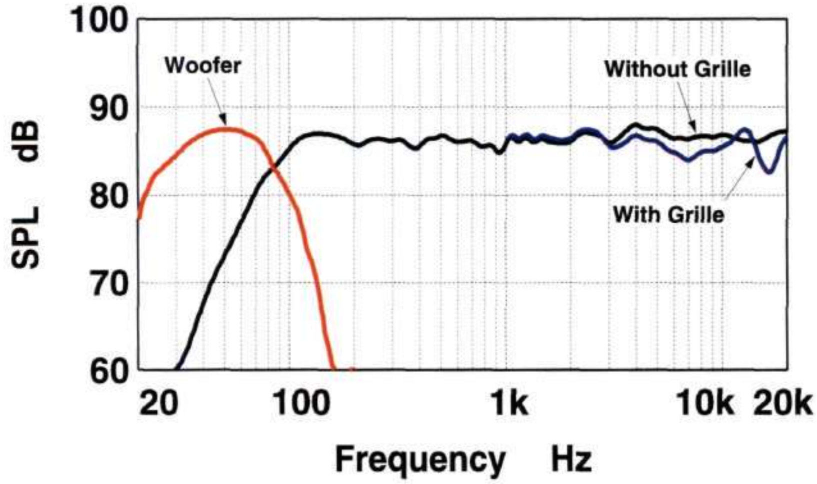


Fig. 1: One-meter, on-axis frequency response with 2.83 V rms applied.

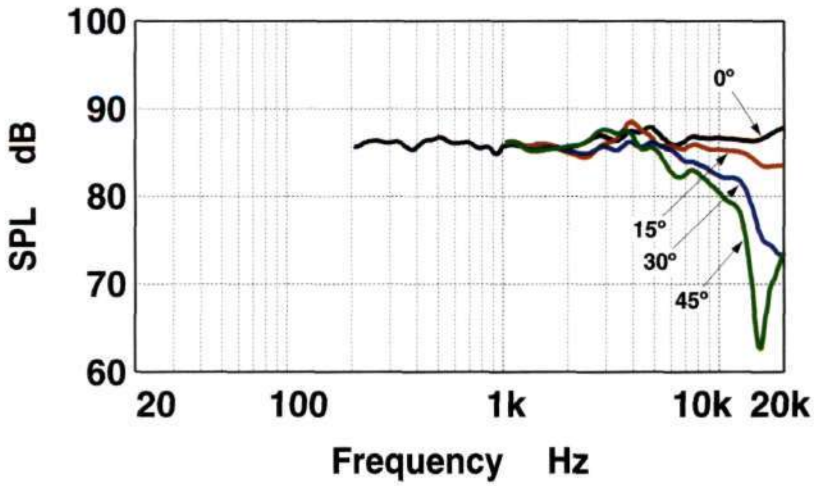


Fig. 2: Horizontal off-axis frequency responses.

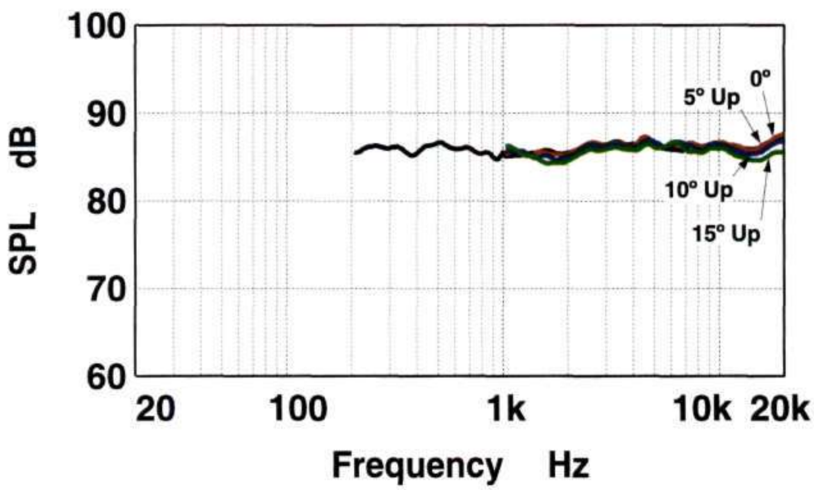


Fig. 3: Vertical off-axis frequency responses above axis.

The Intermezzo 4.1t's horizontal and vertical off-axis frequency responses are shown in Figs. 2 through 4, respectively. The horizontal off-axis curves with 15° increments in Fig. 2 are well-behaved but exhibit rolloff above 12 kHz at angles of 30° and beyond. The system's vertical off-axis curves out to ±15° in Figs. 3 (up) and 4 (down) are exceptionally well-behaved and exhibit hardly any response aberrations through the upper crossover region between 2 and 3 kHz.

Figs. 5 and 6 show the input impedance magnitude and phase of the upper frequency portion of the 4.1t (less subwoofer), with and without the system's highpass filter engaged. Fig. 5 indicates an impedance minimum of 3.2 ohms at 120 Hz with the highpass engaged, and a maximum of about 18 ohms is exhibited at 2.8 kHz with the highpass off. With the highpass filter engaged, the system's impedance rises to above 20 ohms at 20 Hz. The minimum rises to 4.4 ohms with the highpass off. The system's impedance phase in Fig. 6 appropriately follows the magnitude response as any well-behaved minimum-phase impedance should. With the highpass filter on, the low-frequency phase drops to nearly -90°, as it should for a capacitive system. The 4. 1t should be an easy load for any competent power amplifier or receiver.

The continuous sine wave total harmonic distortion (THD) of the Intermezzo 4.1t versus axial sound pressure level (SPL) in dB is shown in Fig. 7. The THD for each frequency in the range of 20 to 80 Hz at each third octave is plotted separately in the figure. The level was raised until the distortion became excessive or the system could not play louder because of the limits of its built-in amplifier. The distortion was measured in the nearfield of the woofer and then extrapolated to the levels generated at 1 m in a free space. My experiences with many subwoofers using 12" to 15" diameter drivers indicate a ratio of about 28 dB between the nearfield sound pressure and that measured in the farfield (usually 2 m ground-plane measurements, which correspond to 1 m free-field measurements); i.e., the nearfield pressure is 28 dB louder than the farfield pressure.

Fig. 7 plots the THD values computed from the amplitude of the 2nd to 5th harmonics as a function of the fundamental's SPL. The figure indicates a robust bass output rising above 110 dB at distortion levels less than 10% between 40 and 80 Hz. At lower frequencies, the distortion rises to higher levels at correspondingly lower fundamental SPL levels, although, even at 25 Hz, levels above 100 dB can be generated at distortion levels below 20%. All in all, the 4.1t's subwoofer can reach some fairly impressive levels in the bass range. Remember, however, that at low frequencies in a typical listening room, subwoofers can play significantly louder due to room gain than they can in a free-space environment without room boundaries.

Fig. 8 plots the 4.1t subwoofer's maximum peak SPL as a function of frequency for a transient short-term signal, which was a shaped 6.5-cycle tone burst. The graph represents the loudest the sub can play for short periods of time in a narrow restricted frequency band in a free-space environment. In-room levels will be significantly higher. These levels are significantly higher than the continuous sine wave levels shown previously in Fig. 7 and represent the peak levels that can be reached short term, using typical program material. These data indicate that below 40 Hz the 4.1t significantly outperformed its predecessor, the Compositions P-FR system, as I noted in the introduction. The bass output of the 4.1t places it solidly in the upper third of all the systems I have tested, including several standalone subs.

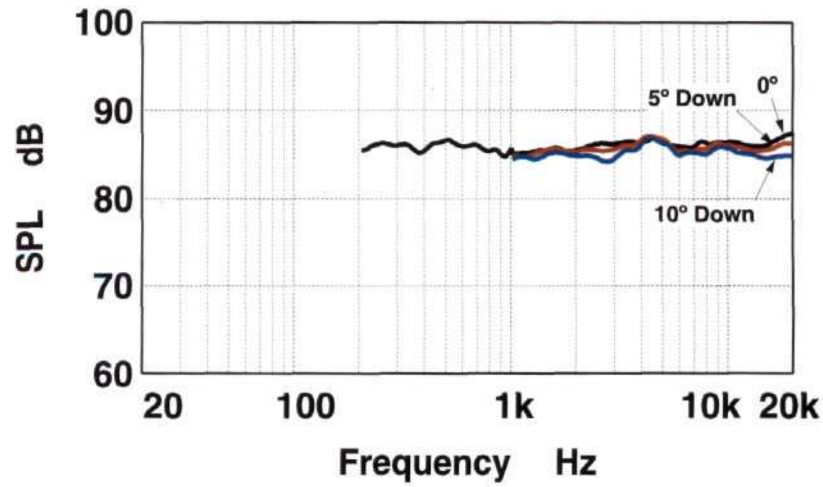


Fig. 4: Vertical off-axis frequency responses below axis.

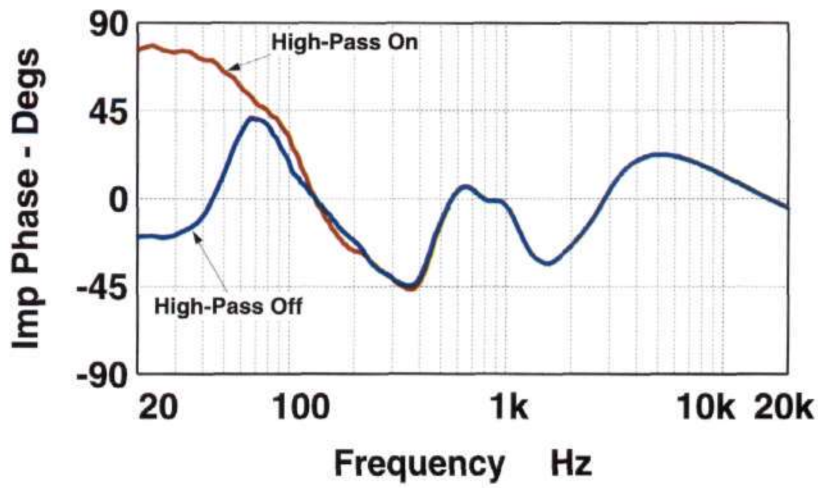


Fig. 5: Impedance magnitude.

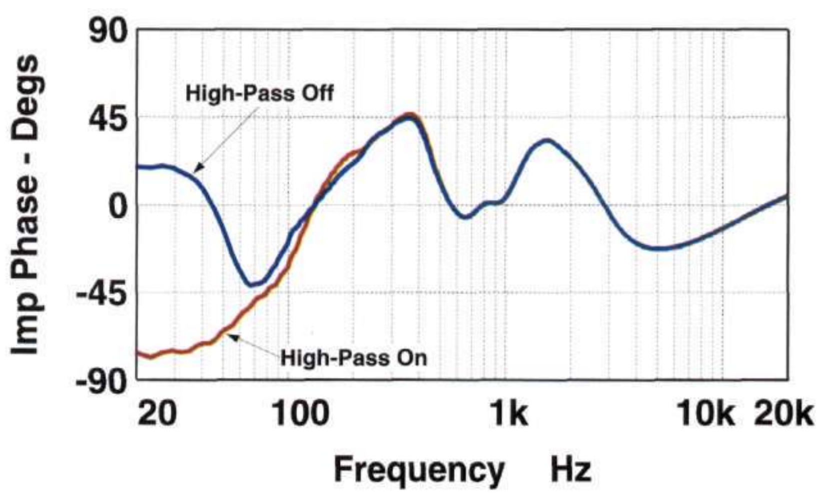


Fig. 6: Impedance phase.

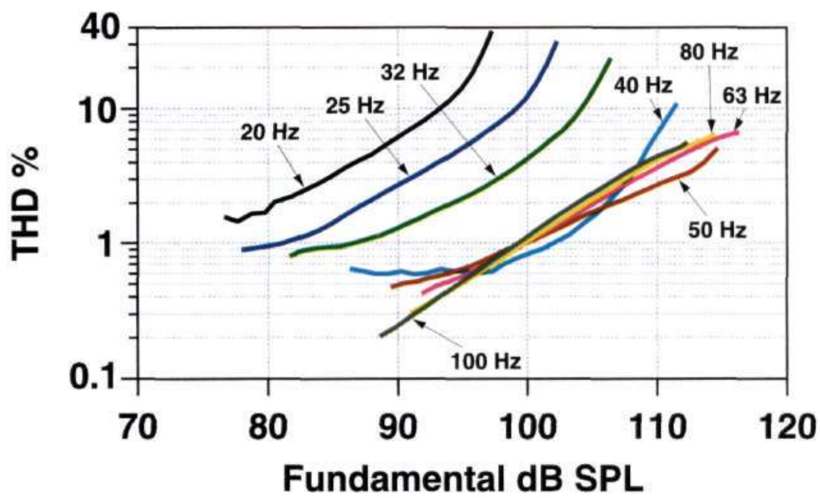


Fig. 7: Woofer harmonic distortion (THD) vs. fundamental level, 20 Hz to 80 Hz.

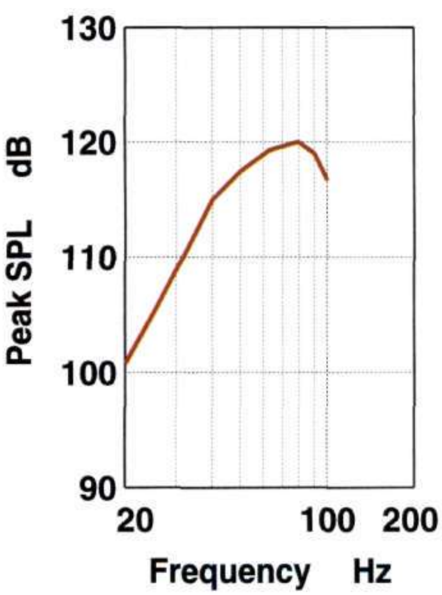


Fig. 8: Woofer maximum peak SPL vs. frequency.

Use and Listening Tests

Although each Infinity Intermezzo 4.1t is quite heavy at 93 lbs., they were relatively easy to unpack and move around. Without spikes attached, they could be walked around on my listening room's carpet without much difficulty for positioning. Once set up, the 4.1t's presented a strikingly handsome appearance with a thoroughly modern look. With their curved and sculptured metallic design and Infinity's attention to detail, they definitely did not present the usual mundane picture of wooden rectangular boxes. With grilles removed, the picture was no less likable. The side-mounted woofers had a heavy-duty, no-nonsense look that urged me to "let's turn these babies on and see what they'll do." The low end of the 4.1t's did not let me down. It was like having a pair of good subwoofers, one on both sides of my room!

I evaluated the Intermezzos as two-channel stereo speakers and not as home theater systems. Their performance was outstanding in almost every area. They would perform very well in either situation. They strongly competed with, and sometimes exceeded, the performance of my reference speakers, the B&W 801 Matrix Series Ill's. I listened to them standing by themselves as well as alongside the reference speakers in a rapid-switching A/B comparison setup. The 4.1t's did not require any line-level attenuation to match the sensitivity of the reference systems. Their volume level was essentially the same as of the B&W's when reproducing the same broadband program material.

I first went through Infinity's R.A.B.O.S. procedure of setting the bass level and equalization (EQ), using their sound level meter (SLM) and CD. My intentions were first to use their supplied SLM and CD along with their suggested procedure long enough to gain familiarity with them to report in this review, and then switch over to my one-third-octave real-time spectrum analyzer (an AudioControl Industrial SA-3050A) to finish the EQ and level-setting process.

But—I was fooled! Infinity's method worked so well I continued using it to measure the room response and set the built-in parametric equalizer. I only used the real-time analyzer to set the overall bass-to-upper-range balance. Part of the problem with using the real-time analyzer and pink noise (played off the Infinity CD or the built-in noise generator) was the variability of the band readings due to the inherent randomness of the noise. The R.A.B.O.S. system, in contrast, uses sine wave warble tones, which inherently exhibit much less level variation. The warble tones, interestingly, worked better with the real-time analyzer but of course energized only one band at a time. The warble tones sounded like something from a '50s sci-fi movie, *The War of the Worlds* or *Forbidden Planet!* The sci-fi ambience was reinforced by the SLM, which looked like a cross between a Star Trek communicator and a Flash Gordon blaster. Setting the width or Q of the parametric equalizer was made much simpler with Infinity's graphical scheme, using the adjustable plastic gizmo.

The measured bass response of the 4.1t's in my basement listening room exhibited a broad peak of about 8 dB at 26 Hz as referenced to the response between 60 and 100 Hz. When the peak was equalized with the Intermezzo's built-in parametric equalizer, the bass response was much flatter and better behaved. The equalizer's controls, which vary frequency, level, and width, are on the front of each system, accessible with a supplied screwdriver through small holes.

Now to the interesting part: how did they sound? In a word, excellent! Interestingly, their sound was extremely close to my reference system's on almost everything I listened to. I often had a hard time telling which system was playing when set up side by side. Sometimes I couldn't believe my A/B switch and had to walk up close to the systems to determine which was playing! Bass was very extended and flat; midrange was smooth and liquid; while the highs were quite neutral and very revealing of whatever I played. High-frequency response was smooth and extended, but the highs were slightly emphasized as compared to the B&W's, although they did not lend an air of brusqueness to vocal sibilance, unlike many systems. Soundstaging and imaging were excellent, with a very stable center image on mono vocal material. The systems really shined when played loud on complex orchestral material with percussion. Even so, I did notice a bit of upper-bass/lower-mid congestion when I played loud pipe organ material, as compared to the reference systems.

The one standout sonic feature of the Intermezzos was their excellent bass response. They could shake the walls and everything attached when played at high levels with material having sub-40-Hz content. Yeah...I know your are supposed to track down and eliminate all the spurious vibrations and rattles in your listening room, but I use them to check for the presence of honest-to-goodness high-level bass energy in the room. Few systems I listen to are capable of rattling the walls; the B&Ws and the Intermezzos can easily do this.

I found myself getting out all my favorite CDs with high-level low-bass content to audition over the 4.1t's. This included Telarc's Beethoven "Wellington's Victory" (Telarc CD-80079) with the digitally recorded canons, the bass drum on "Ein Straussfest" (Telarc CD-80098), the kick drum on Spies "By Way of the World" (particularly tracks 6 and 7, Telarc CD-83305), the low pedals on the organ version of the Mussorgsky "Pictures at an Exhibition" (Dorian DOR-90117), and the jet planes and miscellaneous sound effects on "The Digital Domain: A Demonstration" (Electra 9-60303-2). The excursion of the woofers of the 4.1t was truly scary, a full 1.2" peak-to-peak capability.

The system really came into its own on loud rock music with heavy kick drum and bass guitar. I promptly turned the 4.1t's front-mounted bass-level control up to maximum to provide concert-level bass on this material. The 4.1t took all I could give it while reproducing a very stimulating bass whomp that I could feel in the pit of my stomach. There's got to be something humorous about an early-sixtyish loudspeaker reviewer sitting around listening to the likes of ZZ-Top, AC-DC, and Kiss at near concert levels to evaluate speakers. It's fun though! Who said you couldn't have fun with your hi-fi?

On the pink-noise stand-up/sit-down test, the 4.1t's were nearly perfect, exhibiting hardly any midrange tonal changes when I stood up—the full equal of the B&W 801's in this regard. I did uncover a bit of a problem with the Infinity's upper bass and lower midrange when I listened to my 6.5-cycle shaped tone bursts (the same bursts I used to measure maximum peak SPL for Fig. 8) in an A/B comparison with the B&W's. At 40 Hz and below the Infinity Intermezzos were the equal of the B&W systems. Between 50 to 80 Hz, the 4.1t's could play significantly louder and cleaner than the B&W's. However, from 100 Hz to 200 Hz, the B&W's output easily bested the Infinity's because of the limitations of the rather smallish 6½" cone bass/midrange used by the 4.1t. The 4.1t's 6½" bass/midrange has generous excursion capability but with its smaller area could not keep up with the air-moving capability of the B&W's much larger 12" bass driver.

The 4.1t's did a particularly good job on well-recorded female vocals, projecting a nearly perfect, very realistic center image with no trace of harshness or irregularities. Although the systems shined on large-scale complex program material played loud, they were equally at home on intimate material such as string quartets and other classical chamber music.

'Nuff said. I was very impressed with the Infinity Intermezzo 4.1t's. They performed excellently on everything I listened to, and I was particularly impressed with their bass capability. Their imaging and soundstaging was flawless, and they could play loudly and cleanly on complex program material that profits from loud playback. I much liked their adaptability to match their listening environment, using the built-in parametric equalizer and the easy-to-use setup procedure with the supplied sound level-meter and CD. Their thoroughly modern good looks and top performance make them naturals for any home theater or stereo listening setup.

To get more detailed information on the Intermezzo 4.1t's and other Infinity systems, I suggest checking out their Web site (listed above) and also requesting copies of their quite interesting and informative white papers on their method of equalizing room effects (R.A.B.O.S.) and the story behind their ceramic metal matrix diaphragms (C.M.M.D.).

—***Don Keele***

Floor-Standing 4-Way Speaker

JBL Ti10K

JBL Consumer Products, Inc., a Harman International Company, 250 Crossways Park Drive, Woodbury, NY 11797. Voice: (516) 496-3400 or (800) 645-7292. Fax: (516) 682-3556. Web: www.jbl.com. Ti10K floor-standing 4-way loudspeaker system, $7000.00 the pair. Tested samples on loan from manufacturer.

Striking in appearance, a near miss in performance—that sums up my take on the JBL Til0K. The five forward-facing drivers and two huge bass-reflex vents are certainly impressive. The Danish design of the cabinet is certainly handsome but not very practical; all wire connections have to be made to the bottom, which is not particularly accessible; the three rather than four rubber feet make the cabinet very difficult to slide on any surface—and let's not even talk about the tweako spikes that come in the little plastic bag. Yes, when you're finished setting up the Til0K's they look really nice, but what a drag.

I played them before I measured them because I didn't want to be influenced by the measurements one way or the other. They sounded bright and punchy in my room, detailed but much too aggressive. I shudder to think what they would have sounded like in a really live room, my main listening room being fairly dead. One fairly sophisticated listener who auditioned them briefly remarked that "it's a commercial sound." There was more to it than that, however, as the measurements revealed.

The quasi-anechoic (MLS) frequency response on axis showed a 3.5 dB dip centering on 4 kHz and *rising response* above 5 kHz, peaking at 11 kHz (+2 to +3 dB, depending on the where the microphone was aimed). Moving 45° (not 30°!) off axis horizontally, the response flattens out to ±1.5 dB up to 11 kHz and is down only 5 dB at 17 kHz. Furthermore, at 30° off axis vertically, the response has a very similar profile above 6.5 kHz, although there is a huge suckout at the approximate upper-mid-to-tweeter crossover point of 3.3 kHz (which is expected). Now, what does this mean? It means that in the effort to achieve exceptionally flat power response into the room, the designers goosed the on-axis frequency response, raising it far too much above 0 dB. It would have been better to split the difference between the on-axis and off-axis response. The on-axis response is what you hear first; the off-axis response reaches you with a delay. In an exceptionally dead room—a virtual anechoic chamber—the speakers might actually sound just right, but not in the real world.

Manufacturer's Specifications

Recommended Power Amplifier Range: 10–400 watts

Impedance: 6 ohms, nominal

Sensitivity (2.83 V @ 1 m): 91 dB

Frequency Response: 30 Hz to 30 kHz

Crossover Frequencies: 250 Hz, 1 kHz, 4 kHz

High-Frequency Driver: 1" pure titanium dome

Upper Midrange Driver: 4" pure titanium inverted dome

Lower Midrange Driver: 6½" polypropylene cone on cast aluminum frame

Low-Frequency Driver: dual 8" polypropylene cones on cast aluminum frames

Dimensions: 50¾" (height) x 16⅛" (width) x 22⅞" (depth) = 129 cm x 41 cm x 58 cm

Weight: 108 lbs. (49 kg)

The vented enclosure is tuned to 31 Hz, and the summed nearfield response of woofers and vents shows a -3 dB point at 35 Hz—not especially impressive bass response for a huge speaker. The woofers appear to be crossed over lower than the manufacturer's specified frequency of 250 Hz; the other crossover points seem to be just about on spec. Perhaps to compensate for the phase reversal by the apparently second-order bass crossover, the woofers are wired out of phase with the other three drivers. The impedance magnitude from 70 Hz on up is much closer to 4Ω than the specified 6Ω, so that the specified 91 dB sensitivity is really for 2 watts input, making the true (1 watt) efficiency 88 dB. The impedance phase (again, above the wild gyrations at the box frequencies) is ±26°, making it a cinch for any amplifier to drive the Til0K.

Distortion is an issue only in the lower midrange and the bass. The nearfield spectrum of a 400 Hz tone off the lower midrange driver at a 1-meter SPL of 100 dB (unbearably loud at 400 Hz) shows a 2nd harmonic components at -46 dB (0.5%), 3rd harmonic at -55 dB (0.18%), all other harmonics at *-66* dB (0.05%) or lower. That's really low distortion. Off one of the woofers, the nearfield spectrum of a 100 Hz tone at a 1-meter SPL of 105 dB (again unbearably loud) shows 2nd and 3rd harmonics at -53 dB (0.22%) and -60 dB (0.1%), respectively; all other harmonics are negligible. Going down to 60 Hz at "only" 100 dB, 2nd harmonic is -40 dB (1%), 3rd harmonic -51 dB (0.28%), all others negligible. At the best summing junction of woofers and vents, the nearfield spectrum of a 30 Hz tone at 1-meter SPL of 88 dB (couldn't push it much higher) shows a 2nd harmonic at -23 dB (7%) and a 3rd harmonic at -30 dB (3.2%), indicating that the woofers unload in the vicinity of the tuning frequency. Higher up the bass distortion figures are very respectable.

How can I arrive at a balanced evaluation of the Ti10K? Its striking cosmetics and high-tech drivers certainly make an ambitious statement. Its midrange is flat and undistorted—and that's important. But what about its miscalculated high-frequency response and a bass that isn't even close to that of the $499 Hsu Research VTF-2 subwoofer (see above)? At $3500 per side? And inconvenient to connect and to move, on top of everything else? I can't really give a ringing endorsement to a speaker like that, regardless of its positive qualities.

—Peter Aczel

2-Way Minimonitor

Monitor Audio Gold Reference 10

Monitor Audio USA, P.O. Box 1355, Buffalo, NY 14205-1355. Voice: (905) 428-2800. Fax: (905) 428-0004. E-mail: goldinfo@monitoraudio.com. Web: www.monitoraudio.com. Gold Reference 10 2-way minimonitor, $1495.00 the pair. Gold Reference Center Channel, $995.00. Tested samples on loan from manufacturer.

Those of you who have been following my adventures in minimonitor testing will recall that the last top of the heap was the JosephAudio RM7si Signature. This superseded the Monitor Audio Studio 6 (see Issue No. 20) on my list of top dogs. Now comes the replacement for the Studio 6's at a little more than half the price (but without the fancy piano-black finish).

The Gold 10's are a complete redesign. The woofer has little dimples punched all over it—sort of an ultra-high-tech version of the RCA LC-1, designed by Harry Olson as his ultimate statement in the '40s and used by RCA well into the '70s as studio monitors. The dimples are said to reduce cone resonance, which they actually appear to do, as we'll see below. They are also great in allowing you to visualize the cone displacement of the woofer at low frequencies. The speaker also has a fixed conical metal piece affixed to the end of the pole piece. The tweeter is still a one-inch dome but of different design than in the Studio *6's.*

On the test bench the Studio 6 and the Gold 10 look rather similar. Both have a broad dip in their on-axis response between about 1.5 kHz and 5 kHz. The dip reaches a depth of 4.5 dB at 3.2 kHz in the case of the Gold 10; it is somewhat less pronounced in the response of the Studio 6. The big difference is a peak of about 2.5 dB at 5.3 kHz in the Studio 6's response, whereas the Gold 10 is peak-free. The JosephAudio RM7si Signature is far flatter on axis than either—and dramatically flatter in its vertical off-axis response as a result of the "Infinite Slope" crossover. The Gold 10 develops a significant (20 dB) dip in the 2 kHz to 3 kHz range if you measure it approximately 45° off axis vertically. The effect is quite similar to that produced by the Monitor Audio Silver 9i reviewed in Issue No. 27 but not nearly as bad as with the old ACI Sapphire II of ten years ago, which had a first-order crossover. Clearly the Gold 10's need to be well placed, so that the tweeters are approximately at ear level, to get good sound quality.

The horizontal off-axis response of the Gold 10 shows good dispersion characteristics, with the 10 kHz response almost unchanged and the 15 kHz response down 5 dB. Downstairs in the bass the response is down 3 dB at 43 Hz, but do not get too excited because the 2.25% distortion point for a 90 dB SPL at 1 meter was 80 Hz. At 70 Hz with the same SPL we were looking at over 6% distortion and very close to buzzing. These numbers indicate that the use of a subwoofer would be desirable in large rooms—and not a bad idea even in smaller rooms.

The above measurements were taken in laboratory of *The Audio*

Critic, with the MLS (quasi-anechoic) method at the higher frequencies and the nearfield method in the bass. In addition, I took some measurements with the somewhat less precise ETF software (see Issue No. 25) and my own computer. The energy time curves of the Studio 6 and the Gold 10 are also very similar, with a small amount of energy coming at the microphone (1 meter) 1 msec after the initial impulse. This energy is 20 dB down. The JosephAudio RM7si Signature, by contrast, shows some thickening of the impulse curve, but no discrete event can be observed.

Waterfall plots are more revealing. The Studio 6 has a big resonance just above 5 kHz, occurring exactly where the frequency response peak is. The Gold 10 also shows a small resonance in this frequency region but it is down about 18 dB in comparison with the Studio 6. The Infinite Slope crossover of the JosephAudio produces significantly more energy in the waterfall and cumulative spectral energy plots. A resonance at 5 kHz, which appears to be coming from the woofer, is also present. The high-order crossover of this speaker keeps the overall energy contribution of the woofer resonance to a much smaller value than is the case with the Studio 6. A new version of the RM7 (not tested yet) has a crossover which is said to reduce the energy storage at the crossover region.

So—what do they sound like? The Studio 6 and the Gold 10 sound a lot less alike than the measurements suggest. The Gold 10 appears to have a bit more tweeter level and it does benefit from a slight reduction of the treble control, at least in stereo. At first the Studio 6's sound more alive and detailed, but after extensive listening one comes to understand this is a coloration, perhaps related to the woofer resonance. The Gold 10's emerge as cleaner and much more relaxed and natural-sounding after extensive listening to both speakers side by side.

Choosing between the Gold 10 and the RM7si Signature is much harder. The JosephAudio is much easier to place and get good sound out of because of its much smoother response across vertical axis changes. This may also help in giving a flat power response into the room. On the other hand, the JosephAudio appears to have an upper midrange emphasis or coloration. Could this be the woofer resonance or the energy storage effects in the crossover? In any case, a properly placed Gold 10 with the treble control slightly reduced gave a remarkable sense of the sound of real instruments. This remained true even when things got complex, which on some other minimonitors could lead to harshness, although on the Joseph it was only a subtle sense of forwardness that could be interpreted as extra detail.

What was truly remarkable happened when I moved from the stereo configuration to the 5.1 configuration. Four Gold 10's were used with the addition of the matching Center Channel speaker. The Monitor Audio Gold Reference Center Channel is similar to the Gold 10 with the addition of another woofer, which is active only below 200 Hz. This is an attempt to prevent the interference effects between the two woofers that were discussed by Tom Nousaine in Issue No. 27. The larger cabinet causes the energy time curve of the Center Channel, as measured by ETF, to show more first echo (about 5 dB higher) than the Gold 10, even in a vertical configuration. Frequency response is very similar to the Gold 10, vertically. Horizontally the speaker also gives a similar response on center, but moving horizontally off center gives big nulls in the crossover region. These are similar to the nulls one would see in the Gold 10 moving vertically off center. So why would one deploy the speaker this way? Because it has excellent vertical response and it is very likely to be higher than your ears sitting on top of the TV. Even significantly below the tweeter axis, I got great frequency response with only a couple of dB reduction in treble energy above 7 kHz. The energy time curves start to show more early return echoes in this configuration but they are all 20 dB below the initial pulse.

In the 5.1 configuration the sonic results are amazing. I did not have access to discrete 5.1 sources so I used Dolby Pro Logic. The receiver was a true high-end piece—the Sony STR-DE675, which I picked up for $275 at a local audio store. I drove it with a cheap Pioneer CD player that had an optical output. That unit cost about $130. Cables were the best one could find at a Sears hardware store. So what happens with less than $500's worth of

Manufacturer's Specifications

6½" midrange/bass

1" gold dome tweeter

Biwiring-ready

Solid aluminum phase plug

Video shielded

Frequency Response: 40 Hz to 30 kHz, ±3 dB

Sensitivity (1 W @ 1 m): 88 dB

Nominal Impedance: 8 ohms (5 ohms minimum)

Power Handling: 100 W continuous, 300 W peak

Recommended Amplifier Power: 50–250 watts

Cabinet Alignment: 4th-order reflex

Dimensions: 14⅞" (height) x 8⅞" (width) x 11½" (depth)

Weight: 20 lbs.

Finishes: black oak, natural cherry, rose mahogany electronics and cables attached to the Monitor Audio Gold Reference speakers? Magic! The speakers disappear, leaving the instruments placed across the sound field as they are in real life. No instrumental group images more strongly than others because we have a real center, not one created in our mind. Depth across the stage is also remarkably well presented. The brass and choirs appear to be in the rear of the stage. A solo violin is clearly placed out front, and the winds are firmly in the center. With all that well-defined space the subtle tonality of each instrument becomes clearer. This especially true of the winds, which usually get lost in a mass of comb effects between left and right. Brasses have a weight that is not to be experienced in monopole two-channel. Strings are no longer scrawny and edgy. The chorus really sounds like a group of hundreds of people spread across the stage. As your Editor once put it in a different context, 5.1 on speakers this good will change your audiophile life. My whole understanding of how good reproduced music can be changed with this system. It is just that good.

In the 5-channel mode I had no need to reduce the tweeter level. The speakers appeared perfectly balanced. They reproduced dynamics with no apparent strain even in really, really big things like the Verdi Requiem. On the other hand, chamber music was presented as if the musicians were in the room. Again, totally detached from the speakers and with a sound-field size that suggested the real thing.

New models of minimonitors appear to come out each week. It is impossible to say whether the Monitor Audio Gold Reference 10's with matching center channel are the best. I can say that this speaker system is excellent and that it is unlikely that any other similarly priced speaker system would perform as well in the 5.1 mode.

—David Rich

Powered Minimonitor Speaker

NHTPro M-00

NHTPro, 527 Stone Road, Benicia, CA 94510. Voice: (707) 748-5940. Fax: (707) 748-5945. Web: www.nhtpro.com, M-00 powered minimonitor speaker, $350.00 each ($700.00 the pair). Tested samples on loan from manufacturer.

Introduction

Technology has done wonders for the home recording enthusiast. In my younger years, home recording required purchase of a good-quality two-channel reel-to-reel tape recorder, mixer, and a pair of microphones. None of this came cheap! And this didn't include means for listening to what you recorded or for any miscellaneous signal-processing gear such as equalizers, compressors, or noise gates. Nowadays, with the advent of computer-based recording systems, including sophisticated software, multichannel sound cards, and direct-to-disk recording, the amateur recordist can create a product that can keep up with the very best professionally produced recordings of the past, all without a major dollar investment.

Unfortunately, the modern-day recordist still requires means for listening to his recording, particularly when out in the field and not near any of the usual monitoring speakers available back home. Of course, you can use headphones, but they're just not like listening through a pair of decent speakers. NHTPro offers a small set of powered minimonitor speakers aimed directly at solving this home recordist's problem.

The NHTPro M-00 is a two-way closed-box system with a 4½" treated paper-cone woofer and a 1" silk-dome magnetic-fluid-cooled tweeter, powered by a built-in 75-watt amplifier. All this is mounted in a rather small 9" x 5.7" x 7.3" heavy-duty cast-aluminum zinc alloy enclosure with heat sink fins, controls, and connectors located on the rear. The enclosures are fully magnetic-shielded, which makes them ideal for high-quality PC monitoring when set up along side a workstation and not being used in the field. The system is supplied only in basic black, with a round nonremovable grille covering the woofer and with the tweeter exposed. When I first picked up one of the M-00's and noted how relatively heavy it was, and then glanced at the rear panel with its heat fins, my first thought was how did they get all of that stuff in there! NHTPro also offers a small powered subwoofer called the S-00, using an eight-inch driver, which is intended to operate with the M-00.

A 75-watt continuous-rated amplifier with a fully discrete output stage powers the woofer and tweeter (both proprietary and designed in-house) through a passive 2.2 kHz crossover. NHTPro rates the system at covering 93 Hz to 20 kHz, ±2 dB, with a maximum peak SPL capability of a loud (for its size) 111 dB. The amplifier includes an 80-Hz fourth-order highpass filter that protects the woofer from being overdriven at low frequencies.

The inputs on the rear panel are quite versatile and include a pair of balanced XLR and ¼" TRS phone

Manufacturer's Specifications

Type: 2-way powered minimonitor closed-box system with magnetic shielding

Drivers: One 4½" treated paper-cone woofer, one 1" soft-dome tweeter

Crossover Frequency: 2.2 kHz

Rated Frequency Response: 93 Hz to 20 kHz, ±2 dB

Peak Acoustic Output: 111 dB SPL @ 1 m (100 ms pink noise burst).

Amplifier Power: 75 W continuous, 150 W peak (for 100 ms).

Dimensions: 9" (height) x 5.7" (width) x 7.3" (depth) = 22.9 cm x 14.5 cm x 18.5 cm

Weight: 14 lbs. (6.36 kg) each

Input Impedance: 10 kΩ unbalanced, 32 kΩ balanced.

Controls

- Input Sensitivity: –10 dB, +4 dB
- Position: NF (nearfield), MF (midfield).
- Auto Power: On, Off
- Master Power: On, Off

Input Connectors: Balanced XLR, balanced TRS phone, unbalanced phono

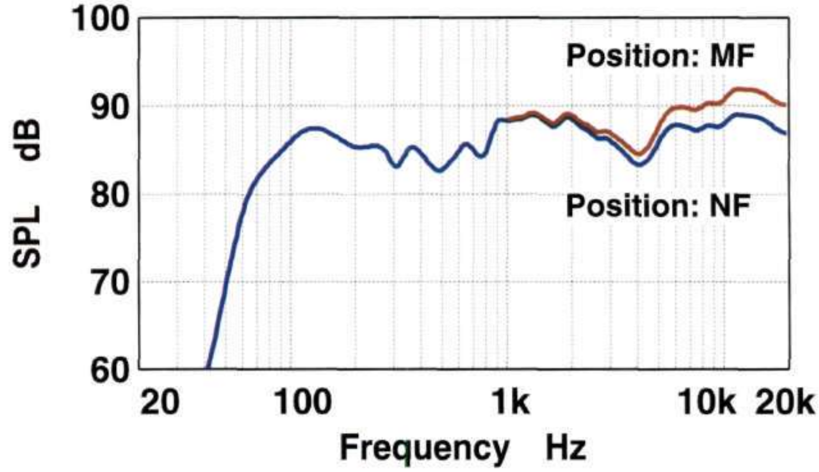


Fig. 1: One-meter, on-axis frequency response.

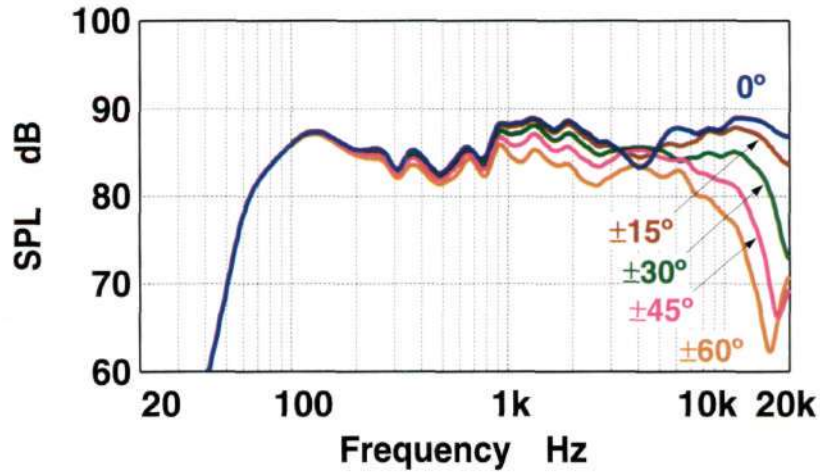


Fig. 2: Horizontal off-axis frequency responses.

jacks and an unbalanced RCA input jack. The XLR and phone inputs are paralleled, which allows several M-00's to be daisy-chained easily for application in commercial setups. The system's controls are minimal. They include three mini toggle switches that control, respectively, (1) input sensitivity, either -10 dB or +4 dB, where +4 dB is a higher-level lower-gain position compatible with pro gear and -10 dB is a high-gain position matching consumer products, (2) listening position, MF or NF, selecting two high-frequency levels, a lower level for nearfield close-in listening and a higher level for midfield listening at farther listening positions, and (3) auto power, either auto or on, which controls whether the system automatically turns on or off in the presence of a signal. A front-mounted red/green LED shows the status of the system's power. A fourth, much larger switch controls power to the unit. The unit is supplied with a standard removable power cord.

Measurements

I put the NHTPro M-00's through a series of tests, which included on- and off-axis frequency responses, harmonic distortion, and peak acoustic output. I did not separately measure the internal amplifier.

Fig. 1 shows the 1-meter on-axis response taken at a point midway between the woofer and tweeter. A signal of 100 mV was applied to the balanced input, with the sensitivity switch in the -10 dB position. The graph shows the responses with the listening-position switch in both the MF and NF positions. The MF position provides a high-frequency boost that commences at 2 kHz and rises to about 3 dB between 10 and 20 kHz. The curve exhibits a slight depression between 200 Hz and 800 Hz with a dip just above crossover at 4 kHz, and the overall NF curve fits a moderate 6 dB window between 75 Hz and 20 kHz. Stated another way, this is ±3 dB referenced to 800 Hz, somewhat outside NHTPro's stated ±2 dB response limits. The frequency response of the two systems was quite close being within ±1 dB of each other.

Fig. 2 and Fig. 3 show the M-00's off-axis horizontal and vertical responses. The horizontal responses shown in Fig. 2 exhibit rolloff above 10 kHz for angles beyond 30°. Some narrowing of response is also evident between 1 and 4 kHz, presumably due to enclosure diffraction. The vertical up responses shown in Fig. 3a are fairly well-behaved for angles up to about 30° above axis, particularly through the crossover region. At higher angles, a dip develops in the 2 to 3 kHz range, coupled with greater high-frequency rolloff. The below-axis responses in Fig. 3b, however, exhibit severe response anomalies in the crossover region. Clearly the M-00 was optimized for listening on and above its axis, rather than below.

I measured the M-00's 80 Hz harmonic distortion as a function of input level (graph not shown). I applied an 80 Hz sine wave signal to the system (with its sensitivity set to +4 dB) and raised the level from -30 dBV (31.6 mV rms) to 0 dBV (1 V rms) in two-dB steps. At each input step, I measured the level of each harmonic from the 2nd to the 6th. The predominant distortion at each step consisted primarily of third, which rose to a significant 22% at the highest input level. Third-harmonic distortion results from symmetrical flattening of the system's output waveform, due to running out of excursion capability equally in both directions. Although NHTPro rates the M-00's low-frequency response only down to 95 Hz, its 80 Hz output was quite usable.

The M-00's maximum peak acoustic output is shown in Fig. 4. This graph shows how loud the M-00

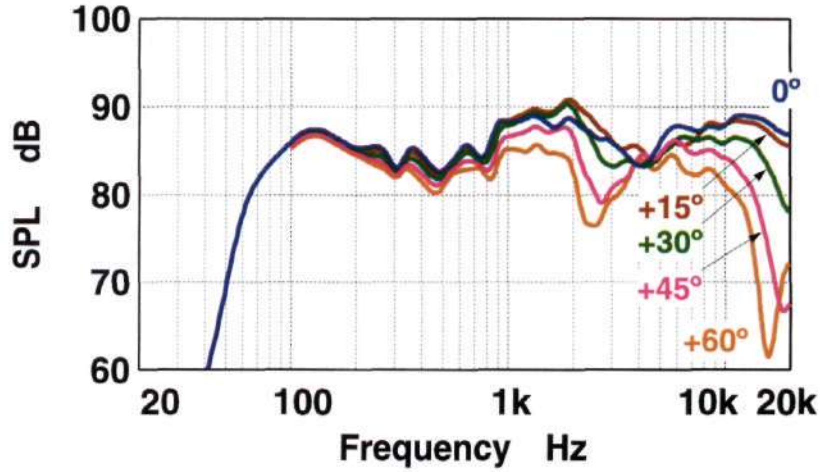
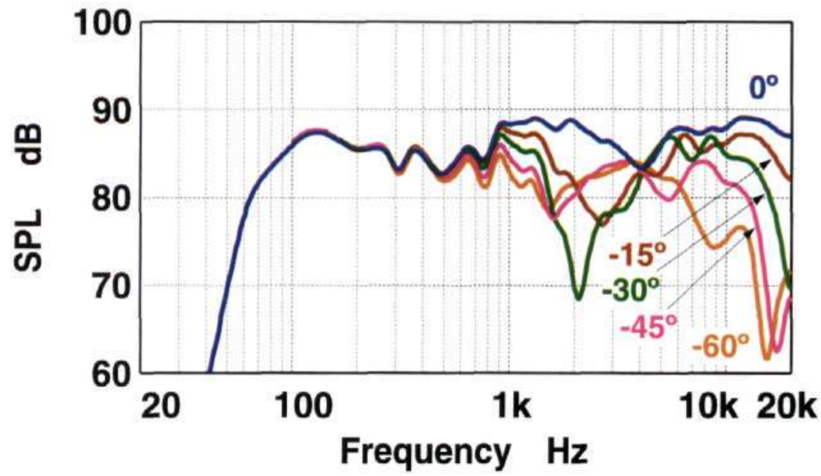


Fig. 3a: Vertical off-axis frequency responses above axis.



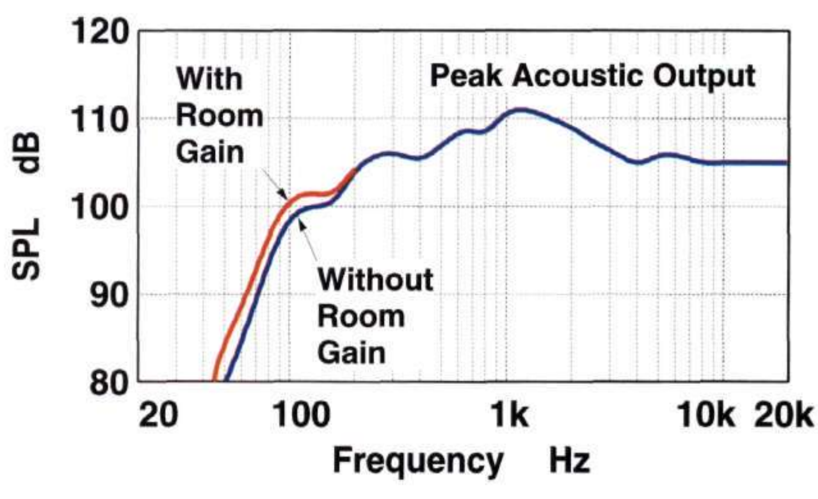


Fig. 4: Maximum peak sound output.

can play in narrow frequency bands for low-duty-cycle signals such as music. It was measured by energizing the system with shaped 6.5-cycle tone bursts at each third-octave center frequency and then raising the input level to the point at which the system's output became subjectively bad-sounding. At each frequency, the peak SPL was noted and then plotted on the graph. On the graph I have plotted the effect of room gain, which essentially shows the possible additional output due to the room's boundaries at low frequencies. Over most of its operating range the speaker can generate fairly loud levels in excess of 105 dB SPL. It is only below 200 Hz where its output starts to fall, with a much faster rolloff below 100 Hz. Amplifier clipping limited the system's output above 400 Hz. Between 600 Hz and 2 kHz, the maximum SPL rose near and slightly above 110 dB. NHTPro's claim of 111 dB was only met in a fairly narrow range near 1 kHz.

Use and Listening Tests

Most of the my listening to the NHTPro M-00's was done with them set up normally in my listening room, spaced at about 7 feet apart and listened to from about 8 feet away. I placed them on tall stands, which raised their tweeters to ear height, and positioned them significant distances from side and rear walls. With the speakers specifically designed for close-in listening, why listen to them this far away? I thought that if they performed favorably at this farther distance, they would certainly perform equally well or better at closer distances. I did do some listening to them placed on either side of my 19" computer monitor, with me sitting about 18" away, and they clearly outperformed any computer speaker I have used. Some listening was done with an added subwoofer filling in the bass below 90 Hz.

Can a very small pair of two-way systems with 4½" woofers and built-in 75-watt amplifiers keep up with a pair of very much larger high-end systems powered by a 700-watt-per-channel amplifier? In a word, yes. I was quite surprised at how well they came off in the comparison with my B&W 801 Series III reference systems, driven by the Crown Macro Reference power amplifier. They were able to play loud enough to elicit "turn that thing down" comments from my spouse, all with a fairly well-balanced sound, with an extended and smooth high end, and with sufficient upper bass not to sound bass-shy on material with minimal mid- and lower-bass content.

Most listening was done with the rear-panel listening-position switch in the Nearfield (NF) position. The Midfield (MF) position proved to be to bright, particularly when compared to the B&W systems. First listening was done with some well-recorded Latin music from Cuba, with lots of percussion, horns, and a high dynamic content. Here the M-00's came off quite well, with the capability of being played quite loud and cleanly, and with an overall balance that compared well to the B&W systems. They handily passed the "stand-up-and-face-the-rear-and-switch-between-the-systems" test. For a system to pass this test, its off-axis and reverberant-field power frequency response must be quite smooth and well-behaved. Reproduction of the Latin wood block percussion was extremely realistic, with a sharp, clear, and clean sound.

Female vocals were rendered well, with no harshness, although some high-frequency emphasis or sibilance was noticed. Other warts included a bit of a one-note-bass characteristic in the upper range of acoustic bass and a smoothness that was clearly not the equal of the reference systems. Although the M-00's could be played quite loud, when forced to higher levels on complex wideband material they sounded congested. On well-recorded rock-drum rim shots—such as track 5 on "The Sheffield Track Record/The Sheffield Drum Record" CD (CD-14/20)—the M-00's could play quite loud but were no match for the B&W's, with the much higher peak power of the Crown amplifier. However, although the amps in the M-00's were clipping on this very high crest-factor material, the resultant sound was not objectionable; the speakers simply would not play any louder when turned up higher. Note that when the M-00's are listened to at close-in distances of less than two feet, they definitely can play much louder than the B&W's listened to at eight feet. In this situation, the direct sound is higher by about 12 dB, simply because the listener is two feet from the speaker rather than eight feet.

The M-00's clearly exhibited a tonal quality on pink noise, rather than the smooth featureless quality of the sound of the B&W's. On the stand-up-sit-down test, some tonal changes were evident, but this was quite acceptable. On this test, the B&W's sound hardly changes when listened to standing up versus sitting down.

On a broad range of other material, including country, classical, rock, and jazz, the NHTPro M-00's performed very respectably. I don't have any reservations about recommending them for any application where very small size and self-powered high-performance sound are a requirement. This includes use in remote recording applications, as computer monitors, in dorm-room systems, etc. With a decent subwoofer, such as NHTPro's S-00 or a larger sub, the M-00's can keep up with much larger systems and, furthermore, can be listened to up close or at the more usual distances with very good results.

—Don Keele

Electronics

REVIEWS OF AUDIO ELECTRONICS

By Peter Aczel, Editor
By Ivan Berger, Contributing Editor
Richard T. Modafferi, Technical Consultant
David A. Rich, Ph.D., Technical Editor

Seven Totally Unrelated Pieces of Electronic Gear

Phono Preamp with A/D Converter

B & K Phono 10D

B & K Components, Ltd., 2100 Old Union Road, Buffalo, NY 14227. Voice: (716) 656-0026 or (800) 543-5252. Fax: (716) 656-1291. E-mail: info@bkcomp.com. Web: www.bkcomp.com. Model 10D phono preamplifier with A/D converter, $698.00. Model 10 (preamp only), $498.00. Tested sample on loan from manufacturer.

To many, a standalone phono preamp might seem a link to the past. But by adding a built-in A/D converter to its Model 10 phono preamp, B&K has made it a link to the future. That converter promises an easy, high-end way to digitize the music in your favorite LPs' grooves, ready to record on CD via standalone recorders or your PC. If nothing else, that's a convenience; even collectors who have a turntable or two up and running are likely to have several CD players in their homes, offices, and cars.

The analog inputs on computer phono cards and home CD recorders lack the extra gain stages and RIAA equalization needed to accept signals from most turntables. The A/D converters behind those inputs are not always of the highest quality, and even finding out these products' A/D specs can be a battle (I've been trying for years to get my sound card's A/D specs). The Phono 10 includes the circuitry needed for use with moving-magnet or moving-coil cartridges and offers at least two simple specs (24-bit encoding, 95 dB SNR) for its digital section.

The front panel is bare except for an on/off button and pilot light. The rear panel's audio facilities comprise two RIAA phono input jacks (with a binding post for a ground lead), analog line output jacks, a 10 dB attenuator switch, and a coaxial digital output jack. (Oddly, there's no way to tell the analog-only and analog/digital models apart; both have digital output jacks and both are labeled "Phono 10.") Also on the panel are an input for turn-on signals (5 to 24 V dc) and a control jack that delivers a 12 V dc signal to switch other components. The two-prong line cord is detachable.

The gain switch on the rear panel is for matching the phono system's level to other components in your system; another switch, inside the preamp, sets the input for moving-magnet or moving-coil operation. Normal input loading is 50kΩ for MM, 133Ω for MC, but you can tweak those values by changing the input resistors and adding input capacitors, following detailed instructions in the manual. The A/D converter module plugs into the main circuit board and is available as an upgrade for Phono 10's originally sold without it.

There are good reasons why the Phono 10D has a 24-bit A/D even though it will be mainly used to make 16-bit CDs. For one, says mastering engineer Bob Katz, of Digital Domain, no A/D actually delivers all the bits it's rated for: "A really good 24-bit A/D, the kind that sells for $6000 to $8000, actually squeaks out about 20-bit performance," and B&K's specs (digital SNR of 95 dB, A-weighted) suggest that it delivers at best 18-bit performance if properly dithered. Even so, a converter like the B&K's will have greater linearity than a 16-bit A/D because its internal computations have 24-bit precision. One result will be that signals below the noise floor (which actually are audible) will have greater resolution.

Theoretically, feeding a signal with even two excess bits into the 16-bit inputs of home CD recorders and most home-computer sound cards would cause a slight degradation of performance, because those bits would be truncated instead of rounded off through dithering. But in practice, noise in signals from even a clean, brand-new LP probably dithers the signal adequately.

In *The Audio Critics* lab tests, the Phono l0D's performance was mainly good but not exemplary. Frequency response (i.e., RIAA equalization error) was good but not great, meeting B&K's specified +0.2 dB over most of the frequency range, with output lowest at about 200 Hz and with output a hair above spec in the low bass and above 4 kHz. The treble rise, which reached 0.4 dB at 20 kHz for the analog outputs, was even more negligible for the digital output, where it was rolled off by the filtering inherent in 44.1 kHz sampling. Our response curves were somewhat saddle-shaped, with a broad but very shallow dip centered at 200 Hz; even knowing it was there, I didn't notice it in my listening tests.

Crosstalk was essentially inaudible. Save for a few peaks at the hum frequencies, none exceeding -60 dB, it measured -68 dB or better at the analog outputs and about -84 dB at the digital output.

Measured at the analog outputs, distortion was completely noise-dominated and bottomed out with 1 kHz input at -79 dB (0.011%) and 4.3 V output, with 20 Hz at -71.5 dB (0.027%) and 2 V, with 20 kHz at -69 dB (0.036%) and only 1.1 V. At the digital output, distortion was quite high for signal levels of 0 dBFS but was moderate to low for signals a few dB lower. (Having to reduce signal levels by 3 to 6 dB to avoid distortion effectively throws away one bit of converter resolution, all the more reason to be thankful for a converter with more than 16 bits.) With input levels reduced to keep output at -3 dBFS, distortion at was barely above the -100 dB (0.001%) level at 1 kHz and 10 kHz, though with 20 Hz input signals the 3rd harmonic (60 Hz) was at -58 dB (0.126%) and the 9th harmonic (180 Hz) at -77 dB (0.014%), but of course those are hum frequencies.

With the Shure VI5V cartridge I used, distortion was no problem, even at the higher gain setting. I did most of my tests with Chesky's "The Reiner Sound" (RCl1), chosen because it was carefully produced and because it was one of my newest, hence least played, LPs. At no time did my recording from this disc exceed -6 dBFS on the digital side, which is reasonably high (considering the high noise floor of phono reproduction) but not high enough to push the Phono 10D into audible distortion. Levels on other discs might well be higher, of course, as might levels from some phono cartridges, so users should use their digital recorders to check levels on the loudest section of each LP they record (just look for the roughest groove areas) before deciding whether to set the Phono l0D's gain switch at the normal or the -10 dB position. You can never exactly optimize the Phono l0D's gain, as you could if it had a variable level control, but such a control (unless it was a very good one) might add noise, especially after a few years of use. And there probably are cartridges for which the available gain will always be too low. These are not problems for the analog listener, but for the fussy digital recordist it would be nice to have a multiposition gain switch, perhaps with settings of +6 to -12 dB.

Overall, the Phono 10D does a creditable but not stellar job. Its A/D converter is good enough for me to wish the unit had a line input that could be used for dubbing nonphono sources; that would greatly increase its versatility and value.

—Ivan Berger

Headphone Amplifier & Signal Processor

HeadRoom Total AirHead

HeadRoom Corporation, 521 East Peach Street, Bozeman, MT 59715. Voice: (800) 828-8184. Fax: (406) 587-9484. E-mail: roz@headphone.com. Web: www.headphone.com. Total AirHead headphone amplifier, $159.00. Tested sample on loan from manufacturer.

The bad news about listening to headphones is that you are leashed in by the cord attached to your big high-end system. The good news is that a portable CD player, even the $50 variety, delivers the same sound quality as your big rig, so you are now free to move around. The bad news is that the little portable does not have enough voltage drive to get a high-end headphone, like the Sennheiser HD 600, up to a satisfying volume level. Additional bad news is that headphone listening can often create an in-the-head soundstage that is also dry and overbright. The good news is that you can overcome the level problem and the headphone imaging problem with this little cigarette-box-shaped amplifier, which has the name of Total AirHead.

The HeadRoom Total AirHead

The unit runs on two AA 1.5 V batteries, but a dc-to-dc conversion switching power supply brings that up to 10 V, which is enough voltage swing to get SPLs that would make OSHA unhappy out of even low-sensitivity headphones like the HD 600. The Total AirHead also has a processor mode which is designed to reduce the unnatural soundstage that occurs with headphone listening.

The internal construction of the Total AirHead can also be viewed on the company's Web site. They give a great view of the front and back of the PC board. Except for the big electrolytics, it is almost all surface-mount. The PC board is two-sided, with four low-dropout series regulators driving the two quad op-amps that are in the signal path. Given the low production quantities (1000s, not 100,000s), it hard to understand how the unit is priced at $159. Direct sales through a Web site no doubt have a lot to do with this.

The HeadRoom Web site goes into great detail about the processor circuit in a section called "Fixing the Blobs in Your Head." The Web site goes into far greater detail than what your Editor will allow here, so I encourage you to read the original, not this Reader's Digest version, if you want to know how it really works. The basic problem with headphones is that what comes out of the left channel goes only into your left ear. Contrast that with when you listen in open space—both ears hear all signals, even if they are from the left or right channel only. The signals are time-delayed at one ear relative to the other, and the frequency response is obviously different. The HeadRoom processor uses an active filter circuit to mimic the delay and filter profile that occur naturally between the ears. This active circuit then drives the right ear with the processed left-channel signal (another processor circuit does the same with the right-channel signal at the left ear). HeadRoom is candid in stating that this processor circuit is an approximation to solving the problem and they go on to explain how a DSP-based system would work even better.

In my subjective tests the HeadRoom Total AirHead did what it is advertised to do—more SPLs than I could get out of the portable player itself and improved soundstage with the processor engaged. The effect of the processor is subtle but it is a clear improvement. The sound becomes less bright and edgy. The soundstage appears more spread out and diffuse. It is not like listening live, or even to 5.1 reproduction, but it is a significant improvement over an unprocessed signal. Certainly it is a $159 improvement. If you add up the cost of a very flat and very clean headphone like the Sennheiser HD 600 ($450), plus the Total AirHead ($159), plus a portable CD player (I used a Panasonic SL-SX271C that I got for less than $50), you have for less than $700 a system whose sound would be surpassed only by a high-end 5.1 system for $5000 or more,

HeadRoom has a number of other headphone amplifiers. These run on balanced ± 15 V power supplies for even more SPL. They also come in bigger metal boxes instead of the plastic box of the Total AirHead. The bigger box of course provides more room for the power-supply components. Some HeadRoom units such as the "Little" ($259.00) are wall-powered only. The $449.00 "Supreme" uses four D-size cells to drive a dc-to-dc converter that outputs +15 V. I guess one could call this a sort of portable. Prices at HeadRoom run up to $3333.00 for something they call the "BlockHead," which is the company's ultimate statement. The thing is dual mono back to the transformers, has a fully balanced signal path (which requires the headphones be rewired, since they all have a common return path as supplied with a three-terminal phone plug), and uses Burr-Brown 627 op-amps among lots of other top-of-the line parts. I found the Total AirHead, at more than an order of magnitude less in price, just fine for my purposes, using a portable CD player. This little headphone amplifier comes with my highest recommendation.

—***David Rich***

2-Channel Power Amplifier

QSC Audio DCA 1222

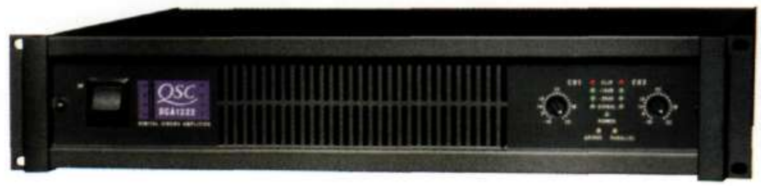
QSC Audio Products, Inc., 1675 MacArthur Boulevard, Costa Mesa, CA 92626. Voice: (714) 754-6175 or (800) 854-4079. Fax: (714) 754-6174. E-mail: info@qscaudio.com. Web: www.qsc-audio.com. DCA 1222 Digital Cinema Amplifier, $948.00. Tested sample on loan from manufacturer.

There is a whole world of audio out there unfamiliar to, and probably unsuspected by, the typical audiophile. QSC Audio is the largest manufacturer of professional amplifiers; their equipment is in over 80% of all cinemas and touring with many of the most famous bands; yet the 'philes are more aware of tiny companies like Boulder than they are of QSC. Too bad because QSC makes good switching power-supply amplifiers at a reasonable price, at least as exemplified by the DCA 1222. This is a 200/200-watt stereo power amplifier weighing only 21 pounds, made primarily for cinema applications with some unconventional input and output connectors. I managed to test the amplifier using the 3-pin XLR jacks for the input and the barrier-strip screw connectors for the output, which for me were the only possibilities among the available options. RCA jacks for single-ended input and output connectors that accept banana plugs? There aren't any. The cinema world is different.

The amplifier has separate front-panel gain controls for each channel, and I found that a 20 x (26 dB) gain setting resulted in the lowest distortion. With that setting, into an 8Ω load, the purely noise-dominated THD + N curves bottomed out at -98 dB, -93 dB, and -77 dB with inputs of 20 Hz, 1 kHz, and 20 kHz, respectively, just before the clipping point of 200 watts. Into 4Ω, clipping occurred at 370 watts, and the minima at same frequencies were -91 dB, -87 dB, and

-75 dB. That's a truly excellent result, except at 20 kHz, where some not very important dynamic distortion is apparent. Frequency response at 1 watt into 8Ω measured -0.34 dB at 10 Hz and 20 kHz; the -1 dB point was 37 kHz. Channel separation at 1 watt into 8Ω ranged from 61 dB at 20 kHz in the less good channel to 95 dB at 350 Hz in the better channel, with 77 dB or better at all frequencies below 3 kHz in either channel. Good enough.

The PowerCube test, exclusive to ***The Audio Critic*** in the U.S.A., feeds short (20 ms) tone bursts of 1 kHz through the amplifier into 20 different resistive and reactive loads to determine maximum dynamic power at 1% distortion. Dynamic power is nearly always greater than continuous power. The DCA 1222 showed excellent behavior with 8Ω/4Ω/2Ω loads at -60°/-30°/0°/+30°/+60° and sharply declining but still decent output into 1Ω loads at the same phase angles. Into 8Ω/0° dynamic power was 252 watts. I haven't seen a better PowerCube at this price and then some.



Regular readers of ***The Audio Critic*** know that we don't go into specifics about the sound of a well-designed amplifier, since it is the same as that of any other well-designed amplifier, but in the case of the DCA 1222 it should be mentioned that the sound of the cooling fan is occasionally audible in a quiet room. David Rich (see the sidebar) is unenthusiastic about the use of this amplifier for consumer applications but he forgets that very few, if any, home hi-fi amplifiers give you so much clean power for only a little over a dollar a watt (when you count both channels into 4Ω).

—Peter Aczel

Circuitry of the QCS Audio DCA 1222

The neat (and not cheap) trick here is the use of a high-frequency switching power supply. Instead of a giant transformer that can efficiently transfer energy at 60 Hz, we have a small transformer that is fed by 230 kHz. That high-frequency signal is ereated by full-wave rectifying the ac line directly and then switching that dc signal back and forth with big power FETs. The result is lots of supply current without a lot of iron. This is by no means a cheap solution. First we add in the whole 230 kHz switcher and then we throw in a transformer that works well at 230 kHz . This appears to be a solution for the professional sound reinforcement market, where weight and size count for a lot.

The amplifier itself is an old topology (think BGW of the '70s) with an NE5532 operating as the differential amp. A discrete, symmetrical common-emitter amplifier with bipolar cascode devices re-references the signal to the supply rails. Local feedback from the speaker terminal comes back through the emitters of this stage. The re-referenced signals then drive another common-emitter stage, which in turn drives the four output devices, which are also in the common-emitter (not the common-collector) configcation. We have in the past addressed the issue of common-emitter and common-collector stages, and I still think common-collector stages are more stable. I also think it is better to use a simple wideband discrete differential pair that can live on the output supply rail and skip the voltage re-reference stage and the need for extra feedback loops to keep the whole thing stable. The dynamic distortion in this unit is a result of this old and slow topology.

IV current limiting is the foldback variety. The PowerCube looks OK because the foldback circuit is rather complex, but one is again left to wonder why not use modern IC chips for the IV protection that do an even better job. The unit has an input filter, gain adjust, and clipping limiter circuits that appear to be oriented toward professional applications. One would like to bypass these, but this is not an option. Inputs are balanced only, with the first IC going balanced to single-ended. The rest of the signal path is single-ended. Additional circuitry to limit inrush current and output over current conditions again speak to the needs of professional applications.

In summary, it is light, swings lots of current, cannot blow up, and has some dynamic distortion. Good for sound reinforcement applications, but ultimately other choices are better for consumer applications.

-David Rich

1-Bit Amplifier & SACD Player

Sharp SM-SX1 & DX-SX1

Sharp Electronics Corporation, Sharp Plaza, Mahwah, NJ 07430. Voice: (201) 529-8200 or (877) 388-SHARP. Fax: (201) 529-8819. Web: www.sharp-usa.com. SM-SX1 1-Bit Digital Amplifier, $4499.95. DX-SX1 Super Audio CD Player, $2999.95. Tested samples on loan from manufacturer.

The Sharp SM-SX1

I developed an instant love-hate relationship toward this pair of compact, gleaming boxes. I love them—well, at least appreciate them—because they do something that no other digital equipment does, namely keep the bitstream from a Super Audio CD in digital form until the very end, right up to the power amplifier output, the obviously right way to handle the signal. I hate them because of certain dumb-ass high-end marketing features, not the least of which is the ridiculously inflated price, and the most irritating of which is the spiked feet on each chassis, a totally absurd idea. (Needless to say, I did not remove the protective plastic sleeves from the spikes when I placed the equipment on my shelf.)

Let me elaborate. The so-called Direct Bitstream Coupling applies to SACD reproduction only. Regular CDs are reproduced conventionally. The 1-bit straight-through SACD coupling takes place via a proprietary 11-pin cable, not usable with any other equipment. That's why it is permissible at all; normal digital outputs from SACD players, whether coaxial or optical, are politically incorrect, i.e., subject to the digital copying prohibition/taboo/hysteria. (I still don't see why very, very high-quality copies through the analog outputs are OK, but perfect copies through the digital outputs are a no-no. Get real, record companies.) Of course, if it weren't for this feature, the units would not be sold as a matched pair and would undoubtedly cost less. Now, as for the spiked feet, they most probably have to do with some kind of shock-proofing or vibration-isolation mythology—God only knows. I don't even countenance the damn things on floor-standing speakers (where they make some minimal sense on thick carpeting), let alone on lightweight electronic components. I am willing to bet that a marketing man thunk those up, not an engineer.

The more interesting of the two units is of course the SM-SX1, which is in effect an integrated 50/50-watt stereo amplifier with volume control and inputs for analog and digital program sources. I say "of course" because it is completely unconventional in design. It has no analog amplification elements and obtains speaker driving power by means of a high-speed switching power supply controlled by 1-bit signals. A 7th-order delta-sigma modulator outputs the 1-bit control signals. (There was no schematic available, and therefore we cannot offer you a circuit analysis by David Rich.) The amplifier is about one third the size of an equivalent conventional amplifier and weighs only 15 pounds. Cosmetically it is most attractive, sporting a flat "pancake" chassis and gleaming chrome trim.

My measurements of the amplifier were a bit confusing—or shall I say unusual? The out-of-band noise that is the concomitant of the delta-sigma circuitry seems to spill down into the fringes of the audio band, resulting in relatively high THD + N figures at rising audio frequencies. Analog input through the amplifier with an 8Ω load resulted in distortion readings all over the place, ranging from as low as -80 dB (0.01%) at 28 watts out with a 1 kHz signal to as high as -32 dB (2.5%) at the rated 50-watt output with a 20 kHz signal, with all conceivable values at various frequencies and outputs in between. (The measurement filter bandwidth had to be adjusted along a sliding scale to obtain these values.) With a 4Ω load the measurements got worse, the absolute minimum being -72 dB (0.03%) at 34 watts out with 20 Hz and 1 kHz signals, and the maximum with 20 kHz—don't ask.

Of course, one could argue that the typical use of the amplifier is not with analog input signals. All right, since the 1-bit digital input is via the exclusive 11-pin cable only, I tried one of the regular (multibit) digital inputs. I ran a 0 dB full-scale signal (48 kHz, 24 bits) from 20 Hz to 20 kHz into an 8Ω load at 28 watts, the amplifier's minimum 1 kHz distortion point in the analog test. I got a reading of no less than —80 dB and no more than -70 dB at all frequencies across the spectrum. Not bad but far from brilliant. All in all, the amplifier is definitely not a distortion champion even at its relatively wimpy outputs. The official specification is 0.05% (-66 dB) at 1 kHz with 1 watt output. That jibes with my analog tests into 8Ω, but you can see how unrevealing such a limited spec can be. (Not that it's so great even at face value.) The PowerCube test (short-burst power at 1 kHz into 20 different resistive and reactive loads) showed nearly perfect behavior with 8Ω and

4Ω loads, sharply declining output into 2Ω but still correct response with reactive loads, and marginal but still usable response into 1Ω loads. On the whole, better than I expected on the basis of my distortion tests.

The SM-SX1 also displayed a frequency-response peculiarity (analog input, 1 watt output into 8Ω). If we accept ±0.1 dB as normal, the response above 8 kHz is abnormal, gradually rising from that point to a peak of 0.75 dB at 27 kHz. This is something I have never seen before. To my ears the rising response was inaudible, but still...

With all the little glitches (a few of them not even so little) and the limited output capability, the $4.5K price of the Sharp SM-SX1 appears to be an absurdity, Direct Bitstream Coupling notwithstanding. I can't really endorse this amplifier, even though the concept appeals to me.

The SACD player part of the pair, the DX-SX1, is another story. It is a highly competent machine—but, again, way overpriced at $3K. It can't play multichannel SACDs. I must admit it is very handsome, matching the SM-SX1 in size and cosmetics. To test its SACD performance, I used the Sony Test Signal Disc for Super Audio CD, which is labeled "Tentative." Interestingly enough, THD + N at the analog outputs appeared to be pretty much the same as I measured some time ago on Sony's $5000 flagship, the SCD-1 (see Issue No. 26). That raises the suspicion that the limitation is in the test disc and/or the measurement procedure, not the players. The distortion, with a measurement filter bandwidth of 22 kHz, was between approximately -86 dB and -80 dB across the audio spectrum at the 0 dB level. Theoretically it should have been lower, but then again the FFT spectrum of a 1 kHz tone at -60 dB was clean as a whistle all the way up to 20 kHz, with not even a tiny blip protruding from the bin-by-bin noise floor of -135 dB. Frequency response was -0.15 dB at 10 Hz and 24 kHz; at 50 kHz it measured -2 dB. Nothing wrong with that. Gain linearity was virtually perfect (as can be expected of a 1-bit conversion system) with +0.14 dB error at the -100 dB level.

In the regular CD mode the measurements through the analog outputs were quite good. Full-scale THD + N averaged -94.5 dB all the way up to 3.5 kHz; the maximum was —87 dB at 8 kHz. Dynamic range measured 97 dB. Frequency response was -0.13 dB at 10 Hz, -0.32 dB at 10 kHz, and -1.2 dB at 20 kHz—a little too rolled off. Gain linearity was absolutely perfect down to -90 dB and off by +0.35 dB at -100 dB in just one channel. The noise spectrum on a digital zero track was interesting: -125 dB to -109 dB within the audio band but shooting up to —90 dB to -80 dB in the 40 kHz to 200 kHz band—typical noise-shaped behavior. Monotonicity was satisfactory, the 0 to 10 LSB steps being reasonably distinct. Error correction on the CD-Check test disc by Digital Recordings was not the best: very slight clicking on Track 3, intense clicking on Track 4, stopped playback on Track 5. (Many other CD players can play Track 3 without clicking and Track 5 with intense clicking. Of course, clean playback of Tracks 1 and 2 is what really matters.)

As for Direct Bitstream Coupling, I could not measure the DX-SX1 in that mode because the proprietary 11-pin cable does not interface with any of my instruments. Obviously, the two gleaming Sharp units are designed to impress the adventurous high-end consumer, not the curmudgeonly lab-bench geek (that's me). Even as a wide-eyed and well-heeled novice audiophile, however, I would hesitate to spend $7500 for the pair. The very least I would expect for that kind of money is the ability to play the new multichannel SACDs. The Sharp equipment is strictly stereo.

—Peter Aczel

The Sharp DX-SX1

5-Disc SACD Player

Sony SCD-C555ES

Sony Electronics, Inc., 1 Sony Drive, Park Ridge, NJ 07656. Voice: (201) 930-1000. Fax: (201)358-4060. Web: www.sony.com. SCD-C555ES five-disc Super Audio CD player, $1700.00. Tested sample on loan from manufacturer.

There are two main uses for a carousel-type CD changer. One is background music—you start the player, maybe activate the random order (shuffle play) mode, and forget about it for hours and hours. The other is playing multidisc sets, like operas. I seldom have background music on when I am doing something else, and I get out of my chair between acts of an opera anyway because I can't sit still too long, so I am definitely not a prime candidate for a carousel. That doesn't mean, however, that I can't appreciate a fine machine like the Sony SCD-C555ES. Its five-disc tray is simply a small bonus feature for me.

The Sony SCD-C555ES

All types of SACDs, including multichannel, are compatible with this player, as well as regular CDs. The only 5-inch optical discs it does not play are CD-ROMs, DVDs, and DVD-Audios. A special feature is the ability to display in the front-panel window the disc name, artist name, and current track title. CDs can be played through the analog outputs or the coaxial/optical digital outputs; SACDs only through the analog outputs. Separate 2-channel and 5.1-channel analog outputs are provided. Adjustments can be made for large or small center and surround speakers, but not with the flexibility offered by the best multichannel processors and receivers.

I tested the SACD performance of the C555ES with the Sony Test Signal Disc for Super Audio CD, which is labeled "Tentative." Once again, the SACD distortion at full scale was higher than it is supposed to be (theoretically, as well as per the specifications), for possible reasons I've already speculated about in the Sharp review above. Not that the distortion was bad—between -86 and -84 dB across the audio spectrum, with a measurement filter bandwidth of 22 kHz. That's 0.005% or thereabouts, which may appear low enough—but in the CD mode (see below), through the same analog outputs, the distortion was 10 dB lower. I pass. On the other hand, the FFT spectrum of a 1 kHz tone at —60 dB was absolutely clean all the way up to 20 kHz, with nary a blip protruding from the bin-by-bin noise floor of -139 dB. The SACD frequency response rose to a 0.3 dB peak at 30 kHz; otherwise it was dead flat. Gain linearity was superb, with +0.1 dB error in one channel and +0.24 dB in the other at —110 dB. (Such perfection is of course automatic with 1-bit quantization.) Most interesting was the difference between digital mute and analog mute with the wideband noise spectrum measurement. Up to 5 kHz the two measurements were identical, rising from about -130 dB at the lowest frequencies to -120 dB at 5 kHz. From there on up, the analog mute curve rose much more rapidly, peaking at the -59 dB to -53 dB level at about 57 kHz. The digital mute curve peaked at a much lower —107 dB level a little earlier, at 48 kHz. The noise-shaping characteristics of the DSD system are clearly in evidence.

In the CD mode my measurements indicated near perfection. Full-scale distortion was in the -97 dB to -95 dB range up to 2.5 kHz and between -95 dB and -92.3 dB the rest of the way up to 18 kHz. There are very few CD players that can equal or surpass that spec. Dynamic range and quantization noise were both 97.5 dB. Gain linearity error was under +0.1 dB at the -90 dB level. The monotonicity waveform display showed basically good stepwise increments. The only slight weakness was in error correction when tracking the higher levels of the "CD-Check" test disc of Digital Recordings. Tracks 1, 2, and 3 were clean; track 4 produced lots of clicking; track 5 was unplayable. (Not that any other CD player in my experience is much better on this test.)

In actual use, the performance of the Sony SCD-C555ES was limited only by the program material and certainly not the electronics. Not all multichannel SACDs are of the same quality; the very best (e.g., the Berlioz *Symphonie fantastique* on Telarc) sounded absolutely wonderful. I can recommend this player without reservations. It's a bit pricey, but you get what you pay for.

—Peter Aczel

AM/FM/DAB Tuner

TAG McLaren Audio T32R

TAG McLaren Audio, Inc., 1506 Providence Highway, Unit 25, Norwood, MA 02062. Voice: (781) 769-6611 or (888) 293-9929. Fax: (781) 769-6615. E-mail: usa@tagmclaren.com. Web: www.tagmclarenaudio.com. Tuner Avant-Garde T32R si, $2500.00 (without DAB). Tested sample on loan from manufacturer.

This tuner has two AM bands: long wave (144 kHz to 288 kHz) and medium wave (530 kHz to 1710 kHz). The long-wave (LW) band is used in Europe along with the medium-wave (MW); only the medium-wave band is used in the USA. The FM band is the usual 88.1 MHz to 107.9 MHz. The DAB section tunes two bands: L band (1.452 GHz to 1.492 GHz) and band III (174 MHz to 240 MHz). The DAB module was not installed in the tuner tested. DAB broadcasting has not yet begun in the USA, and it could not operate in band III in any event, as this is used for VHF television here. When and if digital broadcasting becomes available in this country, it would be in the L band, using a microwave dish antenna for reception.

Features

- DAB (Europe and UK only)
- Timer
- 99 presets
- Multilayer PCB
- Remote control
- Straight-line technology
- Microcontroller
- Twin FM antenna sockets
- Software upgrade capable
- Shielded toroidal transformer
- TAGtronic comminucation bus
- Premium-grade audio components
- RDS, including radiotext and EON
- Clear display with smooth-scrolling text

The AM and FM tuners are straightforward designs using standard IC chipsets. Performance is good but ordinary. A better Japanese tuner from Technics, Sony, etc., would be equal in performance to the TAG McLaren but not up to the latter's build quality, which is excellent, as the T32R uses computer-grade PC boards and high-quality discrete components.

The AM medium-wave tuner is a simple design that uses only two RF tuned circuits (mixer and oscillator), the same topology used in most 5-tube AM radios of the 1950s. Performance is adequate for local AM reception. Wide and narrow IF selectivity modes are available. A loop antenna for LW/MW was not provided; I faked a working loop antenna by trial and error.

The FM tuner performance of the T32R is roughly equal to that of a typical good-quality Japanese FM tuner but not up to that of a "supertuner," such as the Onkyo T-9090II, Accuphase T-109, or the no longer produced Mcintosh MR-78. The latter three are the only tuners known to me that are capable of receiving signals under difficult adjacent-channel conditions and are also able to reject spurious responses in areas crowded with many strong signals. *[Should I add that the Onkyo, and even used and refurbished MR-78's, cost a lot less than the T32R? Not to mention the ridiculously cheap Blaupunkt car radio, which was reviewed by Richard Modafferi in Issue No. 27—did you forget, Rich?—and found to be almost as good as the MR-78?—Ed.]* For example, my own MR-78 can tune the adjacent channel, 92.3 MHz, to the station on 92.1 MHz, which is located only 138 feet away in my backyard and is received with a signal level of about 1 V! Reception of 92.3 MHz is admittedly terrible, but the signal is *there.* Clean stereo reception of 91.3 MHz, 75 miles away, adjacent to the local signal from 91.5 MHz, 6 miles away, is possible with the MR-78. Slightly poorer reception of 91.3 MHz, with some crosstalk due to insufficient selectivity, is possible with the Onkyo and Accuphase. No other tuner than the aforementioned three can receive 91.3 MHz. *[Again, Rich, you forget the Blaupunkt—-just because it's a car radio?—which could also receive 91.3 MHz according to your review in the last issue.—Ed.]*

In fairness to the TAG McLaren, very few people demand the communications-receiver level of RF performance, such as provided by the MR-78. The RF performance of the T32R is good enough to satisfy almost anyone, and anywhere DAB becomes available no one will miss less-than-the-best analog FM broadcast reception.

The measurements shown in Table 1 are slightly worse than the specifications. If the service manual had been available, a touchup alignment of the detector and stereo decoder circuits would have improved the measurements; the tuner should easily make specs. The stereo separation curves, in both IF-wide and IF-narrow modes, showed relatively little fluctuation across the audio band. Frequency response was dead flat up to 15 kHz.

RF spurious response rejection was good. There were few spurious responses caused by the two strongest signals at my location, 92.1 MHz and 105.7 MHz, and none interfered with the reception of desired stations. Selectivity was sufficient to allow reception of 91.3 MHz (see above) if the tuner was detuned to 91.225 or 91.250. This works because there is no strong signal on the other side, at 91.1 MHz.

AGC and spurious response rejection on AM were OK, despite the simple circuit topology. There is a 5-

The TAG McLaren Audio T32R

		IF wide	IF narrow
1 kHz stereo separation, 95% modulation		47 dB	34 dB
1 kHz harmonic distortion, 95% modulation	2nd	-56 dB	-41 dB
(taken with PAR wave analyzer)	3rd	-75 dB	-57 dB
	4th		-64 dB
	5th		
Total harmonic distortion		0.16%	0.9%
Stereo IM distortion, 1 kHz/10 kHz		0.02%	0.16%

Table 1: Measurements of the TAG McLaren FM tuner-frequency 91.1 MHz, input 25,000 µV, stereo

kilowatt AM station on 1430 kHz, only 600 feet away from my location; the T32R did not overload, and reception of weak signals on 1330 kHz and 1360 kHz was possible without interference from 1430 kHz. The "image" response from 1430 kHz could be tuned at the low-frequency end of the MW band. Also, 1430 kHz was received as a spurious signal when the T32R was operated in the LW band.

There is no audio level control on the TAG McLaren. *[It requires some kind of front-end control unit with a volume control to be fed into an audio system.—Ed.]* The output level is 1.3 V rms. I thought the tuner had an internal clock, similar to that used in computers, but the time/date settings are lost when the unit is left plugged in but powered off. The manual states that time and date are reset if the tuner is tuned to FM stations having time/date data transmissions in RDS mode. I tested this and it works. Tuned to the only station I could find with RDS, time/date was reset.

To sum up: Build quality is excellent. Although the performance of the traditional AM and FM tuner circuits is on about the same level as that of a good Japanese tuner, the electrical component quality is superior. This tuner is built to last a lifetime or more. Since its functions are controlled by upgradable internal software, and since the plug-in digital section is upgradable, the TAG McLaren is unlikely to become obsolete.

The instruction manual is printed in a small booklet format that fits into a CD jewel box. Very well-written, it explains the complex technical functions of this tuner in clear English. The manual clearly explains the need for proper antennas for LW, AM, FM, and DAB modes, and how to obtain and install them for best performance. (A special microwave dish antenna is needed for L-band DAB reception, which would be similar to those currently used for satellite radio/TV.) Also, the custom-designed packing of the unit is very professional and well thought-out. It even comes with a lapel pin packed in the box with the tuner!

In conclusion, this is a well thought-out and properly conceived product. It does what I tested it for well, without fault. I regret not having been able to enjoy the DAB functions it could provide, as this would be the T32R's best reason for existence. *[David Rich was less impressed when he briefly looked "under the hood" but he did not directly contradict Richard Modajferi's conclusions.—Ed.]* I laughed when I discovered its "snooze" and "clock" functions—if nothing else, the TAG McLaren T32R is the world's *best* clock radio!

—Richard Modajferi

BOX 978

(continued from page 4)

As an example of a disruptive technology in the audio field, one product comes immediately to mind: single-ended vacuum-tube power amplifiers.

David J. Meraner
Scotia, NY

Disruptive, absolutely (not to mention idiotic).

—Ed.

The Audio Critic:

I'm not renewing. It's been a long, frustrating ride, wondering if the next issue is ever going to show up. The worst thing about the magazine is the ever more negative tone it developed over the years, putting others down. All that wasted space devoted to condescension could've been used for reviews.

Wayne J. Mastel
Lincoln, ND

What you say about our publishing schedule is unfortunately true. What you say about our "negative tone" is a total misperception, probably based on the characteristic middle-American preference for blandness. Competent reviewing involves factual criticism, which means that some things will be praised and others put down. In either case, proof is required, which we scrupulously provide. What I fail to understand about your remarks is that you want reviews instead, *when all the "condescension" is in the reviews!*

—Ed.

Peter and Tom Aczel

By Tom Nousaine

Urban Audio Legends

Some of the most ridiculous notions get popularized both on the street and in the press. You know what I mean: coffee should always be made from cold water, cold water boils faster than warm, hot water freezes more quickly, etc. Their staying power is nothing short of amazing. When it comes to audio, Urban Legends are bountiful. You know: green rings painted on the edge of your CD improve the sound, etc. I believe there are some specific mechanisms that help launch Urban Audio Legends and give them remarkable longevity.

Anyone who has ever heard a phantom image, sound coming from a location where no sound is being made, knows that audio reproduction is magic. Like the first trick at a magic show, the mere demonstration of stereophony, in and of itself, helps establish a willingness to suspend disbelief. Unfortunately, with audio the audience is encouraged to remain in suspension following the show. I think we are maximally susceptible to suggestion because we already know audio is magic when we start.

People are also quite prone to "overdetect" (thanks to Jim Johnston of AT&T Labs for the term) differences in sound. My own work shows that people will routinely describe differences in sound quality, often in great detail, when given two identical sound excerpts. They also confuse small differences in loudness with quality changes. In my experiment, subject preferences were strongly influenced by inserting a 1-dB loudness difference. But—no subject ever mentioned level change as a differentiating factor in either written or oral comments. Not surprisingly, the strength of the loudness effect was roughly doubled when the louder of two alternatives was given last.

This may explain the typical hi-fi demo sequence. The host, be it your best friend showing off his new amplifier or electronic show-booth attendant or salesman at your local high-end salon, always demonstrates the more desirable (to him) product last and he always turns the volume control all the way down between switches, maintaining control of subtle loudness differences that play to his advantage. The process is particularly useful if the salesman doesn't consciously possess knowledge of what's happening. The technique just sells product and doesn't require examination of conscience.

Human decision-making style also promotes Urban Legend making. We are strongly disposed to choose, and we tend to make quick decisions, with perhaps only 5 to 10% of data available. When in our evolution we were still knuckle draggers, running now and finding out it was a real tiger later was a very good strategy. Because of the huge number of evaluative decisions required in modern life, this habit certainly makes life more manageable, especially if the decision has a low cost. You can't go very far wrong choosing laundry detergent that way.

However, research shows that people tend to make purchases of big-ticket items, such as cars, houses and wives, in a like manner and that we are often incredibly decision-retentive. Having made a decision, we will sometimes reject even overwhelming contrary evidence. Once you convince someone he really "heard" that cable—and that isn't hard to do—it may be difficult for anyone to change his mind later.

A good example of this is the wishful-thinking data analysis of a certain capacitor experiment published in a British hi-fi magazine about 15 years ago. In a recent Usenet post the experimenter said, "In case Mr. McC. hasn't performed any blind tests, in the January 1986 issue of Hi-Fi News I reported the results of blind listening tests that showed *identification by ear* of the difference between an electrolytic capacitor used as a series highpass filter and a same-measured-value cap with a polypropylene dielectric." (Emphasis mine.)

With a little digging, I came up with a copy of that report and found the results showed that, in a single blind test, listeners were able to correctly identify a 2.2 (μF electrolytic or film capacitor against a straight-wire bypass just a shade under half the time. That's right, between 49 and 50% correct responses. The test results were clearly null.

This was a large experiment with over 300 subjects and more than 2000 trials, so there was a lot of data to dredge. The claimant felt that there was evidence that "slight" identification could be seen when the experiment was analyzed according to music program, and in his opinion the electrolytic capacitor had a subtle but definite effect. While it was true that three music selections did appear to have statistically significant results when analyzed by themselves, deeper investigation revealed the one particular piece, said by the experimenter to have an abundance of low-frequency information and therefore more resolving power, had apparently significant results for *both* the film and electrolytic capacitors.

However, for the electrolytic the results were significant in reverse. That is, the subjects incorrectly identified the capacitor as a piece of straight wire over 70% of the time. This was the most strongly significant result and a clear indication that some kind of procedural bias was present during the experiment, not evidence that people could hear capacitors. Even if one were to accept that these results have meaning, they are contrary to those claimed; the positive results for the film capacitor should have been thought to demonstrate it was more audible.

Of course, on the whole, the data strongly suggested that neither capacitor could be distinguished from a wire bypass. Even the 1986 report called for additional listening tests. Yet 15 years later the experimenter, without qualifying his comments and apparently not having conducted follow-up listening tests, was willing to unambiguously state that the report showed "identification" by ear.

Remembered results often grow in importance over time when one needs "a reason to believe." (Rod Stewart singing in the background.) This case clearly shows the human tendency to reject negative evidence once a decision has been made, which, in this case, seems to have occurred before the experiment was conducted.

Of course, a scientific experiment should establish a falsifiable hypothesis—capacitor dielectric has a sound quality quotient—and then design an experiment to show that this is true, or not. In this case the hypothesis was not confirmed by the experiment, and the experimenter just dredged the data to find and select bits that seemed to "confirm" the hypothesis, while ignoring the rest of the evidence.

Let's also discuss a powerful marketing procedure that enhances sales and plays to Urban Legends. A number of years ago I was required by my employer to visit 25 shareowners every year, in addition to my regular duties. Armed with a list of shareowner telephone numbers, my initial success rate with actually arranging an appointment was less than 10%. People just weren't inclined to agree to do this.

Changing the telephone technique from "Will you meet with me?" to "I have 11:30 next Tuesday and 8:45 Thursday available for our visit—which works better for you?" improved my success rate to around 70%. People were perfectly willing to choose between alternatives, even when they hadn't already said "yes" to the original question. This technique works on the assumption that you have already agreed to the lower-level question.

That's why salesmen never ask, "Do these sound different?" They always ask, "Which one sounds best?" A simple technique which carries an assumption that you have already agreed they *are* different. Have you ever been to an audio demonstration where spoken comments were "they sound the same to me"? Think about it.

On the other hand, sometimes an Urban Legend hangs on because it just seems logical on its face. You've heard the old saw "You can't get low bass in a small room." This one seems logical at first glance. That's partially because most people have only heard what they consider to be low bass in a large place (organ in a cathedral) or outside (at the airport). But they don't stop to consider that you can still hear recorded bass with headphones or in a car. (The "fast bass" legend is probably another of the apparently logical types.)

So we have two classes of Urban Audio Legends. Type 1 is a function of normal human behavior, often supplemented with good merchandising technique. The other simply comes from a simple mistake of reason. I bet many are a combination. Which of these Urban Legends began as a Type 1 or Type 2 Urban Legend error?

Urban Legend:

1. Fancy parts improve sound (capacitor dielectric, DACs, etc.).
2. Fast bass (small woofers are more linear than big ones).
3. Rhythm and pace (a playback component can change tempo).
4. Low bass is impossible in a small room.
5. Fancy cables improve sound quality.
6. Non-audio tweaks improve sound (change placed on the speaker, tiptoes, green ink, at al.).
7. DVD players sound inferior to CD players.
8. LP sounds better than CD.
9. Data reduction always lowers sound quality.
10. Small amplifiers burn out tweeters.
11. Equalization is bad.
12. Negative feedback is bad.
13. Short signal paths are good.
14. Multichannel is a step backward.
15. Auto sound is bad.
16. Film sound is bad.

• • •

As an addendum, let's discuss the semiannual Recommended Components List of a certain prominent audio publication. You may recall that the letters section of that magazine claimed, and the general consensus was, that Julian Hirsch of the now defunct *Stereo Review* "never met a component that he didn't like." Of course, this was partially a product of *Stereo Review's* policy, at that time, not to publish negative reviews. In that framework the policy was to avoid wasting copy on turkey products. Pretty reasonable, in my opinion.

So let's examine the Recommended Components List of that other still thriving audio publication. The cover boasts the list contains 700 products. Earlier issues say the magazine reviews roughly 150 products per year. The Annual Index for 2001 contains approximately 160. The preamble to the list says that a product gets removed from the list if no one on the staff had listened to it in three years, or if the product is discontinued.

Let's dredge some data. Seven hundred components at 150 per year means that either the list contains a lot of very old components or . . . they seldom meet a product they don't like. Finer investigation shows that all 18 of the power amplifiers reviewed in 2001 appear on the RCL published in 2002. While all of them may be quite useful devices, it seems that this magazine had never met a power amplifier they didn't like. Let's further examine the statistics: the magazine reviews 150 products a year; the RCL contains 700 products; and things that haven't been listened to in three years, or have been discontinued, are dropped. So we arrive at a list of 700 products, which was culled of 100 for the latest RCL, which then has to contain roughly every product reviewed in the past four to five years. This seems to imply that this publication has seldom met a product it didn't like or wouldn't recommend. Sounds a lot like the old *Stereo Review,* doesn't it? TAC

By Peter Aczel, Editor
David A. Rich, Ph.D., Technical Editor
Glenn 0. Strauss, Contributing Editor

A Big TV, a Bigger TV, and Other Such

Bias Lighting for TV

Ideal-Lume

CinemaQuest, Inc., 3551 South Monaco Parkway, #301, Denver, CO 80237. Voice: (303) 740-7278. Fax: (425) 920-4585. E-mail: cinemaquest@viawest.net. Web: www.cinemaquestinc.com. Ideal-Lume fluorescent fixture, $54.95. Tested sample on loan from manufacturer.

My mom did not attend medical school. She did not study physiology. She is not an eye doctor. Yet, like most moms, she seemed to possess an uncanny innate knowledge of all the things that were *good* for her kids, and perhaps an even more encyclopedic grasp of what was *bad* for us. So when my brothers and I were assembled around the TV in a completely dark room, she would quietly enter, switch on a lamp, and say, "What are you trying to do—ruin your eyes?"

What does this have to do with the price of stem cells? Simply that Mom was right! Research done by the Society of Motion Picture and Television Engineers (SMPTE) in the 1980s identified several human factors relating to eye comfort and the best rendition of color in the theater or the home. Watching television or viewing a movie in a pitch-black room can lead to eyestrain. The cause is rapid and frequent opening and closing of the iris in response to dramatic light contrasts in the picture. This can be offset by a "bias light"—a small amount of light behind the screen or CRT biases the iris just enough to offset eyestrain. And if the color temperature of the bulb is near 6500° Kelvin, reproduction of colors is particularly vivid and natural.

Why not simply have a light on in the room? Well, reflections on the glass CRT reduce the quality of the picture, and too much will overwhelm a properly tweaked TV in terms of brightness, contrast, and color temperature. Plus, the light will not be distributed uniformly and is likely to be too warm for best color rendition. For several years I used an infant night-light, powered out of a switched outlet, but always thought this was a kludge at best.

So I was delighted when I stumbled upon the Ideal-Lume, a luminary designed specifically for the bias light problem. It is inexpensive, does just what it claims, and works flawlessly. It is a fluorescent fixture (22" long x 3¼" wide x 2/4" high) with a very quiet, fast-acting electronic ballast to trigger the bulb. The bulb is a long-life, 6500° color temperature, 15-watt T8 fluorescent. An acrylic safety lens protects the bulb. An accessory kit ($12.95) supplies a clear tube, which fits over the

bulb, as well as several sheets of neutral gray filter media, providing one, two, or three f-stops of light reduction. This allows tuning to your room and video setup. I recommend the kit as a necessity.

The fixture comes with mounting screws and full instructions. I mounted the Ideal-Lime to the back of my TV stand, about three feet above the ground; I sourced power from a switched outlet so the light comes on when my system is powered up. Joe Kane's "Video Essentials" DVD has a still-frame reference pattern (Title 15, Chapter 10) that will allow optimal setting of the f-stops, but I found that I had gotten it right simply by eyeballing and switching the filter films until things seemed balanced. Then I put on a video with rich colors and watched.

I was very impressed with the results obtained by the Ideal-Lume. The uniformity of bias light was far better than my old night-light, and the color temperature was much less warm. Eye fatigue was no longer an issue, and yet the room was not so dark as to disallow safe movement to fetch popcorn or answer a call of nature. Colors did appear to be a bit richer, but not dramatically so, and I sensed some improvements in hue and shading. The unit was absolutely silent in operation, never flickered, and always powered up quickly. I adjusted the input voltage to it with a Variac, and its peformance did not materially vary over the normal range of residential voltages (110—130 V ac).

Well conceived, nicely executed, and reasonably priced. Around here we call that Value, and so the Ideal-Lume is recommended without reservation if you have need for such a product in your audio/video system. In my view, it is a Must Have.

—***Glenn Strauss***

55" Rear-Projection TV

Mitsubishi WS-55907

Mitsubishi Digital Electronics America, Inc., 9351 Jeronimo Road, Irvine, CA 92618-1904. Voice: (800) 332-2119. E-mail: MDEAservice@bigscreen.mea.com. Web: www.mitsubishi-tv.com. Model WS-55907 rear-projection television, $5699.00. Tested sample on loan from manufacturer.

A disclaimer is necessary every time we review a piece of video equipment. This is not a video magazine. Our interest in video stems from our interest in audio, specifically surround-sound systems, which are almost inevitably linked to a TV screen. We want to advise our audiophile readers regarding their choice of TV equipment without getting involved in advanced video technology. That may change at a future date; we may even become *The Audio/Video Critic*—but not yet. So we restrict ourselves to the most important technical fundamentals.

The WS-55907 is not the very latest 55" model in Mitsubishi's "Diamond Series" (top-of-the-line) rear-projection TVs; it has been replaced by the WS-55908, which appears to be quite similar if not identical. Mitsubishi produces over 1000 projection TVs in a single day, so there are frequent model-number changes without necessarily involving design changes. The unit is HD-upgradeable (with a DTV receiver, which I did not have) and is formatted as a wide-screen (16:9) TV. The remote control offers five different display formats, four of them wide-screen and one narrow for the older 4:3 aspect ratio, with gray bars on each side to fill the screen. A particularly sophisticated touch is that every time the set is newly turned on, the gray bars are shifted laterally from their previous position, so that the possibility of their leaving permanent ghost images is minimized. In general, I found the function controlling display format simpler and easier to use in comparison with other wide-screen TVs in my experience. It still requires a little practice, however, to select in each case the format with no stretching distortion and/or no cropping of the image.

The huge screen, 55 inches on the diagonal, is of course the main feature of the set, yielding an almost cinematic experience when viewing sports or films. The screen is large enough for comfortably accommodating the picture-in-picture (PIP) and picture-outside-picture (POP) functions; you can actually get nine small POPs next to the main picture with one particular setting. What's more, that big picture is luminous enough, even with the theoretically correct contrast/brightness/color settings, to be enjoyable in a normally lit room, but you will still get the best picture with the lights off. My old 40" direct-view set is much more forgiving in that respect, with the lights on or off.

The WS-55907 has inputs for component video, S-video, and composite video, so that all possible signal sources can be accommodated. The component inputs (there are two) are compatible with standard 480i as well as progressive 480p video signals. The DTV input (not tested) is compatible with 480i, 480p, and HDTV 1080i

video signals. (DTV 720p signals need to be converted by the DTV receiver.) Subjectively, I found the resolution of the set to be excellent, especially with 480p signals from one of the newer DVD players. Mitsubishi claims that its Diamond Vision System uses special CRTs for optimum focus and the smallest spot size, as well as precision beam control and front surface mirrors, to achieve the best possible depth and definition. Be that as it may, the objective way to ascertain performance is to run some tests, in this case some very simple ones (since we are, I repeat, an audio rather than a video magazine). Instead of Joe Kane's still excellent "Video Essentials" DVD, I used Ovation Software's somewhat more up-to-date and more complete "Avia Guide to Home Theater" as an optimization disc. I checked contrast, brightness, sharpness, color, tint, color temperature, convergence, and various test patterns. To my amazement, the factory default settings were either right on the money or very close to it. I had never seen that before. Indeed, the contrast setting could not be increased beyond optimum—the fully optimized picture is actually bright enough to be viewed with the lights on. More sophisticated tests were not performed.

And, yes, I almost forgot—what about audio? Nothing to write home about, but better than some large TVs. There are two speakers below the screen, close to the floor. Each has a 6" woofer and a 1½" tweeter. They are driven by a 10-watt-per-channel amplifier. What did you expect? They do the job.

All in all, the Mitsubishi WS-55907 is my favorite large all-in-one TV so far, slightly preferred to my old and obsolete 40" direct-view set, mainly because of all the latest features and the 16:9 screen. Is it superior to other up-to-date 55" rear-projection TVs? Probably yes, in view of the unusually good test results, but I can't be sure. Manufacturers don't send me 300-pound TVs in an endless stream. One is enough, at least for now.

—Peter Aczel

Broadband Internet Radio:

With classical radio stations dropping like flies as a result of the 1996 Telecommunications Act, it may be impossible to get classical music off the air in your area even if you have a "supertuner" and a giant antenna. If you do manage to DX something, it may be so noisy and distorted as to leave yourself asking why you bothered. Luckily other sources of music are now available. Many cable systems offer digital cable, which sounds very nice, the major problem being that you have no idea what they are going to play next. You also do not get any live-on-tape broadcasts or music appreciation programming with extensive discussions between the music ("The Record Shelf," "Adventures in Good Music," etc.). Instead, you get no live human announcers at all. You have to look at the TV screen to find out what you are listening to.

Another approach is to use the Internet to listen in on radio stations that offer streaming audio service. Lots of people appear to be going this route because a recent survey by the rating service Arbitron claimed that three classical music stations were among the five most listened to on the Internet. Unfortunately, a telephone-based modem will not cut it because of bandwidth limitations of the rate the music can be streamed at. In addition, muting and buffering can be an all too common occurrence. Going to a broadband connection greatly improves the situation. This can be in the form of a cable modem or an ADSL. The cable modem is generally cheaper if you can get two-way service in your area. Since I do not have two-way cable in my area, I went the ADSL route.

Connecting to an ADSL can be as simple as making a call to a service provider, waiting for an ADSL modem and software to come in the mail, and waiting for your telephone line to be provisioned for ADSL. All you need to do is connect the phone line and install the software, and you are off to the land of 200 Kbps, or more, download speeds. That is how it went with my second attempt at this, using Earthlink. My first attempt was with Verizon. Verizon ADSL never would work with any of my PCs. Errors were very exotic, and customer service was clueless, with insufferable wait times to get even the clueless human on the phone. That is not to say Earthlink customer service is much better. It just turned out I did not need them. A good source of information on how good ADSL providers are in your area can be found on the Web site www.dslreports.com. This site compiles customer performance survey information that is useful and sometimes accurate. At least Earthlink ranked above Verizon, but not by much.

If you manage to get through the frustration of getting online with a broadband connection and are willing to shell out the $30.00 and additional up-front fees, what do you get? What you get access to is what must approaching 1000 stations worldwide. To find the stations that interest you requires a little

Home Theater Projector

Studio Experience's Boxlight Cinema 13HD

Boxlight Corporation, 19332 Powder Hill Place NE, Poulsbo, WA 98370-7407. Voice: (800) 884-6464. Web: www.boxlight.com. Distributed exclusively by Studio Experience. Voice: (800) 667-6147. Web: www.studioexperience.com. Cinema 13HD multimedia projector, $4999.00. Tested sample on loan from manufacturer.

Here we are in an altogether different category. Good front-projection TV is the closest thing to the movie theater experience—and I mean a *good* movie theater. It blows away both direct-view, mainly because of the incomparably larger picture, and rear projection, which is really reverse front projection with compromises. The Cinema 13HD is a very high-resolution active-matrix (LCD) front-projection system with inputs for component, S, or composite video, as well as for IBM-compatible or Macintosh computers. It is roughly the size of a

The Current State of Music on the Net

hunting on the Web. What you are looking for are Web sites maintained by people who actually compile lists of all the available stations and then proceed to update these lists, www.classicalwebcast.com appears to be the best site for classical listeners. It bills itself as "An attempt to collect all live-broadcasting classical radio stations on the Web." This site includes the big well-known stations like WQXR, down to things like Bartók Rádió, which comes to you live from Budapest. The big problem is that most of these sites provide data streams at 20 Kbps. The result is AM radio sound quality, without the background noise but with strange artifacts that result from the perceptual coder running at such large compression rates.

Better sound can be found on the few sites that are designed to transmit at higher data rates. A site transmitting at 64 Kbps still has a rolled-off high end and some digital artifacts, but it is listenable if still not FM quality. I have found a few sites that run at data rates of 128 Kbps. This data rate produces sound quality that is close to FM. www.classicalwebcast.com lists data rates available from classical sites. It is not always accurate but at least it is a good place to start looking for sites that produce acceptable sound quality.

As the classical music recording industry appear to be imploding, at least among the Big Five, the Internet may take on the role of a delivery service for new recordings. The site www.andante.com hints at the future by offering on-demand streaming delivery of complete classical concerts. The delivery speed is 64 Kbps. This makes for an interesting listening session but, as stated above, it is not FM quality. Andante has recently begun to charge for this on-demand streaming ($9.99 a month or $99.00 per year). I do not know how many people will be willing to pay at this level of sound quality, but if the site offers on-demand streaming or downloads to hard drives at higher data rates, things could become very interesting.

For the moment broadband music delivery, both by radio and streaming audio sites, is in a relatively primitive state soundwise. The audiophile can wait a while, but the music lover may be able to look past the sound quality problems and find a fascinating new source of music delivery to the home. The best recommendation at this point is to give it a try if you can access a broadband connection. Try to get a one-month trial period with no significant start-up fees to see if the sound quality is acceptable. The problem with this approach is that many services require a one-year commitment and additional up-front fees that can be several hundred dollars. Under those conditions it is harder to recommend that you join a broadband Internet delivery service unless you are sure you understand that the sound quality is somewhere between AM and FM at this point.

-David Rich

very large unabridged dictionary and weighs just a few ounces over 20 pounds. In that small package—and of course in conjunction with a large projection screen—it outperforms any 300-pound TV on the planet. I haven't had too much experience with projectors but I can honestly say that I do not crave any improvement over the Cinema 13HD's picture quality as projected on a 100-inch-diagonal screen. It is truly film-quality, as distinct from TV-quality, especially with a progressively scanned DVD source. I am afraid I can never go back happily again to a console TV, whether direct-view or rear projection.

I must repeat that I haven't tested ultrahigh-end front projectors (believe it or not, the $4999 price of the Cinema 13HD is in the low-to-medium category), which are almost exclusively CRT-based. The main advantage of CRT projectors over LCD projectors is higher contrast; however, the 700:1 contrast ratio of the Cinema 13HD approaches that of some typical CRT projectors. Resolution of the projector is 1366 x 768 Wide XGA. Brightness is 1200 ANSI lumens, actually making lights-on viewing possible, although lights off is better by far.

As for features, the Cinema 13HD has every conceivable adjustment for picture size, position, and quality. The adjustments are menu-controlled and are too numerous to be fully listed here. Control buttons located on top of the chassis are duplicated on the remote control, which can be operated either wired (plugged into the chassis) or wireless. The projector can be focused from 4.43 feet (1.35 meters) to 45.9 feet (14.0 meters), which translates into diagonal screen sizes from 40 inches to 400 inches. The zoom buttons can fine-tune the screen sizes within a fairly large tolerance at all focusing distances. The projection lens can be moved up and down with the lens shift buttons to adjust the exact position of the projected image. Provisions are available for ceiling mounting. The menu provides facilities for adjusting the aspect ratio of the picture (16:9, 4:3, and expansions/compressions). Needless to say, every component video signal format—480i, 575i, 480p, 575p, 720p, 1035i, 1080i—can be reproduced; in most cases the adjustment is automatic. As for image-level menu adjustments—contrast, brightness, color, tint, sharpness, etc.—the possibilities are virtually unlimited. This is far from an exhaustive account of what the Cinema 13HD can do, but I prefer stop here before I infringe on the territory of specialized video magazines.

I did not test the performance of the Cinema 13HD with computer inputs, although it would certainly have been interesting. What I did was to put it through its paces with Ovation Software's "Avia Guide to Home Theater" DVD (see the Mitsubishi review above), which tells you more than you probably want to know. The nearly infinite adjustment possibilities on this test DVD, combined with the nearly infinite settings possible with the Cinema 13HD's various menus, exhausted my patience before I was able to achieve absolute perfection of the projected image. Luckily, the Normal button (on top of the projector and on the remote control) provided factory preset adjustments that were close enough to perfection—maybe 90%. Further fine-tuning was possible by going through each menu, but frankly I was happy enough in the Normal mode. Maybe I'll reach the point where I can only live with hairsbreadth adjustments, but for the moment I am enjoying the best TV picture of my life just from the baseline settings.

Did I mention that I bought the Cinema 13HD? I suppose that's the ultimate endorsement.

—Peter Aczel

CORRECTION

My review, in Issue No. 27, of the Amplifier Technologies AT1506 six-channel power amplifier contained the statement that "the circuit design is by Morris Kessler, who was also the designer of the old SAE amplifiers." An indignant James Bongiorno informs me that this simply isn't so. He claims that all SAE amplifiers, starting with the 31B in 1973 through various models right up to the present ATI amps, use *his* dual-differential full-complementary circuit. He was the original director of engineering at SAE in the early '70s before he founded GAS and later Sumo. Indeed, a huge number of amplifier designs over the pas three decades, he claims, have copied his basic circuit topology. Now, I must confirm that James Bongiorno is one of the audio industry's most original and creative circuit designers. His achievements cannot be, and must not be, minimized. That does not mean, however, that Morris Kessler did not specify the particular circuit components of the ATI amplifier. That is all I meant by "circuit design." The fundamental circuit concept by James Bongiorno was not in question. When Chrysler comes out with a new minivan design, it does not mean they have invented the V-6 engine. So relax, Jim. We all love you. You must just accept the fact that the creative people aren't always as visible as the commercial front men.

-Ed.

Capsule CD Reviews
(including SACD, DVD-A, and DVD-V)
By Peter Aczel, Editor

Some classical labels are dying; others are hanging in there; only Naxos is thriving. In any event, there will always be many more new (and not so new) releases than I can handle. Note that the year in parentheses after the CD number is the year of recording, not the year of release.

BBC Opus Arte

This the British Broadcasting Corporation's label, distributed by Naxos. It focuses, obviously, on English productions.

***Giuseppe Verdi:** Falstaff. Bryn Terfel, Sir John Falstaff; Barbara Frittoli, Alice Ford. The Orchestra of the Royal Opera House (Covent Garden), Bernard Haitink, conductor; The Royal Opera Chorus, Terry Edwards, director; Graham Vick, stage director. DVD-Video OA 0823 D (2000).*

Falstaff was Verdi's last opera and very different from all the others. The music is through-composed; there are no cabalettas, no arias even in a strict sense. It is like a gigantic scherzo that goes on and on without repeating itself, yet it is thoroughly Verdian in feeling. (I sometimes think, in jest, of the early Verdi operas—*Rigoletto, Il trovatore, La traviata,* etc.—as being cranked out on a barrel organ by an old mustachioed Italian with a monkey sitting on his shoulder, repeatedly doffing its little hat. *Falstaff* is definitely not that kind of music.) The opera is hard to characterize but easy to listen to; it is magnificent both orchestrally and vocally. The definitive *Falstaff* recording is of Toscanini's 1950 NBC broadcast performance, but it is of course without the video element, and his Falstaff, Giuseppe Valdengo, is no match for the incredible Bryn Terfel. Nobody is, not now, not before—not ever. The man is an elemental force; he amazes not only with his superb vocalism from beginning to end but also with his acting—he is the ultimate ham, which is exactly right for the role. To be almost uninterruptedly on stage in three acts and sing with matchless beauty at all times is one thing; for a huge man to hop, leap, and cavort in a rubber "fat suit" for hours on end is really the limit. He is simply breathtaking. Everybody else in the large cast is competent or better; Barbara Frittoli is a wonderful singer, and she is not the only one. Haitink's conducting does not have quite the crisp, sharply etched brio of Toscanini's but he is thoroughly authoritative and musical throughout. The sound is Dolby Digital, of course, not one of the uncompressed 5.1 formats, but it is very live and dynamic. Graham Vick's staging is modernistic/minimalist to say the least; the scenery and props are stylized and extremely sparse but very colorful. Overall, a lovely production.

Cedille

Cedille Records is the trademark of The Chicago Classical Recording Foundation. Thus it is a "parochial" label—but then Chicago is a big parish.

***Peter Ilyich Tchaikovsky:** String Quartet No. 1 in D Major, Op. 11; String Quartet No. 3 in E-flat Minor, Op. 30. Vermeer Quartet: Shmuel Ashkenasi & Mathias Tacke, violins; Richard Young, viola; Marc Johnson, cello. CDR 90000 056 (1999-2000).*

This is the second installment of a very slow-moving project to record all of Tchaikovsky's chamber works. The first recording (String Quartet No. 2 in F Major, Op. 22; String Sextet in D Minor, Op. 70) goes back to 1993. The recording venue is not the same in the newer CD, and the change is not for the better. The sound is close-up, occasionally harsh, and rather airless; it could use a little more ambience. The playing is unquestionably competent but a bit stodgy; I can imagine a more stylish performance of this somewhat unfamiliar music, which is drier and more severe than the Tchaikovsky symphonies. All in all, an OK but far from great CD.

Chandos

I rarely review releases under this excellent English label, but here's a good one.

***Zoltán Kodály:** Theatre Overture; Concerto for Orchestra; Dances of Marosszék; Symphony in C Major. BBC Philharmonic, Yan Pascal Tortelier, conductor. CHAN 9811 (1998, 1999).*

Kodály is the "other" great Hungarian composer of the 20th century, perhaps not as original as Bartók but a masterful creative artist in his own right. This program, beautifully played by an excellent orchestra, has as its centerpiece the rarely played 1950-61 Symphony, dedicated to the memory of Toscanini. It is as strong and structured as the music-making of the maestro, utterly accessible in idiom and intensely Hungarian in flavor. A truly fine piece of music. The other works are better-known; the Theater Overture is actually the original overture to *Háry János* with some revisions; the Dances of Marosszék are a near warhorse. To my Hungarian ear, the French conductor's baton is as idiomatic and musical in these works as I could possibly wish. The studio recording is on the dry side—which I like in this music—and wide in dynamic range, a very good job overall. A must for the Kodály lover (and who isn't?).

Chesky

This label is an audiophile icon—inscribed "High Resolution Technology, recorded at 96/24" (now across the board, in all of their releases).

***David Chesky:** Psalms 4, 5 & 6 (Remembrance for the Victims of the Modern Holocausts). Ján Slávik, cello; Matej Drlička, clarinet; Slovak Philharmonic Orchestra, Stephen Somary, conductor. CD203 (2000).*

I keep reviewing David Chesky's compositions because they are contemporary music without major listening problems—melodically and harmonically accessible, pleasingly colorful in orchestration. I don't know how significant they are; I lack the historical and aesthetic perspective so soon after their earliest performances. I know that if they were ugly in sound and structurally perplexing, like most contemporary works, I would walk away from them. These "psalms" are actually sequels to the *Three Psalms for String Orchestra* reviewed in Issue No. 25, but this time they are for full orchestra, featuring a solo cello in Psalm 4 and a solo clarinet in Psalm 5. The three pieces are basically elegiac in mood, interrupted by brief tumultuous passages; they tend to meander on endlessly, with occasionally banal melodic and harmonic progressions—but then you can say the same thing about some acknowledged masterpieces. The recording is very wide in dynamic range, with well-defined high and low transients, but quite mushy in overall texture. The hall is undoubtedly the culprit, not the engineers; there is no mention of it in the CD leaflet but it appears to be the same as in "The Agnostic," reviewed in Issue No. 26. (The recording may even have been made at the same recording session—how could they afford to hire the same huge forces twice?) All in all, a remarkable effort for a small label.

The Cleveland Orchestra

Not really a commercial CD label. The orchestra distributes special releases of its own performances only.

"Live in Tokyo 1970." ***Carl Maria von Weber:*** *Overture to Oberon.* ***W. A. Mozart:*** *Symphony No. 40 in G Minor, K. 550.* ***Jean Sibelius:*** *Symphony No. 2 in D Major, Op. 43.* ***Hector Berlioz:*** *"Rákóczy March" from The Damnation of Faust, Op. 24. The Cleveland Orchestra, George Szell, conductor. TCO-10603 (2 CDs, 1970, remastered 2001).*

This is not a reissue; it has never been released before—and it is simply stupendous. George Szell was one of the greatest conductors of the 20th century, and this is his very last recording. He died ten weeks later, at the age of 73. The live recording is of a Tokyo concert, made during the Cleveland Orchestra's 1970 tour of Japan, Korea, and Alaska. The sound was recorded for broadcast purposes on 2-track 15-ips tape, remastered in the analog domain and noise-filtered in 2001, before the 2-channel 24-bit digital conversion and the eventual editing down to the 16-bit CD master. The process was incredibly successful; the hall and the broadcast tapes must have been exceptionally good to begin with, and the noise suppression is exactly right, so that the end result is virtually indistinguishable from the most up-to-date digital sound except perhaps for a very slight loss of extreme top-end transparency. The midrange impact, the brasses, the tutti are absolutely marvelous. More important—the performances are truly superb. I honestly can't remember more fluent, more beautifully phrased, more virtuosic renditions of these four compositions. That the Cleveland Orchestra is one of the greatest in the world is a given, but here they play at their absolute best and then some. What unanimity, what synchronicity, what fortissimos! A bonus track is a 2001 interview with Pierre Boulez about his relationship with George Szell and the 1970 Far East tour, in which he participated. Boulez's accent is alone worth the price of admission. Seriously, though, this is a pair of CDs to own. You are unlikely to find their equal.

Delos

That the Delos engineering staff, under the leadership of John Eargle, is now regularly using the Sony DSD (Direct Stream Digital) method of recording constitutes a very serious endorsement of this still controversial technology. Nobody has better sound than Delos, and if they are switching to DSD it has to have some significant advantages.

Marina Domashenko: *Mezzo-soprano opera arias. Philharmonia of Russia, Constantine Orbelian, conductor. DE 3285 (2001).*

Marina Domashenko is a 27-year old Siberian phenomenon. I use the word advisedly because she is indeed phenomenal. Her voice is big, rich, unstrained, flexible—she is world-class, even if the world is just beginning to notice her. Here she sings Cilea, Saint-Saens, Mussorgsky, Rimsky-Korsakov, Prokofiev, Ponchielli, Verdi, Bizet, Rossini, and J. Strauss, all with equal panache. On top of it, she is good-looking. What more can you ask for? The Moscow recording is DSD, but this is not an SACD, at least not my copy. The recording engineer was Jeff Mee, a John Eargle disciple and his heir apparent; the sound is nonfatiguing, airy, and panoramic in the best Eargle tradition.

Dmitri Hvorostovsky *(baritone): Passione di Napoli... Philharmonia of Russia, Constantine Orbelian, conductor. DE 3290 (2001).*

Neapolitan songs (for operatic voices) should be sung by a tenor, as everybody knows. That's the only thing that's wrong with this CD. Dmitri Hvorostovsky has a big, free, creamy baritone voice, truly beautiful, and he sings these Neapolitan tearjerkers *(Torna a Surriento, 'O sole mio, Santa Lucia,* etc.) with genuine *passione.* What's missing is that special tenor timbre on the high notes, which is what jerks the tears, let's face it. Everything—orchestra, conductor, Moscow venue, recording engineer, DSD process—is the same as in the Domashenko disc above, but it's not as thrilling, even though it all sounds gorgeous. Hey, there's good and there's better.

Antonio Vivaldi: *Le quattro stagioni (The Four Seasons), Op. 8, Nos. 1—4; La tempesta di mare (Storm at Sea), Op. 8, No. 5; Il piacere (Pleasure), Op. 8, No. 6. Massimo Quarta, violin; Moscow Chamber Orchestra, Constantine Orbelian, conductor; Yuko Tanaka, harpsichord continuo. DE 3280 and SACD 3280 (2000).*

One of the glories of the Baroque literature, *The Four Seasons* has been recorded innumerable times; indeed, I suspect that if you own just ten classical recordings, this marvelously listenable music is one of them, in one performance or another. Nevertheless, this new recording is worth singling out from the crowd because of the freshness and sensitivity of the interpretation, the virtuosity of Quarta's playing, and the transparent recording, which was made by Jeff Mee (see above) in the Skywalker Sound studio of Lucasfilm in California. The recording was issued both as a regular CD and as a hybrid multichannel SACD. The former is actually a little brighter and more aggressive than I think John Eargle would have made it but superbly defined nonetheless. The latter is not only mellower but also an excellent example of 5.1 envelopment.

Dorian

Craig Dory, Dorian's owner/engineer, is the technically tweakiest and most subtle of the handful of recording engineers that I truly admire. His best work is unsurpassed, unquestionably state-of-the-art.

"Magic!" *Peter Richard Conte at the Wanamaker Grand Court Organ, Lord & Taylor, Philadelphia.* ***Modest Mussorgsky:*** *Night on the Bare Mountain.* ***Richard Wagner:*** *Wotan's Farewell and Magic Fire from Die Walküre.* ***Paul Dukas:*** *Sorcerer's Apprentice.* ***Otto Nicolai:*** *Overture to The Merry Wives of Windsor. Sir Edward Elgar: Cockaigne Overture ("In London Town"), Op. 40; "Nimrod" from Variations, Op. 86("Enigma"). xCD-90308 (2001).*

The nearly 100-year old organ in the Grand Court of the Lord & Taylor (formerly Wanamaker) department store in Philadelphia is the largest in the world. It had fallen into total disrepair, but a restoration program started in 1990 and completed in 2001 brought it back to life, and now 75% of its more than 28,000 pipes are fully operational, in fact better than ever. (The work continues to make that 100%.) What makes the organ special is its unique ability to mimic the tone colors of a full symphony orchestra—strings, brasses, etc. That's why organist Conte chose the above program for the restored organ's recording debut and not Bach or Buxtehude. And there's the rub. Despite highly competent and musical playing by Conte, despite the amazing tonal palette of the gargantuan organ, despite the magnificent recording by Craig Dory—it still doesn't sound like a symphony orchestra. The original orchestrations sound better than the organ transcriptions. A case in point is the leitmotiv for Wotan's Spear in the Magic Fire music. It sounds so much better, so much brassier and scarier, on the trombone than on the organ. Bach's Passacaglia and Fugue in C Minor would have been a better demonstration of the organ's capabilities, in my opinion. Other than that, I have nothing but praise for this unique CD. The recording alone, crystal clear and at the same time "juicy" in the impossibly large space of the Grand Court, is worth the price of admission.

Harmonia Mundi

This remains the most distinguished classical label in my book. Nothing but the most serious music by the most serious performers gets into their catalog. You are always in good hands with Harmonia Mundi—if you favor their admittedly heavy diet.

***J. S. Bach:** Mass in B Minor, BWV 232; Magnificat* in D Major, BWV 243; "Ein feste Burg ist unser Gott" Cantata, BWV 80. Johannette Zomer, Véronique Gens, Barbara Schlick*, Agnès Mellon*, sopranos; Andreas Scboll, Gérard Lesne*, altos; Christoph Prégardien, Howard Crook*, tenors; Peter Kooy, Hanno Müller-Brachmann, basses; Collegium Vocale, La Chapelle Royale*, Philippe Herreweghe, conductor. HMX 2908110.12 (3 CDs plus a CD-ROM, 1990* and 1996).*

Not a sequel but actually a precursor to the *Saint Matthew Passion* reviewed in Issue No. 26, this was reissued about a year later, in 2000, with the addition of a CD-ROM. I raved about the St. Matthew and I am equally impressed by the Mass. This is period practice at its best—transparent textures, authentic instruments, small flexible chorus, pure vocalism by the solo singers—yet the underlying drama and emotion of the music is never slighted. A perfectly balanced performance. The interactive CD-ROM, *L'Univers de Bach* (this time for both PC/Windows and Macintosh), is an incredibly rich source of information about Bach, his music, and his era; frankly, I have just begun to explore it—it's inexhaustible. I can't imagine a more rewarding package for the Bach aficionado than this boxed set.

Mapleshade

Pierre Sprey continues to astound with the fidelity of his live-to-two-track analog recordings (which are then digitized for CD). I don't even like most of the music he records, but his utterly intimate and transcendently natural sound challenges my purely digital predilection. Let practice prevail over theory...

***Aislinn** (a vision). David O'Rourke & Lewis Nash's Celtic Jazz Collective. 08032 (1999-2000).*

This is surprisingly enjoyable—Irish pipers meet Afro-Caribbean drummers (an oversimplification, but it will do). The result is hard to describe but easy to listen to. Some tracks are sweetly lyrical, others are intensely rhythmic, all of it is fun. But the sound—ah, the sound... Listen to almost any Mapleshade recording and find out for yourself.

Naxos

While the classical recording industry is wasting away, Naxos is thriving. Klaus Heymann took a page out of the Wal-Mart marketing manual—tremendous variety, huge volume, ridiculously low prices. It works, even in a slowed-down economy. They don't have the greatest of today's artists but they have very good ones, and at $6.99 full retail few music lovers will hesitate. As for their historical series, there they do have the greatest artists of the past and marvelous sonic restorations to boot. My emphasis this time is on these reissues.

***J. S. Bach:** Sonatas for Violin and Harpsichord. Volume 1: Sonata No. 1 in B Minor, BWV 1014; Sonata No. 2 in A Major, BWV 1015; Sonata No. 3 in E Major, BWV 1016; Sonata No. 4 in C Minor, BWV 1017. Volume 2: Sonata No. 5 in F Minor, BWV 1018; Sonata No. 6 in G Major, BWV 1019; Sonata No. 6 in G Major, B WV 1016 (alternative movements). Lucy van Dael, violin; Bob van Asperen, harpsichord. 8.554614 & 8.554783 (2 separate CDs, 1999).*

Bach composed this superb music in his 30s, during his brief years as Court Kapellmeister to Prince Leopold of Anhalt-Cothen. His second son, the composer Carl Philipp Emanuel Bach, referred to these sonatas more than a half century later as "among the best compositions of my dear departed father." They are indeed in his best secular style, comparable to the Brandenburg Concertos (though on a smaller canvas), and they are performed here with authentic phrasing and considerable spirit by these two excellent Dutch musicians. Listen, for example, to No. 3 in E Major and savor the exquisite third-movement Adagio. The recorded sound is perfect; it couldn't be clearer or more balanced between violin and harpsichord.

***Ludwig van Beethoven:** Piano Concerto No. 3 in C Minor, Op. 37; Piano Concerto No. 4 in G Major, Op. 58; Rondo in C Major, Op. 51, No. 1. Artur Schnabel, piano; London Philharmonic Orchestra, Malcolm Sargent, conductor. Audio restorations by Mark Obert-Thorn. 8.110639(1933).*

Artur Schnabel was the greatest Beethoven (and Mozart and Schubert) interpreter of his day and he remains unsurpassed, perhaps even unequaled, to the present. His fingers slipped occasionally; he was not a thunderer, not a giant of keyboard technique; he was just a great musical intellect and an incredibly sensitive musician. His phrasing of some of Beethoven's passages is more probing, more profoundly insightful than just about anyone else's. These are his earliest recorded performances of the two Beethoven concertos and probably his best, at the height of his powers. The deceptively simple opening of the Fourth, for example, is so easy to mess up with mannered phrasing; Schnabel plays it simply and at the right tempo—perfectly. Similar felicities abound throughout the CD. The recording of course shows its age; it's a bit boxy, and some shellac noise is there all the time, but Mark Obert-Thorn's excellent restorations minimize those shortcomings very effectively, and the sound is thoroughly acceptable overall.

***Ludwig van Beethoven:** String Quartet in F Major, Op. 135; String Quartet in C-sharp Minor, Op. 131. Kodály Quartet: Attila Falvay & Tamás Szabó, violins; Gábor Fias, viola; György Éder, cello. 8.554594 (1999).*

If Beethoven was the greatest composer of all time (as the majority of critics would agree), and if his last five string quartets are his most sublime music (again the majority opinion), and if Op. 131 in C-sharp minor is the best of them all (as Beethoven himself believed), then the C-sharp minor quartet must be the greatest music in the world, right? It is certainly unutterably beautiful, transcendent, mysterious, and mercurial. There's no other music like it. Op. 135 is magnificent in its own way but much shorter and lighter in substance. The Kodály foursome plays these masterpieces with very lovely string tone and considerable repose, perhaps more than would be ideal. They are a beautiful, lyrical string quartet, not a powerhouse quartet like the Emerson. On occasion they are too relaxed. On the other hand, the recording (by my Budapest friends Ibolya Tóth and János Bohus) is sonically so perfect, so lifelike, that the total impact of the CD is hard to resist. (By the way, this concludes the Kodály's traversal of the Beethoven quartets in nine volumes.)

***Enrico Caruso:** The Complete Recordings, Volumes 3, 4, 5, 6, 7, & 8. New restorations by Ward Marston. 8.110708/719/720/721/724/726. (1906-1914).*

I reviewed Volumes 1 & 2 of this astonishing series in the last issue—astonishing because the restorations by the blind specialist Ward Marston make these impossibly scratchy, hissy, and veiled original recordings highly listenable. Now you can trace the development of perhaps the most beautiful tenor voice of all time from the lighter, more lyrical, more easygoing quality at age 29 to the darker, more powerful, somewhat more mannered vocalism at 41 (with more to come). No tenor ever had a voice quite like Caruso's, not even Gigli, not even Björling—in my opinion—but this is the first time that can be positively ascertained, thanks to the relative clarity of these restorations. Not that Caruso was the greatest artist among tenors, far from it—somebody like Aksel Schiøtz, to name only one, was an incomparably better musician—but the evenness of his scale, the unstrained power of his top notes, and the sheer beauty of his midrange made his voice unique.

***W. A. Mozart:** Don Giovanni. Bo Skovhus, Don Giovanni; Janusz Monarcha, II Commendatore; Adrianne Pieczonka, Donna Anna; Torsten Kerl, Don Ottavio; Regina Schörg, Donna Elvira; Renato Girolami, Leporello; Boaz Daniel, Masetto; Ildikó Raimondi, Zerlina. Hungarian Radio Chorus, Nicolaus Estherházy Sinfonia, Michael Halász, conductor. 8.660080-82 (3 CDs, 2000).*

Big surprise! I did not think this budget Budapest production of *Don Giovanni* could be competitive with the 1992 Norrington recording on EMI, the 1995 Mackerras recording on Telarc, or any number of famous older recordings. I was wrong. This is an absolutely first-rate *Don,* enthusiastically sung by uniformly fresh, unstrained voices and beautifully played by an excellent chamber orchestra (small but not period-practice). No member of the cast rises head and shoulders above the others, but none of them is less than highly competent. Halász allows momentary lapses in forward propulsion, but by and large his phrasing is lovely. I happen to have seen, in 1996, the Phoenix Studio in Budapest where the opera was recorded and I remember it as rather small. Some artificial reverb may have therefore been used in the mix, but I couldn't detect it. The overall sound quality is outstanding, natural and transparent, maybe the best of all versions known to me. The producer, Ibolya Tóth, and the recording engineer, János Bohus (I personally know both—see above), have truly arrived in the big leagues with this recording.

***W. A. Mozart:** Die Zauberflöte. Helge Roswaenge, Tamino; Tiana Lemnitz, Pamina; Gerhard Hüsch, Papageno; Erna Berger, Queen of the Night; Wilhelm Strienz, Sarastro. Berlin Philharmonic Orchestra, Sir Thomas Beecham, conductor. Audio restoration by Mark Obert-Thorn. 8.110127-28 (2 CDs, 1937-38).*

This was the ultimate "Magic Flute" of the pre-World War II era and it remains unsurpassed to this day. The singers are the absolute best of their day, and the orchestral performance under the great Sir Thomas Beecham's baton has the required Mozartean effervescence to the nth degree. Gerhard Husch must be singled out as probably the best baritone who ever sang Papageno. Helge Roswaenge as Tamino and Wilhelm Strienz as Sarastro are also magnificent. It is Beecham's brio, however, that gives the whole production its special cachet. If the spoken dialogues were included, as they are not, it could be argued that all subsequent recordings are superfluous, especially because Mark Obert-Thorn's restoration is good enough to make one forget that the original sound is two-thirds of a century old. The whole thing is a musical miracle that with a little more political sophistication on Beecham's part would never have taken place in Hitler's Berlin—but today we are lucky that it did.

***Antonio Vivaldi:** The Four Seasons, Op. 8, Nos. 1—4; Concertos for violin and double orchestra in D Major and C Major, RV 582 & RV 581. David Juritz, violin; London Mozart Players. DVD-Audio recording, 5.110001 (1999).*

As the serial number indicates, this is Naxos's first venture into the DVD-A format, so it isn't terribly surprising that it's an unimpressive effort. The performance is competent but strictly routine, surpassed by countless others on CD; the recording is too bright and wiry. A more important audio shortcoming is that the surround sound lacks envelopment, which is the whole point of DVD-A. I am sure that Naxos will catch up very quickly on the technology.

RCA Victor Red Seal

It is sad to see the granddaddy of classical labels reduced to a small trickle of serious music releases, but that's the state of the business today. At least when they come out with something it's likely to be good.

***Modest Mussorgsky:** Pictures at an Exhibition. **J. S. Bach** (arr. Ferruccio Busoni): Toccata, Adagio & Fugue in C, BWV 564. **Mikhail Glinka** (arr. Mily Balakirev): The Lark. Evgeny Kissin, piano. 09026-63884-2 (2001).*

Mussorgsky's best-known and most frequently played composition was originally written for the piano and has some specifically pianistic qualities that are lost in Ravel's brilliant orchestration. Kissin (he is now thirty—nobody remains a wunderkind forever) makes the most of this native keyboard idiom. I have never heard a more virtuosic performance. He uses very little pedal, and the clarity and precision of detail are phenomenal. No blurring whatsoever, even in the densest and most rapid passages. Awesome! Is it all fingers and no soul? I suppose you could argue that, but he shapes the slower episodes so artfully that a kind of synthetic spirituality emerges nonetheless. He obviously sets out to surpass all previous performances, including Richter's. He plays larger than life, risking everything, and yet he loses nothing. To say that I am impressed is the understatement of the year. There are other ways to play the *Pictures,* but this is one way I wouldn't want to have missed. The Bach-Busoni is played much the same way, but there the "soul" is built into the fabric of the music—it's interpretively ineradicable. Yes, you could accurately write down the Busoni piano score from Kissin's playing. As for *The Lark,* it's a Chopinesque trifle, exquisitely played. I really think Kissin is beginning to nudge the Rachmaninoff/Horowitz class as a piano virtuoso. The recorded sound, by Mike Hatch, is also of the highest order—24-bit/96-kHz, dynamic, crystal clear, utterly lifelike. Get this CD.

Reference Recordings

The recruitment of the Minnesota Orchestra under Eiji Oue's baton has been a major coup for RR, raising them well above boutique-label status in classical music. They are still encoding everything with the HDCD process, although decoder chips are few and far between even in high-end playback equipment, but the system is genuinely compatible without decoding, so we can permit them their little audiophile eccentricities. Besides, Keith Johnson's sound is unfailingly superb, decoded or not.

"Bolero!" (orchestral fireworks). ***Franz Liszt:*** *Les Préludes.* ***Maurice Ravel:*** *Boléro. Ten other shorter pieces. Minnesota Orchestra, Eiji Oue, conductor. RR-92CD (1999).*

Warhorses, yes. Routine or boring, no—not under Oue's baton. You need at least one recording of these perennials (which happen to be very good music) in your collection, so you might as well make it Oue's beautifully shaped performances and Keith Johnson's state-of-the-art recording. The *Boléro,* in particular, benefits from the highest possible audio fidelity, and this is it.

Aaron Copland: *Fanfare for the Common Man; Appalachian Spring Suite; Third Symphony. Minnesota Orchestra, Eiji Oue, conductor. RR-93CD (2000).*

Celebrating Copland's 100th birthday (he died in 1990 at the age of 90), these performances are of music in Copland's "popular" style, as distinct from his "modern" style (the Symphony actually straddles both styles). The *Fanfare* appears both in the Symphony and as an independent short piece. Oue's performances are shapely, tasteful, beautifully played, with a judicious balance of drama and restraint. The recorded sound is nothing short of awesome; you might want to obtain this CD just as an audio experience.

Serge Rachmaninoff: *Symphonic Dances, Op. 45; Vocalise, Op. 34; Five Études-Tableaux (orchestrated by* ***Ottorino Respighi).*** *Minnesota Orchestra, Eiji Oue, conductor. RR-96CD (2001).*

The main piece here is the *Symphonic Dances,* arguably Rachmaninoff's orchestral masterpiece, certainly his most colorful. Oue's performance of it is refined, transparent, and generally on a very high technical level, but just a little sluggish or perhaps only insufficiently exuberant. Maybe he was being too careful. The recording is once again absolutely stunning, brilliant and plushy at the same time, unequaled by any other label in this piece.

Ottorino Respighi: *Belkis, Queen of Sheba—Suite; Dance of the Gnomes; The Pines of Rome. Minnesota Orchestra, Eiji Oue, conductor. RR-95CD (2001).*

Little-known Respighi and well-known Respighi are juxtaposed 2 to 1 on this CD. The *Belkis* suite features some of Respighi's most elaborate orchestration, more elaborate than which does not exist. Musically the suite is no world-beater but highly listenable, a kind of *Scheherazade* on steroids. I still prefer the *Pines,* perhaps only because I know it backwards. Oue plays each piece to the hilt; I cannot imagine more precise, more lovingly conducted performances. As for the recording, I'm running out of superlatives—it is brilliant and weighty, with tremendous undistorted dynamics. Orchestra Hall in Minneapolis must be a very microphone-friendly venue, in addition to Keith Johnson's being a great recording engineer.

Surroundedby

This a new label started by entrepreneur Jim Mageras. It specializes in DVD-Audio discs with interactive DVD-ROM features. You can play the music or you can navigate the interactive elements on your computer. A special point of pride of the label is that no watermarking is applied to the discs. Jim is a purist and wants to make the best possible product, whatever it takes. I've heard that one before—let's hope the realities of the market don't prove to be overwhelming.

Maurice Ravel: *String Quartet in F Major.* ***Claude Debussy:*** *String Quartet in G Minor, Op. 10.* ***Gabriel Fauré:*** *String Quartet in E Minor, Op. 121. Guarneri String Quartet: Arnold Steinhardt, violin; John Dalley, violin; Michael Tree, viola; David Soyer, cello. SBE 1004-9 (2000).*

The legendary Guarneri Quartet, formed in 1965, makes a sensational comeback here under producer Max Wilcox, who hadn't worked with the foursome since 1974. It's old home week, and the geezers play as if they were thirty years younger, i.e., magnificently, like the premier quartet they once were. (Max would like to think it's his influence; maybe it is.) The music, of course, is familiar; the Debussy is undoubtedly the masterpiece of the lot, but the others are not to be sneezed at. The DVD-A surround sound is quite convincing, although it isn't 5.1 but 4.0. There is no center channel and no subwoofer channel. Max feels you don't need them for a string quartet, and he is probably right. At any rate, the tonality is gorgeous, as it always is when Max records with his Sennheiser mikes in the American Academy of Arts and Letters in New York. Everything came together to make this recording special, and the bonus features—photos, bios, discography, etc.—are all worthwhile. More power to you, Jim Mageras.

Telarc

In an era of retrenchment in classical and jazz recordings, this label is still doing everything possible to generate some excitement. That means a few major new productions as well as interesting reissues in new formats. I hope they will make it until the inevitable next market resurgence because this is one independent label with their heart in the right place.

Hector Berlioz: *Symphonie fantastique, Op. 14; Love Scene from Roméo et Juliette. Cincinnati Symphony Orchestra, Paavo Järvi, conductor. SACD-60578 (2000).*

I might as well abandon all restraint and declare that the Super Audio CD version of this recording is the best multichannel audio I have ever heard. It has beauty of sound, balance, envelopment, dynamics—the whole bit. Jack Renner has outdone himself with his all-Schoeps microphone setup. Stereo is dead when you hear this 5.1 DSD disc. The playing of the Cincinnati musicians and Paavo Järvi's conducting are also on a very high level; I can imagine a more passionate interpretation of the *Symphonie fantastique,* but overall this extremely careful, detailed, transparent performance is musically convincing and most satisfactory. As for the *Roméo et Juliette* love scene ("is most beautiful music in the world," said Toscanini), any performance of it is worth hearing and this one is better than most.

***Marcel Dupré:** Magnificat VI: Gloria (Finale), Op. 18, No. 15; Carillon, Op. 27, No. 4; Choral et Fugue, Op. 57; Antiphon III: Très lent et sans rigueur, Op. 18, No. 3; Cortège et Litanie, Op. 19, No. 2; Final, Op. 27, No. 7. **César Franck:** Grande Pièce symphonique, Op. 17: Andantino serioso; Allegro non troppo e maestoso; Andante—Allegro-Andante; Allegro non troppo e maestoso; Beaucoup plus largement. **Charles-Marie Widor:** Symphony No. 6, Op. 42: Finale. Michael Murray, playing the organ at St. Sulpice, Paris. SACD-60516(1999).*

This is a kind of "ultimate"—the best French organ music played on the finest and largest French organ by an organist trained in Paris by Marcel Dupré himself. Can't do much better than that, Frenchwise and organwise. The playing is at all times musical and authoritative; the recently restored St. Sulpice organ sounds absolutely gorgeous; and the 5.1 DSD surround sound is right on the money, in tonality, spaciousness, and envelopment. Interestingly enough, this is an early DSD recording, 1999 vintage, by Michael Hatch (i.e., not Jack Renner or Michael Bishop), released after a three-year delay.

***Lang Lang** recorded live at Seiji Ozawa Hall, Tanglewood. **Joseph Haydn:** Sonata in E Major, Hoboken XVI:31. **Sergei Rachmaninoff:** Sonata No. 2 in B-flat Minor, Op. 36 (revised 1931 edition). **Johannes Brahms:** Six Pieces, Op. 118. **Peter Ilyich Tchaikovsky:** Dumka, Op. 59; Nocturne in C-sharp Major, Op. 19, No. 4. **Mily Balakirev:** Islamey. Lang Lang piano. CD-80.524 (2000).*

Lang Lang is the 19-year old (only 18 years old at the time of this recording) toast of half the musical towns in the civilized world. (I have recently heard him in a stunning performance of Prokofiev's Piano Concerto No. 3 with the Philadelphia Orchestra.) He is more than just another gifted young pianist; he is a phenomenon, a sovereign of the keyboard in terms of musicality and technique. Needless to say, he lacks the emotional maturity of an equally great middle-aged pianist but he is getting there. In this program, recorded live at Tanglewood, he covers the gamut from classical to Romantic to purely virtuoso pieces, all with incredibly clean fingering, light pedaling, and superb panache. He dedicates the recording to his teacher at the Curtis Institute, Gary Graffman, who must be hard-pressed to teach him something new. The recorded sound of the piano is as good as it gets, with a fairly close pickup and untrammeled dynamics.

***Gustav Mahler:** Symphony No. 5 (with "Benjamin Zander Discusses Mahler's Fifth Symphony"). Philharmonia Orchestra, Benjamin Zander, conductor. 2CD-80569 and 2SACD-60569 (2 CDs, 2000).*

Symphony No. 9 (with "Benjamin Zander on Performing and Listening to Mahler: Symphony No. 9"). Philharmonia Orchestra, Benjamin Zander, conductor. 3CD-80527(3 CDs, 1996).

I have already reviewed the Zander treatment, both musical and verbal, of the Beethoven Fifth and Seventh (see Issue No. 26). Here Mahler gets the same double-barreled going-over, the Ninth two years before and the Fifth two years after the Beethovens. Each symphony gets a separate bonus CD devoted to Zander's discussion of the music, and his in-depth commentaries on Mahler's works—more than an hour and a quarter's worth in each case—are the most insightful known to me. As for his conducting, he observes the minutest notations in the score—his special claim to fame—without impeding the flow of the music. That, of course, results in a careful, thoughtful presentation, not over-the-top emotion and drama à la Lenny. If the latter is your preference in Mahler, this is not your cup of tea. I am happy with these performances, although there undoubtedly exists one small step beyond Zander in inspiration and the grand gesture; still, this is pretty advanced Mahler playing. As for the audio, both recordings are outstanding, but the Fifth is 4½ years more recent in technology (DSD, etc.) and recorded in a different hall; it is the better of the two. The multichannel SACD version of the Fifth is close to state-of-the-art, with excellent spread and envelopment, exceeded only by Jack Renner's even more recent Berlioz recording (see above).

***Igor Stravinsky:** The Rite of Spring. **Peter Ilyich Tchaikovsky:** Symphony No. 4 in F Minor, Op. 36. The Cleveland Orchestra, Lorin Maazel, conductor. SACD-60563 (1979-80).*

This is another resurrected Cleveland recording, from a decade later than the one reviewed above and with much more of a technical story behind it. The original recording was made at the dawn of the digital era, before the advent of CD, with the Soundstream recording system, which had a sampling rate of 50 kHz. To produce the original compact disc, that sampling rate had to be converted to 44.1 kHz, the CD standard, resulting in certain digital artifacts, not to mention the reduction of the theoretical frequency range from 25 kHz to 22.05 kHz. Now that the DSD technology is available, the Soundstream tapes can be remastered to SACD without any such constraints, and the present disc is the result. This is a 2-channel SACD (no multichannel information was recorded in 1979-80) and, indeed, it sounds quite comparable to today's best stereo CDs, except in the fortissimo climaxes, where there appears to be some compression. The now obsolete Soundstream system was actually superior in some ways to the early Sony digital recorders. As for the performances, this is the Cleveland under Maazel, so how can they be anything but very good? They are, but the story here is the Soundstream to DSD conversion and resurrection. Ain't science wonderful?

***Peter Ilyich Tchaikovsky:** 1812 Overture, Op. 49; Polonaise from Eugene Onegin, Op. 24; Capriccio Italien, Op. 45; Marche Slave, Op. 31; Waltz from Eugene Onegin, Op. 24; Festival Coronation March; Cossack Dance from Mazeppa. Cincinnati Pops Orchestra, Erich Kunzel, conductor. SACD-60541 and DVDA-70541 (1998).*

Some extra ballyhoo accompanied this production, ostensibly demonstrating that Telarc is equally good at SACD and DVD-A—we make 'em, you pick 'em. Upon closer examination of the facts, a fly appears in the ointment. The DVD-A was made from the same DSD masters as the SACD, not from original PCM masters, so where's the comparison? It's a marketing gimmick, not an engineering exercise. What's more, the performances are strictly routine run-throughs, without any distinction, and the surround sound in either version is so-so, far surpassed by the Berlioz and Mahler recordings of Telarc reviewed above. This 5.1 audio is far from the ultimate in depth, spread, and envelopment. I'm a great admirer of Robert Woods, Jack Renner, Michael Bishop, and company, but I'm sorry—this is not their best effort. Nor Kunzel's, for that matter. TAC