

The Audio Critic®

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In this issue:

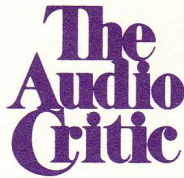
We return to our specialty, objective/subjective reviewing of speaker systems, with an in-depth study of four full-range ribbon loudspeakers and two others.

We review a brilliant \$17,500 parody of the high-end power amplifier scene, along with some good amps and preamps for the common people.

The truly revolutionary new Win FET phono cartridge is reviewed in full for the first time anywhere.

Our first test-bench encounter with CD players and other digital equipment is reported, and the results of listening comparisons are discussed.

Progress in the orchestral sector marks the return of our "Records&Recording" column; and more features.



Issue No. 11

Winter/Spring 1988

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Consulting engineers and other technical advisers are engaged on a project basis, some contributing under their by-lines, others working anonymously.

The Audio Critic® is a quarterly advisory service and technical review for consumers of sophisticated audio equipment. An conclusion, rating, recommendation, criticism or caveat published by **The Audio Critic** represents the personal findings and judgments of the Editor and the Staff, based only on the equipment available to their scrutiny and on their knowledge of the subject, and is therefore not offered to the reader as an infallible truth nor as an irreversible opinion applying to all extant and forthcoming samples of a particular product. Address all editorial correspondence to The Editor, The Audio Critic, Box 392, Bronxville, New York 10708.

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For subscription information and rates, see inside back cover.

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Note: All unsigned articles and reviews in this issue were written by Peter Aczel, Editor and Publisher.

From the Editor/Publisher: Miscellaneous Musings, Notes and Notices

Never apologize, never explain, warned the worldly-wise Evelyn Waugh. In that spirit, we ran six pages of paid advertising in our comeback issue (No. 10) without a word of editorial comment on this change of policy. We were right. Nobody objected. In fact, very few readers expressed any opinion at all on the subject, and those who did were all in favor of our accepting ads from audio manufacturers and/or dealers, citing the importance of advertising revenue in magazine publishing. We are now kicking ourselves for our simon-pure, Consumers-Union-inspired posture of 1977-81; had we unbent a little, the resulting extra income just might have helped us get our act together and—who knows?—prevented our sudden demise. Today we understand, as we should have but did not at the time, that the same total of fourteen and a half loonies from coast to coast will bad-mouth our ethics and attest to our venality behind our back—whether we publish paid advertising or not. To give up needed income in a futile attempt to appease these monumentally unimportant malcontents would be, and indeed was, very poor business judgment. As you can see, we are continuing to run ads in this issue, with full confidence in the ability of our readers to distinguish unbiased, documented test reports from genuflections to advertisers.

* * *

You may have noticed that this issue is dated Winter/Spring 1988, instead of Winter 1987-88 as advertised. The reason is that the previous issue, originally announced as Fall 1987, turned into Fall/Year-End 1987 when it barely made it to the printer at the end of fall, in December. We are trying to maintain something reasonably close to a quarterly schedule in 1988, with three more issues still to come within the year, but of course our cover dates must reflect some semblance of reality. We have not changed our plans to publish six issues in 1989, although a lot of organizing and staff building remain to be done between now and then for those plans to materialize.

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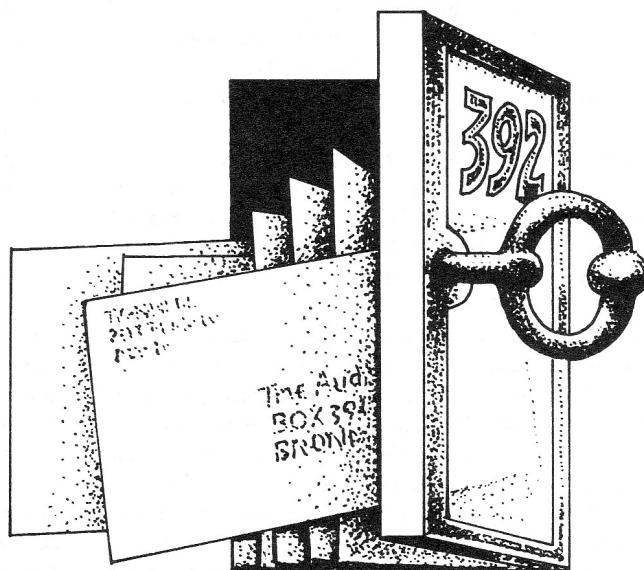
Many of our subscribers appear to be somewhat uncertain as to the length and expiration of their paid-up subscription, especially those who are now receiving issues owed to them as of 1981. In all cases, the answer is very simple. Just look at the number in the upper right-hand corner of your mailing label; it is the number of the last issue you are currently entitled to, no matter when you subscribed. (This is Issue No. 11.) We have been extremely conscientious in determining these numbers, always giving the subscriber the benefit of the doubt in marginal cases (such as fractional issues owed, etc.) and extending the subscription at the most favorable rate when additional payments were received before expiration. Our administrative time and office help being very limited, we hope this clarification will be sufficient to obviate the necessity of individual replies to queries.

* * *

In general, a stamped and self-addressed envelope should be enclosed with any specific query to which you expect an individual reply, unless you are calling our attention to a subscription foul-up which is clearly our fault. We shall try to answer succinctly all legitimate questions, at the very least by scribbling on a Xerox of your letter, but that commitment emphatically does not extend to private advice on equipment purchases.

Box 392

Letters to the Editor



The mail has been overwhelmingly (and heartwarmingly) favorable in response to Issue No. 10, but we are not going to clutter up this column with nice, straight, unkinky love letters. We appreciate them immensely and thank their writers from the bottom of our heart, but here we want information, elucidation and confrontation, not facile applause. Some of the ground rules governing the publication of letters were explained in No. 10; others will become apparent as the plot thickens. Any communication of serious editorial interest coming from a reasonably credible source is likely to be published. Letters may or may not be excerpted, at the discretion of the Editor. Ellipsis (...) indicates omission. If intended for this column, your letter should be addressed to The Editor, The Audio Critic, Box 392, Bronxville, NY 10708.

The Audio Critic:

Congratulations for the comeback.
Please enter my subscription...

With best regards,
Prof. Matti Ojala
Helsinki, Finland

Okay, okay. Publishing this may be a slight contradiction of our introductory remarks above, but we could not resist the opportunity to note that the best minds in audio are among our strongest supporters. Other great practitioners called instead of writing and said gratifying things... No, enough!

—Ed.

The Audio Critic:

Welcome back !!!...

I certainly hope you have your act together this time. We need more snobs in this business, and you are the best.

Best wishes,
Ed Freeman
Los Angeles, CA

Snobs? How preposterous! All we ask of our inferiors is a little bit of humility. Does that make us snobs?

—Ed.

The Audio Critic:

This letter is being sent to the editors of all the audio magazines to which I currently subscribe. I have a question which I invite any or all of you to address.

My question is this: Why are the disagreements among the various points of view...printed in the consumer-oriented audio press so acrimonious? Arguments over ideas or positions often turn into attacks directed at the integrity or competence of individuals. Although strong differences are common among people involved in other subjects (music reviewing for instance, the other side of our hobby), no other field that I have participated in has disagreements as intense, as personal, and as bitter as the audio press.

Perhaps you might consider inviting articles on this topic from readers with appropriate backgrounds in psychology or psychiatry. It would be interesting to at least understand why these disagreements are so intense, even if this situation remains unchanged.

J. B. Oakley III
Tulsa, OK

A perceptive and highly relevant question, deserving a thoughtful answer. Let us try:

Audio, as a general discipline, and equipment reviewing, in particular, lie in a disputed border territory between science and subjective opinion. That can be a highly volatile situation, conducive to all kinds of nastiness, but not nearly as specific to "our hobby" as you seem to believe. For example, as a longtime breeder and exhibitor of pure-bred dogs, your Editor can assure you that dog-show people are just as prone to malicious and hysterical antagonism as underground audio journalists and for comparable reasons, arising out of the turbulence at the interface of factual knowledge (genetics, canine anatomy, the written breed standards) and value judgment (by dog judges in the show ring). The similarities are quite poignant to someone active in both fields.

In audio, the conflict between science and subjectivity derives its special vehemence not from an irreconcilable dichotomy in the discipline itself—after all, the accuracy of a sonic replica is not nearly as much a matter of opinion as the quality of the original—but from

the major gaps in knowledge that divide the various factions. More than nine years ago, in Vol. 1, No. 6, we editorialized that "the... 'dynamic range' from pure bull to sheer brilliance that characterizes today's audio scene is by far the widest in history..." Well, it seems to be even wider today. Our most recent reading ranged from a superb AES paper on digital dither by the erudite Canadian duo, Stanley Lipshitz and John Vanderkooy, all the way down to irresponsible dispatches from cuckoo country (on the subject of headshells) by the tragically untutored Enid Lumley. Such a fundamental inequality between published practitioners in the same field is bound to result in contempt from above and, as a natural reaction, hatred from below. It is the situation analyzed a century ago by Nietzsche in terms of the two German words for "bad"—schlecht (bad, in the sense of inferior or worthless) is applied from a position of superiority, böse (bad, in the sense of wicked or vicious) from a position of inferiority. Either way, perceived badness leads to acrimony.

Historically, as we see it, it was Harry Pearson who exacerbated the contentious tone of audio journalism to the point where it became distasteful to a large number of readers. Before he came out of the woodwork in the mid-1970's, a thin veneer of professional manners covered the inevitable antagonisms. Once he broke the nastiness barrier, others followed suit, and we ourselves were no exception on certain occasions. It is difficult to remain polite in a snarling environment, especially when you are a natural counterpuncher.

As for the relatively greater restraint that exists in music reviewing, your may very well be right, but are you familiar with the play and movie reviews of John Simon? Not exactly sweetness and light.

—Ed.

The Audio Critic:

...The two articles on Carver and his amps were especially interesting and important, I felt. Keep up the good work! Can you verify that current production models of the M-1.5t amp do in fact sound like the original prototype? Perhaps you'll test his tuner and preamp and speakers.

Also, I hope [in] each issue you have some sort of "Recommended Components" guide. I find such a summary

of findings to be helpful.

Thanks, and good luck,
Paul C. Welz
San Francisco, CA

Yes, as recently as January 1988, we tested a brand-new production sample of the M-1.5t (S/N 14004) against the hand-wired duplicate of the prototype Bob Carver had left with us in late 1982. Into monstrous reactive dummy loads (worse than any speaker) and with pink noise and USASI noise as the signal sources, the left channels gave us a -52 dB reading on the null test and the right channels -54 dB. The -74 dB null obtained in 1982 against the ML-2 was admittedly a more sensational result, but it took many hours of bench setup, fanatically careful connections and wire dressing, bated breath—and even then the reading drifted as soon as somebody blinked. The recent test was quick, not nearly as meticulous and sensitive, but still entirely convincing, since even a null of -40 dB is more than sufficient for total indistinguishability in listening tests. We could hear no difference between the 1982 and 1988 units, no matter what kind of music they were amplifying, even when A and B were fully identified. We therefore dispensed with the ABX test.

On the other hand, we must confess that by our 1988 standards the five-year old M-1.5t is no longer among our favorite power amplifiers. It has served honorably and it still sounds good, but time marches on—the ML-2 sound, which dates from the mid-1970's, has been handily surpassed. At this point, none of the above is of much more than academic interest, since the M-1.5t is about to be discontinued.

The Carver speaker, as you can see, is reviewed in this issue; summaries of reviews with updated recommendations will be forthcoming, but not before there is more of an accumulation than thus far.

—Ed.

The Audio Critic:

I read your interesting Issue No. 10 and have some comments about "the Carver controversy." I purchased the amplifier while I was working in Maryland and have not been happy with its performance since day one. There are some technical errors in the original article [as regards] the production model. I have serial number 1431.

(We have taken the liberty of assigning numbers to the various points you bring up, for easy reference in our reply below.—Ed.)

[1] The circuit topology is not complementary symmetry from input to output. [2] A FET input op amp IC (TL081) is used as an input amplifier. From personal experience I would say an AD711 sounds more like a Levinson product. [3] The circuit does not use the fastest output transistors; I recently tried some 60-MHz output transistors and they sounded better, but probably because their HFE was three times higher, reducing power supply modulation. I don't think the Carver circuit is able to make use of their speed. [4] There is still an output filter on the amplifier. Yes, the coil in series with the output is gone, but an RC filter is in parallel with the output jacks. [5] There are only two WIMA MKP10 polypropylene capacitors in the circuit. I know you didn't mention brands in your article, but I don't know why he didn't keep on using them in the other positions where he has changed the circuit (this according to the preliminary service manuals I purchased from the Carver Corporation).

Looking at the schematics of the various revisions of the M-1.5, I notice one other thing missing: [6] Where are all those transistor rebiasings? [7] All the voltage gain stages are the same, the open loop compensation capacitors are the same value, only the feedback around the IC has been changed, the loop gain changed, the input Z changed and the inductor removed. Big deal.

My friend's Electrocompaniet Ampliwire II has an output filter and sounds fine. My Carver M-1.5t collects dust and any "off-the-wall" modifications I come up with, until I find a way to make it sound like a good amplifier.

Sincerely,
Edward D. Berger
Oakmont, PA

P.S. I don't like the sound I've heard from Levinson or Cello amplifiers either.

[1] False. [2] True, but that does not negate the complementary symmetry. [3] 60-Mhz transistors are good for high-speed switching power supplies; they are not suitable for linear applications. [4] False; the RC network does not perform a filter function but is part of the feedback network. [5] True; the

polypropylene capacitors are used where they make a difference. [6] In the second class A stage, in the bias regulator, in the driver transistors, and in the output transistors. [7] First two statements false; the rest true. The second class A stage and the bias regulator are not the same; their gain was changed. Said capacitors are not the same value.

"Big deals" and other amplifiers, good or bad in your opinion, are completely beside the point. All we ever claimed was that the M-1.5t faithfully replicates the sound of the old Levinson ML-2, which you are free to like or dislike. The ML-2 is gone now, and the M-1.5t is also on its way out, as we said above, but the facts remain.

—Ed.

The Audio Critic:

Welcome back! After suffering for nearly seven years with inferior publications, I am overjoyed to have received Issue No. 10 in today's mail. Your review of the MESA/Baron is a perfect example of the sort of information that cannot be found elsewhere.

I wonder if you have any suggestions as to where one can find reliable information on video products? I recently developed an interest in that area and have found The Perfect Vision virtually worthless and Videofax sorely lacking in reviews of televisions, a component they seemingly have forgotten as part of the video experience.

Best wishes for the future.

Sincerely,

John R. Levy

Fort Lauderdale, FL

We have good news regarding the modified MESA/Baron M180. Randall Smith is definitely going ahead with the project of producing and selling an audiophile version of the amplifier. We hope to have final details in our next issue—maybe even a review.

The growing interest in top-quality video has not escaped our attention; we intend to devote some space to it in the very near future. Large-screen TV with multichannel sound is the ultimate media trip for stay-at-homes and is ready for some serious testing.

—Ed.

The Audio Critic:

Yes, it is good to read again the well-written pages of The Audio Critic. Welcome back and good luck.

However, I do wish to make a suggestion. In reference to Dr. Hill's Plasmatronics speaker system [Issue No. 10, Fall/Year-End 1987, p. 11], you appear to go beyond what you need to say about this speaker. (Even sounding a little bitchy?) First, it does require helium: that is necessary to its design. If it is expensive, so what? The [Infinity] IRS and Wilson products are also expensive. Of real concern is your acceptance of the gossip about the "poisonous" nature of the Plasmatronics speaker. If you know Dr. Hill—and I assume you must have met him at one time or another—you must know that he is a gentle soul and would not ever sell a product which would "poison" his customers or the general public. Dr. Hill is a much better scientist than that! In fact, some "scientists" look upon audiophiles as a peculiar breed and dismiss them with a statement like, "Twenty hertz to twenty thousand hertz—that's not difficult." He is one of the rare breed of scientist-audiophiles, who does not think audiophiles are nuts and who is willing to try different technologies to achieve the audio Nirvana audiophiles claim to want. He should not be labeled for that attempt "bizarre," as you characterize him.

I have attached Dr. Hill's reply to the unfounded "ozone" gossip which unfairly circulated about the Plasmatronics speakers. You should read his statement and modify to some extent your biased view of the Plasmatronics speaker. That speaker remains a courageous attempt to give the audiophile what he wants: purity of sound, by a means that only someone familiar with the real physics of sound can appreciate. A thirst for helium and unfounded fears of ozone are really unfair indictments of a scientifically sound design. The speaker is NOT dangerous and will not cause listeners ill effects. You have not been fair to Dr. Hill and have failed to take real measure of his achievement.

I hope you are fairer to other and lesser products, and less tuned-in to misinformation.

Respectfully yours,
Carl E. Miller
Columbus, OH

Whew! Sorry for not remembering how thin-skinned champions of lost causes can be... We do try, however, to express our thoughts with some degree of precision. In your zeal to reel off the

party line in defense of the Hill speaker (confess—you parted with \$10,000 plus tax to own a pair, or are we off base?), you forgot to double-check our sentence on the subject. We never breathed a word about the cost. We never called the speaker poisonous or Dr. Hill a poisoner. We never labeled him bizarre. We wrote that ozone is poisonous, which is a fact, and that the speaker system is bizarre, which is a considered opinion shared by many.

After reading Dr. Hill's "Notice to Dealers, Distributors and Audiophiles" that you enclosed with your letter, we are quite satisfied (1) that the amount of ozone (triatomic oxygen) generated by the Plasmatronics speaker is totally insignificant and harmless, (2) that trace amounts of the healthful negative ions of diatomic oxygen produced by the speaker might sometimes be mistaken for ozone because of the slight resemblance in smell, and (3) that the ultraviolet emission from the speaker (which we did not even bring up) is also completely negligible and nonhazardous.

Those reassurances remind us of the old Béla Lugosi film in which, as we recall, the girl is frightened by the mad scientist's gorilla. "Doan't be afraid," he says, "he is onder hevvy seedation." The Hill speaker may have been rendered harmless, but it is still a monster (just look at that big ugly cylinder of compressed helium) and still a creature of the experimental laboratory rather than a civilized presence in the music room.

We consider ourselves to be reasonably "familiar with the real physics of sound" and do not feel we have belittled Dr. Hill's technical achievement, as such. A linear electroacoustic transducer without moving parts has undeniable appeal, and we realize that Dr. Hill has made a positive contribution to the technology that started in the early 1950's in Paris with Sigmund Klein's invention of the Ionophone tweeter (known as Ionovac in the U.S.). The Hill plasma transducer appears to be the most advanced implementation of the basic concept so far, with response from about 700 Hz to virtual infinity, but the other half of the Plasmatronics speaker system is still quite conventional and not particularly impressive. A full-range, monolithic, crossoverless plasma speaker (fat chance) could make us overlook more than a little awkwardness and, yes, bizarreness, but in its present ungainly form, which is neither

fish nor fowl, the Hill speaker does not meet our minimal commonsense standards for domestic audio gear and does not interest us for purposes of testing—and that is all the offending sentence was intended to mean.

—Ed.

The Audio Critic:

Welcome back!...

Issue No. 10 looks quite good, but I would like to raise what is probably an obvious sticky point. In [your] reply to [the letter from] Frank Pulli, you state that the Fourier situation should not be decided without hearing the Model 8e. With the company gone, this poses a problem, which I believe I have a solution to.

How about releasing the design into the public domain? This would allow analysis and discussion about the design, as well as giving diehards info to roll their own.

I hope this doesn't sound like asking you to part with one of your children, but it could avoid some complaints (and start a whole round of debate, no doubt).

If the design contains a custom driver, perhaps the approach would be to let a supplier like Madisound offer a set of parts. I am assuming that they could get the old vendor to make the special parts simply by asking for a quantity of them.

Again, I wish you success.

Sincerely,
Carl Van Camp
Lansing, MI

The Audio Critic:

...It is good to have a "voice of reason" back in audio reviewing.

As a continuation of the Fourier story... there are a number of do-it-yourselfers who would love to have plans (tech info) on the 1's and 8e's, if you have no further plans toward the commercial loudspeaker business...

All readers (most, anyway) would like to learn from your investigations into crossovers and driver design...

Sincerely,
Connol Reid
Phoenix, AZ

The matter is not quite as simple as either of the above letters assumes. A good roll-your-own or do-it-yourself speaker system is designed as such from the ground up. The making of Fourier

speakers involved various steps and procedures not easily translated into the simplicities of the typical home workshop. The end result would suffer, unless some serious kit engineering were undertaken beforehand.

Another problem is that vendors require a commitment to a cumulative total of at least 1000 (more often 2000) units of a special-order, "dedicated" woofer, such as was used in each Fourier model. Who could guarantee that kind of interest among home constructors?

We are still doing a bit of loud-speaker R and D for our own edification, without any commercial involvement, and as a result we have progressed well beyond the more than four-year old Fourier 1L and even a little past the two-year old Fourier 8e. If we published anything for "analysis and discussion," disregarding the home construction impediments, we would want it to reflect our latest thinking and the most up-to-date computer support. We are not quite ready for that yet.

Should any finalized hardware result from our current investigations, the readers of The Audio Critic will be the first to know.

—Ed.

The Audio Critic:

I appreciate the complimentary copy of TAC, but concern about your attitude gives me pause. Your reply to Dr. Eichenwald was shocking. Rather than admitting you were wrong not to refund money owed on an unfulfilled subscription (even if only \$12.50), you turn around and attack the doctor. You do not seem contrite about leaving your subscribers high and dry for about seven years. Samuel Johnson is not venerated because he made customers wait many years for their books, but rather in spite of that. He should have been contrite, too.

You take a similar arrogant attitude with regard to the guy who regretfully bought the Fourier 1. You compare yourself with Shakespeare.

Failure in business is a fact of life. Failure to pay debts is excusable only in cases of bankruptcy. Your repayment of those debts now (albeit in kind and without interest) furthers your redemption. But your arrogant attitude impedes it.

Sincerely,
Marc Richman
Washington, DC

Leave it to someone who is not, and never was, a subscriber and thus could not have been left high and dry, but who did manage to wangle a free copy of Issue No. 10, to be such a stern guardian of our morals. We admit that contriteness is not our bag; we never regarded it as useful equipment for the audio journalist—or the encyclopedist, for that matter.

Now for the facts: Refunds on unfulfilled subscriptions were available from us on request for quite a while, until the money ran out. We could have filed for bankruptcy at that point, but we kept hoping to resume fulfillment eventually, as we are doing now. The Shakespeare rap leaves us dumbfounded; where in that sentence did we equate ourselves with him? Are you serious?

The good doctor (we love that cliché—as if none were bad) constitutes a special case, in a class by itself. We obviously touched a nerve there. Some readers reacted with unrestrained whoops of iconoclastic joy, others felt we had committed sacrilege. We never believed that an M.D. degree gave its bearer some kind of diplomatic immunity from being considered asinine, but it is clear that such irreverence offends the sensibilities of various sociocultural groups.

In this particular instance, Dr. Eichenwald ended up as the most authoritative source of evidence in support of our "shocking" comments. He wrote us a (get this!) 4-page single-spaced letter, with a 3-page single-spaced curriculum vitae as an enclosure. The letter ends with the statement that we do not have his permission to publish it (because we would most likely respond to his criticism by poking fun at it); however, no one can take away our First Amendment right to discuss what the good doctor said. What a case history!

It turns out that he is a 62-year old pediatrician of the utmost academic and professional distinction; his résumé starts with primary school in Switzerland (whence his humorlessness may spring), continues with magna cum laude at Harvard and the finest medical education at Cornell (plus New York Hospital), goes on to professorships, department chairmanships and staff commands at various major universities, medical schools and hospitals, and then lists the most dazzling assortment of professional honors. A veritable giant in his field. This giant proceeds to berate the hapless Editor of this hardly

gigantic journal, in ringing Germanic tones alternating between hectoring and condescension, for commercial hucksterism, lack of business ethics, poor loudspeaker design, incorrect evaluation of amplifiers, loss of respectability and, as a recurrent theme, the attack on his medical ethics. The fact that we never even nudged the subject of his medical ethics does not seem to intrude on his knee-jerk indignation. Perhaps what we actually wrote, expressing disappointment in his intellectual priorities and emotional maturity as they reflect on his stature as a healer, was so much more traumatic that it had to be tuned out. It does not occur to him that he is proving our point with his epistolary marathon—can you imagine a Dr. Salk or a Dr. De Bakey caring so desperately about an audio journalist's opinion of them? Would they have dared us to print a hate letter to begin with?

Here comes the most hilarious part: After his paroxysm of contempt and rejection, he offers to send us the detailed results of his and his friends' private tests of the Carver M-1.5t, which he claims will prove us dead wrong on the Levinson sound-alike issue—provided we publish them in The Audio Critic and Carver reprints them in an advertisement! In other words, even though we are naughty boys, he would like to play with us in our electronic sandbox, as long as he can bring his own pail and shovel. We ask you—were we wrong when we did not take the good doctor seriously?

—Ed.

The Audio Critic:

Welcome back. No other magazine I've seen has filled the void that you had left...

About amplifiers: In Vol. 2, No. 2, p. 37, you said to "forget about 'black box' tests (comparing the output against the input) in general." In that issue, you wrote favorably about the sound of the Bedini 25/25, despite its being a "test-bench turkey," and you seemed certain that it would indeed measure beautifully, if only you knew what to measure. At that time, how could any reader have known whether or not you were correct, or whether you were taken by some euphonic colorations imposed on the signal by the Bedini? Now, with the advent of people like Bob Carver and his skill in duplicating an amplifier's transfer function

(and after other advances that have occurred since way back when), I imagine you probably have a better understanding of what makes amplifiers sound the way they do. It would be nice to have a more detailed statement of your current views on the subject. Was the Bedini really an audible yet enticing signal processor? Or, more importantly, what do you feel are the most revealing "black box" tests nowadays, and how useful are they?

I'm delighted to see that your acerbic wit is intact; your remarks in Issue No. 10 about Matthew Polk and his speakers were highly appropriate, in the best Audio Critic tradition. Please don't stop remarking on the excesses of the audio marketplace and its press. The old "Admonitor" column was a fine feature...

You use a number of foreign phrases in your magazine. Personally, I'd prefer to see more German and less Romance, but that's just my taste. *Jedenfalls*, I'm thankful that you at least don't butcher German spelling, grammar and capitalization the way The Absolute Sound et al. have been known to do...

Thanks again for returning from the dead. I really appreciate your understanding of audio technology, your writing skill and style, and your willingness to call 'em like you see 'em. I hope you stay around for a long time.

Sincerely,
Tom Ace
Boulder, CO

"Test-bench turkey" was a little too brusque anent the Bedini 25/25 (we were younger then and more impetuous); actually, as the review stated, most of its parameters were quite felicitously chosen, even if the use of the speaker wire as the stabilizing series inductance was a somewhat crude touch. Today we would pay more attention to its input impedance and output impedance characteristics, subsonic response (i.e., high-pass filter characteristics), distortion spectrum (not just THD) and other little black-box clues to audible performance we have picked up since, which now give us greatly increased faith in I/O comparisons. Yes, judged against, say, an all-JE-990 signal path by Boulder, the Bedini 25/25 does appear in retrospect like a mild signal processor, but we see no reason to take back what we wrote about it in a 1979-80 context.

By the way, have you heard that Madame Tussaud's of London has made an offer to buy the wax sculpture of Matthew Polk that Polk Audio's ad agency is using in all those full-color advertising spreads and brochures? The famous waxworks would like to add it to their permanent gallery of geniuses. Apparently the agency is reluctant to part with the piece because they would then have to think of another great campaign, but it is rumored that consultant Vincent Price has come up with a radical yet mutually acceptable solution.

As for our use of foreign words and phrases, we generally restrict ourselves to those that have been naturalized in English. Since there are many more Latin and French entries than German in the Merriam-Webster dictionaries, the existing immigrant quotas, as it were, are simply not in accordance with your preferences. We are not afraid, however, to sneak a nonresident alien into our vocabulary when it is le mot juste; for example, it is our opinion that those Schöngelster at TAS need elementary coaching in science more urgently than in German.

—Ed.

The Audio Critic:

...When I read of the imminent return of The Audio Critic, I looked forward most of all to the fire-and-brimstone broadside I expected you to fire at the digitization of music. When you left us seven years ago, your last word on the subject was basically this: Concept, A+. Execution, C-. Your reservations have apparently been taken care of since then; mine have not... [at a sampling rate of 44.1 kHz... [etc.]]

Sincerely,
John Steinberg
Balboa, CA

We are not printing the earnest but flawed two-page argument against 44.1-kHz sampling and the Nyquist-Shannon sampling theorem that follows the above. It would only tend to muddy the waters for newcomers to the subject.

We are aware that said subject is booby-trapped and that we added to the confusion with our remarks seven years ago. We owe it to you and other readers who have been stirred up by similar arguments to clarify these matters, and we are beginning to do so in this very issue, in the article on CD players.

—Ed.

Audiophile Loudspeaker Systems (Mostly Ribbon) from \$1576 to \$7000 the Pair

Here we go again. It is becoming painfully obvious that once you get past a certain price point, more money will not necessarily buy you better sound. Especially not in the delirious world of high-end, high-tech speaker systems, six of which are reviewed here.

This is in effect a dipole speaker survey. All of the speakers discussed below are open-backed dipole radiators, except the Dahlquist DQ-20 (which tries to look like one but is not). Dipoles are more difficult to measure than sealed or vented boxes; for one thing, the highly accurate Keele method of measuring the low-frequency response with the microphone almost touching the diaphragm does not work with an open baffle because the opposite-phase front and rear waves cannot be summed at that point. The room also becomes a more intimate part of an open-baffle system than of a box speaker, the distance from the back wall being a particularly significant variable, and thus the repeatability of the measurements is inevitably compromised.

Our laboratory tests of these speakers should therefore be considered exploratory or diagnostic, seeking measurable causes of audible effects, rather than an attempt to obtain certifiable performance figures. Where there is a significant glitch or design flaw, you can be reasonably sure that we have nailed it, and we do believe that our procedures are thoroughly sound and realistic, but we are not the National Bureau of Standards and our numbers cannot be interpreted as "official."

Apogee Scintilla

Apogee Acoustics, Inc., 35 York Industrial Park, Randolph, MA 02368. Scintilla three-way full-range ribbon loudspeaker, \$3995.00 the pair. Tested samples on loan from owner.

To begin with, this very beautiful-sounding but crazily amplifier-dependent speaker system is not all-ribbon, as claimed. Nor is any other Apogee model, old or new. The woofer design in these speakers is more or less the same as in the familiar Magneplanar systems, appropriately called "planar-magnetic driver" by Magnepan and fictitiously yclept "a bona fide ribbon" by Apogee, probably because they feel that only a 100% ribbon system has the required

high-tech image. We are not particularly upset by the false nomenclature, since a planar-magnetic woofer by any other name would sound as sweet (sorry, Will)—if it were a sweet design concept to begin with, which it is not. More about that in a moment.

The heart of the Apogee Scintilla, and its indisputable claim to fame, is the combined midrange/tweeter assembly with five loosely suspended four-foot ribbons, one wide and four narrow, within an integrated magnet structure. It is a true ribbon transducer, although a little on the idiosyncratic side, or shall we say an engineering think piece? One grows quite fond of it, watching those ribbons flop this way and that, with more degrees of freedom than would seem correct, but producing delicious sounds nonetheless. The two narrow ribbons in front move forward in response to a positive signal, while the two in the back move rearward, so that the tweeter is an approximation of a pulsating cylinder. The wider midrange ribbon, sandwiched in between, moves in phase with the front tweeter ribbons and with the woofer panel. The overlap in flat response capability from woofer to midrange to tweeter permits the use of first-order (6 dB per octave) slopes in the passive crossover with impunity.

The woofer is another story. The thin plastic sheet to which the conductive foil grid is bonded (with a horizontal orientation of the elements, in contrast to the vertical pattern of the Magneplanars) is in the shape of a right-angled trapezoid, four feet tall, and is clamped around its perimeter. We never liked this "drumhead" approach to bass reproduction (see our 1978 and 1979 Magneplanar reviews), since it tends to leave the plastic diaphragm grossly underdamped, regardless of the latter's shape and without the possibility of a cure. The resulting high-Q peak in the response is equalized out to some degree by the slope of the open-baffle bass cancellation; in fact, that is the basic principle which Bob Carver quantified and harnessed so cleverly in his speaker (see the Carver review below), but in the Scintilla and other Apogee designs this natural phenomenon appears to be hap-

hazard and the dominant peak remains, always followed by a characteristic dip (analogously to the familiar peak-dip filter). What the trapezoidal taper of the diaphragm achieves is a widening of the effective passband through the gradual staggering of resonant modes; however, the excursion of the diaphragm is in resonant segments as a result, so that only part of the total surface is available to move the air at any given frequency. In other words, the woofer is not as big as it looks.

We could go into further details on all this (see also the Apogee Diva review below), but the truth is that we have limited patience with plastic-sheet woofers—ribbon, planar-magnetic, electrostatic or what have you. As our erstwhile associate, Bruce Zayde (now up to his golden ears in computers at Hewlett-Packard), used to say when the talk turned to the drawbacks of conventional electrodynamic speakers, “the woofer is not the bad guy.” Cone-type woofers, in correctly designed enclosures or baffles, are very hard to beat and still at the head of the class in our school. We find the conceptual appeal of “all ribbon” or “all electrostatic” quite specious, especially when there is a crossover network in the system. It came as no surprise, therefore, that the low-frequency performance of the Scintilla is not its long suit. First of all, the woofer panel buzzes and breaks up all over the place when swept sinusoidally—at all levels. Then there is a huge peak in the 1-meter response at around 32 Hz, some 14 or 15 dB above reference level, varying slightly with the exact microphone location. It is followed by smaller peaks, of the order of 4 to 6 dB, centering on 100 Hz and 220 Hz. In listening quality the bass is not as flawed as the lab tests would indicate; it is merely unremarkable. Reviewers who raved about it must have been accustomed to Celestion SL600’s.

By contrast, the 1-meter response above 400 Hz or so is impressively flat over almost five octaves up to 10 kHz, after which there is a dip of 8 or 9 dB to 15 kHz, followed by a return to reference level at around 19 kHz. The dip is the result of phase cancellation, confirmed by tone bursts and clearly due to the reversed polarity of the two tweeter ribbons in the rear. Elsewhere in the audio range, the quintuple ribbon assembly reproduces tone bursts very well and the woofer panel not too badly, with just a bit of ringing. Pulse replication is quite coherent, since the woofer panel, the midrange ribbon and the forward-firing tweeter ribbons are all in phase. The audible outcome of all this is absolutely gorgeous sound from the lower midrange upward—uncolored, sweet, liquescent, beautifully detailed and untrammelled in dynamics—demonstrating the low distortion, high power handling and superior wave launch of a well-designed ribbon. The stereo image and dimensionality are somewhat dependent on room placement and the tilt of the baffles, as can be expected, but leave nothing to be desired after a little massaging.

Now, cancel every bit of the positive commentary above, forget the Scintillas altogether, unless you have the equipment to drive them with. Here we come to the crux of the matter. The nominal impedance of the speaker is 1 ohm;

we measured 1 to 1.4 ohms up to 2 kHz, after which there is a smooth rise to a plateau of 2 ohms that extend from 5 to 20 kHz. A ridiculous load for normal amplifiers, even some of the best. At the same time, the efficiency is miserably low; an input of 1 watt yields 73 dB SPL at 1 meter according to our measurements. With an input of 2.83 volts (representing the sensitivity reference of 1 watt into 8 ohms) the SPL at 1 meter is 82 dB. Thus, to obtain 103 dB SPL in mono and 106 dB in stereo, which is roughly a Wagnerian climax as heard in the first few rows—and let us not even bring up rock concert levels—you need an amplifier that can deliver 1000 clean watts into 1 ohm. The Krell KMA-200 or the even costlier KRS-200 can certainly do that; some of the lesser Krells come close but no cigar; the Carver “Silver Seven” vacuum-tube power amp (see the review in this issue) was the most suitable we had on hand for these tests and it, too, comes close but quits in the high hundreds (with a 1-ohm load, that is). There may be a few other options for the faithful, but the point is that adequate amplification will in all probability cost even more than the speakers. We find that hard to approve of.

The main reason for this review of a more than three-year old product—just when the Diva is being touted as the latest-and-greatest super speaker from Apogee—is that the Scintilla is still, in our opinion, designer Leo Spiegel’s best effort to date. After the original Apogee Full-Range speaker (now \$10,000.00 the pair), which was a kind of laboratory of ideas in which first-time shortfalls were almost inevitable, it was the Scintilla that emerged as the highly creative albeit somewhat impractical solution to the defined complexities of the problem. Subsequent models seem to reflect the pressures and constraints of the marketplace and possibly subjective second-guessing by dilettantes with a say-so in product development—that is our intuition, not our information. The speaker that makes us respect Apogee and Leo Spiegel is the Scintilla, warts and all.

Apogee Caliper

Apogee Acoustics, Inc., 35 York Industrial Park, Randolph, MA 02368. Caliper two-way ribbon loudspeaker, \$1995.00 the pair. Tested samples on loan from owner.

To our mind, this is a poorly conceived product. The Apogee format does not translate well into a reduced-size speaker system. Just because the marketing people need an entry-level model to be able to offer their dealers a full line, the inherent engineering problems cannot be expected to go away. The Caliper is in effect a small-signal loudspeaker that uses an unnecessarily complex and costly technology to achieve its limited performance. Although not nearly as large, intricate and expensive as the other Apogee speakers, it is still too much of all that for what it does.

The woofer panel buzzes at numerous frequencies with a sinusoidal input of only 6 watts or thereabouts; we wish we could say that such is not the case when the signal is music, but the fact is that heavy symphonic or rock bass

quite regularly excites the resonant modes to the point of audible buzzing. The fundamental resonance of the panel is at 36 Hz, where there is an 8 dB peak. That defines the low-frequency cutoff of the system. All general comments about the design of Apogee woofers in the Scintilla review above apply here as well.

The single-ribbon midrange/tweeter of the Caliper is, by contrast, quite well-behaved when swept and sounds fairly smooth, possibly a little hot in the 2.5 to 4 kHz region but not offensively so. It moves forward in response to a positive signal, whereas the woofer moves rearward. Wiring the drivers out of phase in a system with 6 dB per octave crossover slopes is strictly an amplitude-response tailoring expedient and not very sound practice, since it destroys coherence. The overall response curve of the Caliper, taken at the best “sweet spot” we found for the microphone after considerable hunting, shows a downward-sloping trend from 300 Hz to 1.5 kHz, dropping a total of 8 dB, followed by a generally flat portion from 1.5 to 20 kHz, except for the slight “presence” peak already noted. Between the bottom end and 300 Hz, the peak-dip filter profile of all the Apogee woofers is evident.

The resulting sound, if we absolutely had to check one of two boxes labeled “good” and “bad,” would still have to be classified as “good,” since most speakers sound worse. That, however, is no endorsement. On complex program material played at a room-filling level, the Caliper always sounds a little raucous; the bass, as we said, goes to pieces; the top end, though smooth, tends toward brittleness. With one driver pushing while the other is pulling, and the consequent discontinuity fairly high up in the midrange, it should come as no major surprise that the speaker is not particularly coherent-sounding, either.

As for amplifier compatibility—no problem. The nominal impedance of the Caliper is 3 ohms, and the SPL we measured at 1 meter with 2.83 volts input was 85 dB. Thus a nominal 100-watt amplifier as recommended by Apogee should be more than adequate, since the limiting condition will be the breakup point of the speaker.

Apogee Diva

Apogee Acoustics, Inc., 35 York Industrial Park, Randolph, MA 02368. Diva three-way full-range ribbon loudspeaker, \$7000.00 the pair. Tested samples on loan from owner.

“The Diva will redefine the state of the art,” says the Apogee blurb. Obviously, this speaker system is Apogee’s everything-we-know-is-in-here statement as of late 1987. The overall dimensions and basic “architecture” of the Diva are comparable to those of the half-decade old and defiantly impractical Full-Range flagship model, which will presumably be retired now, and everything about the new speaker is clearly intended to proclaim *ecce machina!* We must regretfully note, therefore, that we are not buying any of that.

It is indeed sad, bordering on the tragic, that the Diva is not as good as the considerably older and less expensive

Scintilla, except for being much easier to drive. The older model proves that Leo Spiegel knows how to design a large and highly sophisticated ribbon loudspeaker whose output greatly resembles its input (disregarding for the moment the shortcomings of the plastic-sheet woofer, which result strictly from the “all-ribbon” constraint—see above). The Diva, on the other hand, appears to have a formatted output, as if someone had decided how it *must* sound, regardless of how it measures. All we can say is, if you are going to do that, you had better have exquisite taste.

The frequency response of the Diva can be manipulated to some degree by using a variety of adjustable settings on the externally connected passive crossover. Small trims of the order of ± 2 dB may thus be applied to four different segments of the response curve. Since the formatting of the overall response profile is much grosser than that, such a feature is largely a red herring. The most obnoxious departure from a smooth (let us not even talk about flat) response is a broad hump centering on 400 Hz and extending over two octaves from approximately 250 Hz to 1 kHz. It goes up 6 or 7 dB and comes down 12 or 13 dB with respect to its surrounding valleys. No matter where the speaker is placed in the room and regardless of the microphone distance or location, this bulge of excess energy is always apparent. Since the older Apogee models are considerably more neutral (though not perfectly so) over the same two octaves, it would appear that such a midrange boost is somebody’s idea of an improvement. Its audible effect is an unmistakable and unmusical honk whenever the program material has a fairly complex texture. It is the Diva’s clubfoot.

The woofer panel of the Diva exhibits the same family traits that we faulted in the Scintilla and Caliper woofers, only more noticeably because of its larger size. The tapered trapezoidal diaphragm, some five and a half feet high and peripherally clamped, does not move the air as a single large piston but in staggered resonant segments. The fundamental resonance of the lowest and widest segment is 32 Hz, where the high-Q peak defines the bottom limit of the speaker. At that frequency, a sinusoidal input of 30 watts makes the panel rattle quite badly. Maximum excursion of the diaphragm is $\pm 1/6$ " ($1/3$ " total). The characteristic and inevitable dip in the upper bass centers on 100 Hz.

Above 1 kHz, all the way up to 10 kHz, the 1-meter response of the Diva is reasonably flat, though not quite as flat and smooth as that of the Scintilla. In the 10 to 20 kHz octave there is some decline in output, with a profile dependent on microphone location, but nothing objectionable. A dominant influence on the overall trend of the speaker’s frequency response is the polarity of the drivers as connected to the crossover network. With a positive-going signal as the reference, the woofer panel is negative, the midrange ribbon positive and the tweeter ribbon again negative in polarity. In a system with 6 dB per octave crossover slopes, this seems utterly perverse—the equivalent of a Band-Aid in frequency-response doctoring. As a direct result, wave-front coherence is shot to hell; there is no coherent pulse shape obtainable out of the Diva at any microphone location, re-

ardless of pulse width. Nor can tone bursts of any frequency be reproduced without ringing; everything seems to be a little underdamped.

Lest anyone should jump to the conclusion that these characteristics result in catastrophic sound, let us hasten to declare that the total impact of the Diva is that of a very clean-sounding loudspeaker. That 400-Hz honk is extremely disturbing; the compromises in coherence are easily audible; the bass is not nearly as impressive as that of, say, the Carver speaker; the frequency balance is subject to instant improvement by means of ordinary tone controls—still, in a world populated largely by bad speakers, this is a good speaker. It is disappointing only because its size, price and marketing promise true greatness.

As far as suitable amplifiers are concerned, those who ignore our advice and buy the speaker will probably opt for a biamped or triamped configuration—and why not?—although the Apogee literature specifies a single 100-watt amplifier (presumably rated at 8 ohms) as sufficient. To us that seems like a bit of wishful thinking. The nominal impedance of the Diva is 3 ohms; we obtained a gently undulating impedance curve that stays closer to 4 ohms over most of the audio range, never drops below 3 ohms until it reaches 7 kHz and finally declines to 2 ohms at 20 kHz. The SPL we measured at 1 meter with 1 watt input (efficiency) was 76.5 dB, with 2.83 volts input (sensitivity) 80.5 dB. Thus, the Krell KMA-200 or KRS-200, rated at 200 watts into 8 ohms and capable of putting a steady 40 volts into just about any load, will drive the Diva only to 103.5 dB (106.5 dB in stereo), which is adequate but far from awesome. We used the Carver “Silver Seven,” which can drive 3 or 4 ohms quite a bit harder, and were totally satisfied with the dynamic range per se. A big stereo power amp like the Boulder 500 bridged for mono would also provide sufficient drive.

The question that remains is whether the Apogee Diva could have been a great speaker with the same technology but a different engineering/marketing philosophy. Future products from Apogee may shed some light on that one.

Carver “Amazing Loudspeaker”

Carver Corporation, P.O. Box 1237, Lynnwood, WA 98046. “The Amazing Loudspeaker,” \$1576.00 the pair. Tested samples on loan from manufacturer.

Leave it to Bob Carver to name a product in such a way that you cannot refer to in print or in speech without glorifying it. A cunning little marketing ploy (“Bob, this is an amazing loudspeaker, it really is.” “Hey, let’s call it that!” “Call it what?” “The Amazing Loudspeaker.” “I love it, I love it!”), but we must confess that we were initially quite turned off by the name. Now that we have tested the speaker, we are in a better position to ask whether it is indeed amazing. The answer, in a word, is—yes. In several respects, the Carver system is an embarrassment to speaker designers and manufacturers with many more years of experience

than Bob, your Editor being one of them. It solves certain design problems and achieves certain sonic results with a simplicity and flair that can only be called, well, amazing.

The amazement begins as soon as you unpack the speaker from its shipping carton. How can this sell for \$1576.00 the pair? The flat, trapezoidal, open baffle is five and a half feet tall and finished in hard black lacquer, almost like a Steinway; there are four 12" woofers per side in a vertical array, flanked by a very high-tech-looking five-foot ribbon—if the manufacturer were, say, Infinity, the price could be easily three times as high before the question of sound quality even came up.

Unfortunately, the Carver speaker does not sound so amazing right out of the box. The drivers must be broken in before they settle down to their proper operating parameters. The fundamental resonances of the woofers and the ribbon are too high before break-in, and there are also stress modes in the clamped ribbon that must be homogenized out, so to speak, by exercising it. Carver recommends approximately 50 hours of use before critical listening, and our experience confirms that number. Without break-in the upper bass and lower midrange are a bit thick and woolly, and there is a somewhat glary or electronic quality from the upper midrange on up to the lower highs. These faults are gradually, and in the end totally, wiped out as the speaker is played, but they account for the generally poor impression made by the Amazing at trade shows and also in many dealers’ showrooms. No trade show is open to the public for 50 hours, and not many dealers log 50 hours on a demo pair before letting their customers listen. This is not a trivial matter; we consider it to be a serious shortcoming and fervently hope that Bob Carver will do something about it.

Once the speaker is working properly, the bass is the next source of amazement. Everybody knows that open-baffle speakers without electronic equalization have no bass, or at best just boomy upper bass with no real sock down below—right? How could it be otherwise with the self-cancellation of the opposite-phase wave fronts launched by the dipole? That is why we Thiele/Small nerds have always insisted on box speakers, despite all the wall-deadening, bracing, stuffing, duct-tuning, etc. pains that come with the territory. Now Bob Carver, the upstart speaker designer (with nothing but the dreadful Phase Linear Andromeda III of 1976 under his belt), has come up with a devastatingly simple and sweepingly efficacious insight into open-baffle woofer behavior that changes the ground rules and results in flat response down to the limits of audibility. Frankly, we are jealous as all hell. Somebody should have thought of this elementary solution long ago.

Here is how it works. We have all seen, in a book or an article, the classic curve showing the effect of open-baffle bass cancellation. When the woofer is mounted asymmetrically (i.e., when the front-to-back paths are not all the same length), there is a smooth 6 dB per octave slope with a turn-over frequency corresponding to the half wavelength defined by the average front-to-back path. This curve prevails as

long as the free-air resonance of the woofer is at a much lower frequency than the turnover. Now let us recall another diagram on a different page of the same or perhaps another book or article. There we have seen the family of curves representing the infinite-baffle low-frequency response of a woofer with different values of Q . Starting with the rolled-off response when $Q = 0.5$ (critically damped), progressing through the Butterworth profile with $Q = 0.71$ (maximally flat), just beginning to show a little ripple at $Q = 1$, then clearly reaching the bumped-up stage when $Q = 1.41$, the hypothetical woofer finally displays a heavily bass-boosted output when the Q is higher than any you can find in the vendors' catalogs. A sufficiently high Q will result in a slope of just about 6 dB per octave on the right side of the bump. Eureka! Bob Carver, on the road to Damascus or Seattle or the bathroom, made the connection between the two familiar diagrams. You cut away the infinite baffle until it becomes exactly the right open baffle, then the high- Q rise of 6 dB per octave and the cancellation drop-off of 6 dB per octave add up to flat response right down to the free-air resonance. It is a much more elegant solution than electronic equalization of the cancellation slope *à la* Enigma or Celestion, since it does not cost additional amplifier power and demands the use of a very small magnet to achieve the high Q . The penalty paid is that the free-air resonance, the Q and the size/shape of the open baffle become extremely critical parameters, unforgiving of design laxities and production tolerances.

All theory aside, the bass of the Amazing, as we already intimated, is amazing. Its bottom limit is defined by the 22-Hz free-air resonance of the woofers after break-in; the -3 dB point is a few cycles below that. The 12" woofers have exceptionally long linear travel and can move a lot of air. Bob's taste runs to somewhat heavier bass than ours and he set the Q to create a very slightly tipped-up response at the lowest frequencies, but you can easily flatten that out with a line-level passive equalizer network (included in the package as the Sub-Bass Room Damper—there you go again, Bob), which has outputs for $Q = 0.7$ and $Q = 0.5$. In many rooms the unequalized speaker will sound just right. One thing is certain: no subwoofer is needed! The bass is at all times completely reproduced, with excellent definition, impact and musicality, unless of course the room placement is totally unsuccessful. (A separate article on room placement, of open-baffle as well as box speakers, is scheduled for the next issue.)

The ribbon is amazing for entirely different reasons. No eureka insights here, just "blood, toil, tears and sweat" to obtain the desired characteristics at low cost. The basic structure is quite similar to that of the Strathern or the Gold 3.0 ribbon, but the design details, materials and construction techniques are simpler and better. Resonances and other anomalies have been painstakingly massaged out of the design, and whatever response irregularities remained are equalized out in the crossover network. It is a case of not accepting the limitations of an existing format and just hacking away at the faults one by one until they are gone.

Amazing perseverance. The resulting frequency response is almost ruler flat from 200 Hz to 15 kHz, except for a so-called Gundree dip (apparently a BBC-derived expression) of 3 to 4 dB spread over the octave from 2.5 to 5 kHz. This is a bit of deliberate "voicing" introduced in the network to satisfy a certain school of thought (not ours); it is basically innocuous and of minor importance. From 15 to 20 kHz there is a 4 or 5 dB drop, normal in a large ribbon. From 200 Hz down the response is generally elevated a couple of dB above reference level (independently of the bump at the extreme bottom); here again we are dealing with voicing, this time for an overall "warm" balance, which is not exactly our taste but persuasive enough to be accepted as Bob's right to his own priorities. Remember, these are subtle effects, not gross formatting as in the Apogee Diva. We also disagree with Bob's decision to connect the ribbon and the woofer array with opposite polarities to the crossover network. The saving grace of this dubious frequency-response trimming practice is that the crossover frequency for the 6 dB per octave slopes is 100 Hz, which is low enough to make the discontinuity in wave-front coherence inconsequential.

The nominal impedance of the Amazing is 4 ohms; actually the curve meanders all over the audio band, rising as high as 14.5 ohms at 170 Hz and gradually declining at the higher frequencies to as low as 2.3 ohms at 20 kHz, all on account of the equalization network, not the drivers. We estimate that 6 ohms would be a better figure for calculating typical power dissipation with music signals. Sensitivity is quite low: 82 dB SPL at 1 meter with 2.83 volts input, on a par with the Apogee Scintilla, but the Carver is much more efficient because of its higher impedance. With 1 watt input as referenced to 6 ohms, the SPL at 1 meter comes out at 80.5 dB, still a far cry from efficient box speakers but adequate for use with amplifiers rated at 200 watts or better. The Amazing will put the biggest amplifiers on their mettle; it just gets louder and louder without distortion as you turn up the volume and never buzzes or breaks up at any frequency. You *need* 200 watts but you could *use* 1000.

All told, what kind of musical sound do these amazing and not so amazing features add up to? Excellent sound, on the whole preferable to that of the Scintilla, with far better bass and of course saner amplifier options. Both speakers sound equally clean, sweet transparent and musical; the Carver is perhaps a bit more reticent or "polite" in the upper midrange and lower treble because of the somewhat warm balance preferred by Bob but makes up for it in full-range power handling. We would not hesitate to choose the Amazing over an Apogee ribbon speaker even if price were not the issue, as it usually is, simply because we consider bass quality, freedom from breakup and general practicality more important than nuances of tonal balance. If Bob could fix the three boo-boos of the speaker—the need for lengthy break-in, the relative inefficiency and the opposite-phase driver connection—our enthusiasm would know no bounds.

The Amazing Loudspeaker is, even so, a dyed-in-the-wool high-end audio product at a medium price. *Rara avis!*

Dahlquist DQ-20

Dahlquist, Inc., 601 Old Willets Path, Hauppauge, NY 11788. Model DQ-20 Phased Array loudspeaker system, \$1800.00 the pair. Tested samples on loan from dealer.

This is clearly the successor to the classic DQ-10 of the mid-1970's, the speaker that made Jon Dahlquist one of the *lares et penates* of the audio salons. We have known Jon for about eighteen years and have always respected him both as an engineer and as an audio philosopher; however, as early as the winter of 1977-78 we began to feel that he had put too much faith in the permanence of the DQ-10 design and that it behooved him to come up with an improvement. That did not happen until about three years ago, when the DQ-20 began to be phased in, and the DQ-10 was not dropped from the catalog for another year or two, after a longer run than some of the most successful Broadway musicals. It all happened so gradually that we do not even recall seeing a review of the DQ-20.

The most immediately obvious thing about the 42" high, floor-standing DQ-20 is that it tries to look like an open-backed dipole speaker but is not, thereby continuing the tradition established by the DQ-10, which was an unabashed early-Quad look-alike. The DQ-20 consists of a 10" woofer in a sealed box of 1.4 cubic feet internal volume (our estimate), a 5" cone midrange driver in a small tube-vented pod and a 3/4" dome tweeter in one of those little Scandinavian quasi-horns. The three separate units sit one on top of the other in a reflection/diffraction-reducing formation (*à la* B&W); the Quad-like screen enfolds them with so much air to spare that the speaker looks twice as big as the equivalent normal cabinet would—and thus more deserving of its high price tag. A mildly deceptive bit of packaging with a plausible engineering alibi (we can just hear it): you must keep the frame far away from the midrange and tweeter to avoid reflections. Very good, Jon.

The specifications place the crossover frequencies at 400 Hz and 3.5 kHz; our measurements provided no clue as to the exact configuration of the crossover network but, as we shall see, it must be fairly complex. The venting of the midrange enclosure may conceivably be an inexpensive but perfectly good way to synthesize a third- or fourth-order high-pass filter characteristic without L's and C's. The bass enclosure appears to be perfectly matched to the woofer, the Q being 0.71 or thereabouts, the bass response nice and flat, and the -3 dB point at the box frequency of 43 Hz. There are ways to get deeper bass than that out of a 10" woofer, but what there is seems very accurate.

The overall frequency response as measured on the midrange/tweeter axis 75 cm from the grille is perhaps the flattest we have ever seen in a three-way electrodynamic speaker system. The upper limit is a hair short of 20 kHz; there is an unmistakable dip, say 5 dB, at around 1.8 kHz but (get this!) it disappears 30° off axis where the actual stereo listening takes place. The off-axis response is almost frighteningly flat, actually flatter than the axial response

except on the extreme top end, leading to interesting speculations regarding Jon's methods and priorities. The plot thickens as one discovers that the DQ-20 Phased Array is not phased. Notwithstanding the staggered setbacks of the midrange and tweeter, it is not possible to recover a square pulse of any width from the speaker, not even vaguely or raggedly, not at any distance, not at any height. With respect to a positive-going pulse, the driver polarities are woofer plus, midrange minus, tweeter minus—what kind of network is this? The impedance curve provides a partial clue; it is a roller coaster with very abrupt transitions, for example from the 4-ohm minimum at 1.1 kHz to 18 ohms at 2.5 kHz, and with excessively large phase angles throughout. Not an easy load for an amplifier; something like the Boulder 500, rated at 250 watts into 4 ohms and rock stable, would be a good recommendation although not quite compatible in price. The efficiency of the speaker, while perfectly adequate, is not so high that a run-of-the-mill 100-watter would be a good choice. (We forgot to take SPL readings at 1 meter before returning the speakers, alas.)

We have a theory about this mixed bag of engineering data. Jon Dahlquist is definitely a purist. We are quite sure he was aiming for perfection in both the frequency and the time domain, i.e. for a flat *and* coherent output. It is also our understanding that he is set up to make instantaneous and unlimited LCR changes in a crossover network while listening. He must have found, given the available drivers and the general architecture of his prototype, that he could make the output either flat or coherent but not both—the usual empirical conclusion, especially with three-way systems. The only escape route out of such a dilemma is offered by computer-aided network analysis, filter synthesis and iterative optimization, all of which takes sophisticated programs and many hours of computer time. The DQ-20 shows no evidence of having been subjected to such procedures, which could probably have solved the problem. What most likely happened was that the time came to go into production, further delays were unacceptable, and a command decision had to be made whether the speaker should be flat or coherent (i.e., phased). Jon must have opted for flat but was apparently unwilling to give up the Phased Array appellation. Only a theory, as we said.

We must admit that this dead flat but not really phased array sounds extremely neutral, uncolored, balanced and unexaggerated in every way. If we had to steer Bob Carver, for example, toward a model of "voicing," this would be a good one. The relative freedom from transient ringing also adds to the just-right feeling in this respect; our tone-burst tests showed each driver to be well behaved, the midrange perhaps least so. On the other hand, the DQ-20 lacks the solid dimensionality, palpable airiness and spatial delineation evident in the sound of more coherent speaker systems. There is something aesthetically flat about that acoustically homogenized flat response; perhaps the very excellence of the output in the frequency domain makes one long for greater excellence in the time domain. We were left vaguely dissatisfied though far from unimpressed. To be

more specific, we preferred the frequency balance of the Dahlquist DQ-20 to that of our own Fourier 8e (now a defunct design but still our standard in a medium-sized three-way) but definitely heard a bit more information through the more coherent Fourier.

A very good showing, everything considered, but we cannot imagine anyone not choosing the Carver "Amazing Loudspeaker" for \$224 less the pair, unless vertical size is the decisive factor. The Carver is the more exciting audio component and the more complete speaker.

Martin-Logan CLS

Martin-Logan, Ltd., P.O. Box 741, 2001 Delaware, Lawrence, KS 66046. The CLS full-range electrostatic loudspeaker, \$2490.00 the pair. Tested samples on loan from owner.

Gayle Sanders may very well be the most gifted of the self-taught audio designers who started out as dealers. Never mind that the *genre* abounds in charlatans and jackasses; Gayle is the rare prince among them, a genuine whiz, the exception that proves the rule if indeed there is one (let us hope not). Here he has created a speaker so beautiful to look at, so intriguing in design details and generally so attractive as an idea that the reviewer begins to root for it before the first note is heard and just *wants* it to pass all tests with flying colors. Such emotions are of course an invitation to disappointment, which in this case is happily not too big.

The CLS is a full-range, crossoverless, electrostatic dipole loudspeaker. Its active element is a four-and-a-half-foot high, monolithic, seamless, gently curved, push-pull electrostatic "sandwich" of unique construction and appearance. For one thing, you can see right through it, so it looks smaller than it is because it does not block your line of vision. For another, it makes you wonder how Gayle managed to stretch the plastic diaphragm so beautifully between the two curved and perforated stationary electrodes. (Try to bend a thin Swiss cheese sandwich into a curved shape without kinking the bread or the cheese.) That diaphragm is very special; an extremely laborious graphite treatment invented by Gayle gives it unprecedentedly high resistivity and helps eliminate arcing, the major plague of electrostatic speakers. The perfectly smooth, edgeless perforations in the stationary electrodes remove another cause of arcing; they are made possible by a dielectric paint of unique properties, also developed by Gayle. The uncovered, grilleless high-voltage speaker is as safe to pat and stroke with your bare hands as the family dog, and as a final touch of virtuosity the entire structure is assembled without nuts, bolts, screws or any other hardware—just glued and force fitted. In sheer "techie" appeal the CLS is hard to beat; you want to own it even if you never play it.

It should be pointed out that Gayle Sanders has modified the CLS many times; we tested the version that was the latest-and-greatest as of the beginning of 1988. The fundamental resonance of the diaphragm is at 50 Hz, which more or less defines the low-frequency limit of the speaker.

Everything we said about plastic-sheet woofers in connection with the various Apogee models applies equally to the CLS. The driver Q per se is approximately 3.5, resulting in a huge nearfield peak, but the open-baffle cancellation effect (see the Apogee and Carver reviews) synthesizes an acceptably level bass response with just a bit of the inevitable peak-dip profile. The overall frequency response of the speaker shows a general downward trend, and pretty ragged at that, but with the microphone in the farfield at seated ear level and both channels swept at the same time there is a decently flattish stretch from 200 Hz to 3 kHz. The upper limit of the speaker is around 16 kHz, with steeply falling output beyond. We have no mathematical model for the CLS geometry and are willing to be very forgiving as regards these measurements—who knows, it may all add up to reasonably correct power response. Some of the response peculiarities may be due to deliberate "voicing" by Gayle.

In the absence of a crossover and with all points on the diaphragm driven in phase, one would expect coherent reproduction of pulses and one gets it after a fashion, but the waveforms are not clean—too much ringing. Tone bursts confirm the latter conclusion, revealing modes and nodes all over the place, with some clean patches in between. There just ain't no such thing as a large, well-damped plastic sheet, nohow.

The remarkable thing is that this hodgepodge of so-so physical characteristics results in quite beautiful sound. Not at all volume levels, mind you; the CLS is definitely not a large-signal transducer. Nor is it a pip-squeak; let us call it medium-signal. It is not very happy with complex passages played *fff*. At normal, room-filling levels, however, it sounds magnificently transparent, with a warm, lush character, especially rich in the lower midrange and suggesting just a trace of electrostatic "sh" coloration. It is a somewhat formatted sound, not really accurate on an I/O basis, but exceedingly pleasant and exactly what many music lovers are looking for. If this is what Gayle Sanders likes, we are certainly not going to argue with him. The addition of a subwoofer, crossed over in the neighborhood of 100 Hz, would probably add significantly to the large-signal capability of the CLS but take away from the Bauhaus purity of the design concept.

The impedance curve of the speaker starts at around 7 ohms on the bottom, rises to 24 ohms at 250 Hz, drops a little, then skyrockets to 46 ohms at 2 kHz (equalization network?), after which the expected capacitive drop-off takes over, all the way down to 2 ohms at the highest frequencies. It is not a particularly difficult load for an amplifier, and the sensitivity of 85 dB SPL at 1 meter with 2.83 volts input leaves the user with a good many amplifier options.

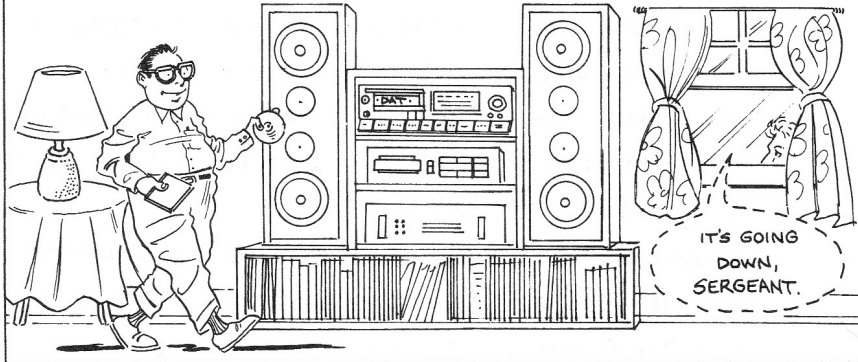
Where does the Martin-Logan CLS rank in this survey and how does it fit into our current loudspeaker pantheon? We cannot rate it quite as high as the Carver, which is just more speaker for less money. The Apogees are in effect visitors from outer space, leaving the Dahlquist as the one to beat for runner-up. Our emotional choice would be the CLS, although not as accurate as a monitor. ◊

In Your Ear

NOW THAT THE NATIONAL BUREAU OF STANDARDS HAS KILLED THE PROPOSED CBS COPY-PREVENTION SYSTEM, EXTREMIST ELEMENTS IN THE RECORDING INDUSTRY WOULD LIKE TO SEE SOME DRASTIC LEGISLATION AIMED DIRECTLY AT THE CRIMINALS WHO MIGHT USE THEIR DAT'S TO COMMIT CD PIRACY AT HOME.



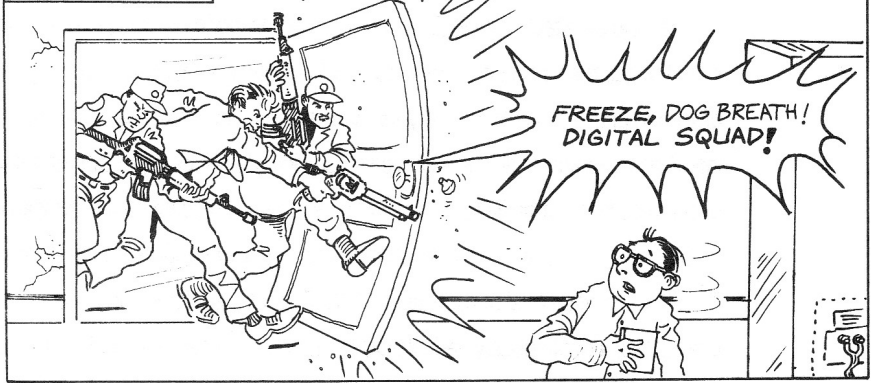
AUDIOPHILE MARVIN SCHLEPP HAS BORROWED A FRIEND'S EMMYLOU HARRIS CD TO MAKE A DAT COPY OF IT FOR HIS MOTHER'S BIRTHDAY. LITTLE DOES HE KNOW....



MOM LOVES EMMYLOU HARRIS. THIS WILL MAKE HER SO HAPPY!



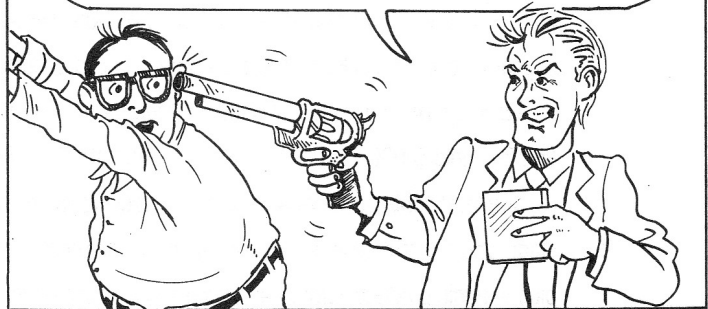
SUDDENLY....



THE FUN'S OVER, SCHLEPP. ASSUME THE POSITION.



MAKING A DIGITAL COPY OF EMMYLOU HARRIS, EH? SCUM LIKE YOU MAKES ME SICK!



BOOK HIM, SERGEANT. DIGITAL ONE.

GOSH, I JUST WANTED TO SURPRISE MY MOM....



THE RECORDING INDUSTRY ASSOCIATION OF AMERICA IS FOREVER IN YOUR DEBT, LIEUTENANT.

THANK YOU, SIR. IT WAS A GOOD COLLAR. IT MADE MY DAY.



HAFLER PRODUCT UPDATE: *First, the XL-280.* This Excelinear amp is being recognized as just what we claimed it to be—the first amplifier in which distortion of all types is inaudible. Since the XL-280 was introduced 1½ years ago, no one has successfully challenged the validity of the differential test for audible distortion, which the XL-280 passes head and shoulders above the competition. Some individuals may prefer the sound of other amps at times, but it has been our experience that when we were able to measure such a preferred amplifier, there were recognizable indicators which showed that it was, in fact, less accurate. The argument of preference thus seems to be one of complementing inaccuracies.

Some early XL-280s exhibit evidence of spurious oscillation, and a few changes were made in production during 1987. If your XL-280 has a serial number below B1725000, and you have reason to question its high frequency accuracy, we invite you to contact us at (609) 662-6355 for possible updating. We will provide the parts, when needed, at no charge, if you wish to make the changes on each module yourself.

Another update is available for present owners of DH-100 preamplifiers. The DH-100 Series 2 has several dB lower noise in both the phono and line level stages. A kit is available for \$20 which provides all the parts, including 3 new plug-in integrated circuits, which brings the specs in line with current production. Some soldering is required. If you wish the factory to make these changes, they are included in the normal service charge.

The long awaited XL-600 Excelinear power amplifier is going into production. As a higher power version of the XL-280 circuit, it has the same ultra low phase shift design. The Excelinear topology offers the capability for nulling out audible distortion products while driving your own speakers. In actual use, it can be demonstrated that the Excelinear design has inaudible distortion of any and all types. For more details on input-output differential test procedure, and how you can use it to compare amplifiers, please write us at 5910 Crescent Blvd., Pennsauken, N.J. 08109.

Other features of the XL-600 include multiple power supplies; an 80% increase in power supply capacitance over the DH-500; and additional output lateral MOSFETs for superior low impedance drive capability. There are added niceties like gold input jacks, a continuously variable DC fan for quieter operation, and built-in mono bridging capability. It's Hafler sound at its finest, and most powerful.

The new sculptured faceplate for the XL-600 has a baby brother which fits the XL-280. This XL-281 is 19" rack width, and includes sculptured handles. A 17" wide version, without handles, is the XL-282, serving only to enhance the amplifier's appearance. In typical Hafler value-conscious fashion, there's also a lower cost standard 19" rack mount, the XL-285.

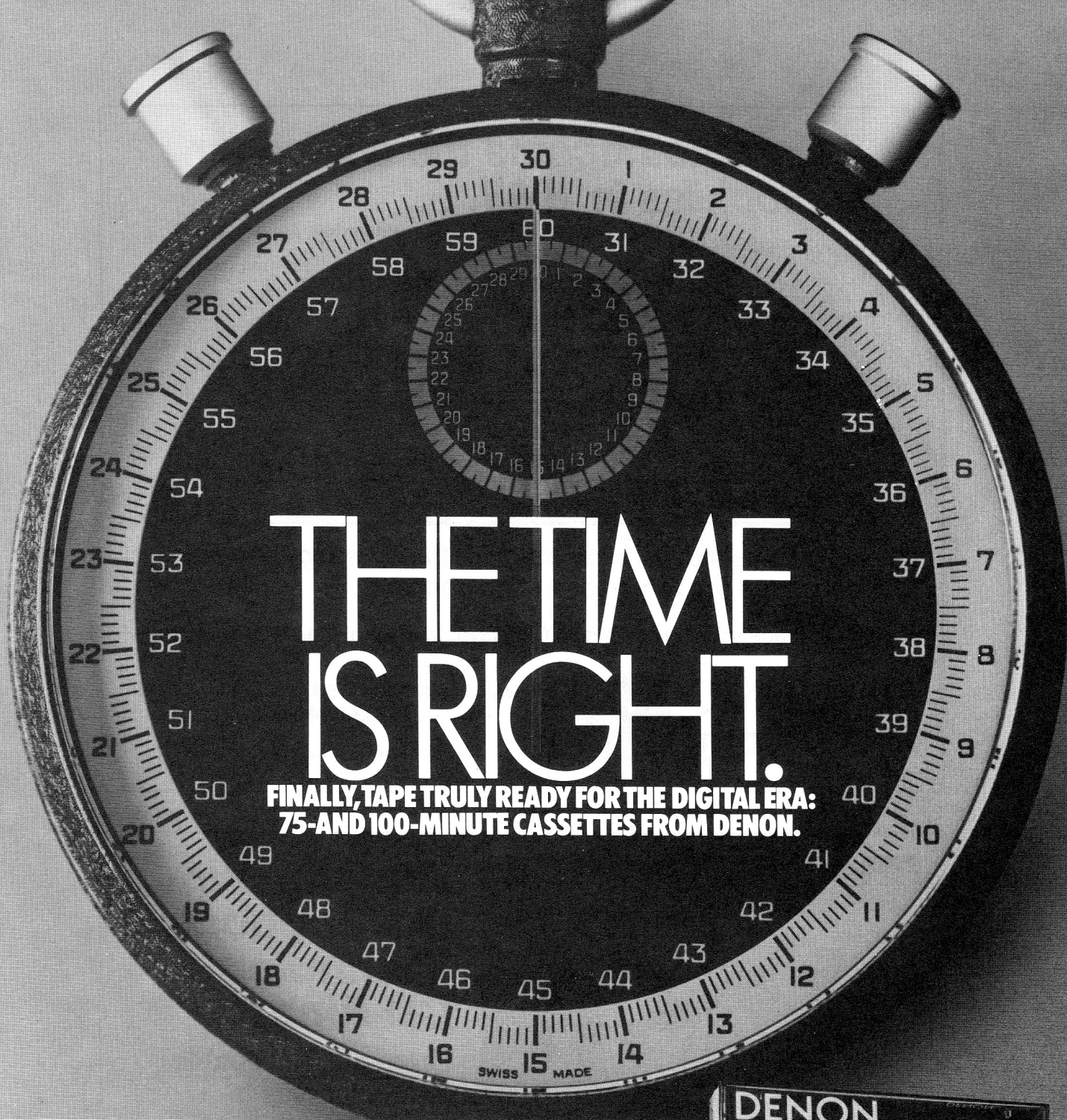
A brief glimpse of the next Hafler introduction: a totally new, full-control preamplifier with optional infrared remote operation for under \$1000. And that's only for starters. It's an all-FET design, with CMOSFET electronic input selection, a cyber-optic passive level control system with precision tracking, internal accommodation for moving coil/moving magnetic phono stage, and buffered tape outputs. A big plus is the employment of a building-block concept which can interface with other plug-in audio products supported by the same 12 button remote controller. What is really unique is the convenience of analog volume and balance knobs on the remote—the only way to get audiophile precision. Just wait until you try it for yourself!

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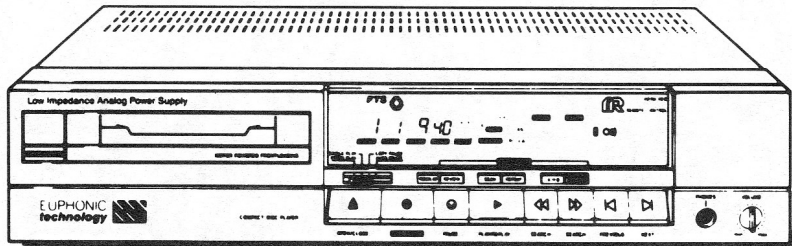
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—Ken Kessler Hi Fi News & Record Review, January 1988

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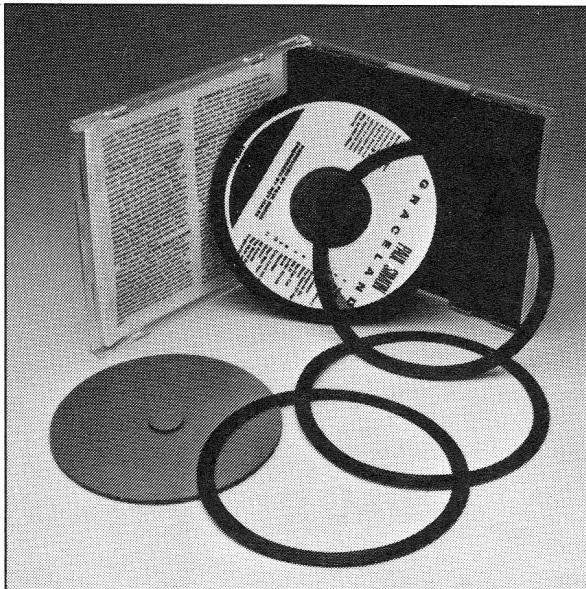
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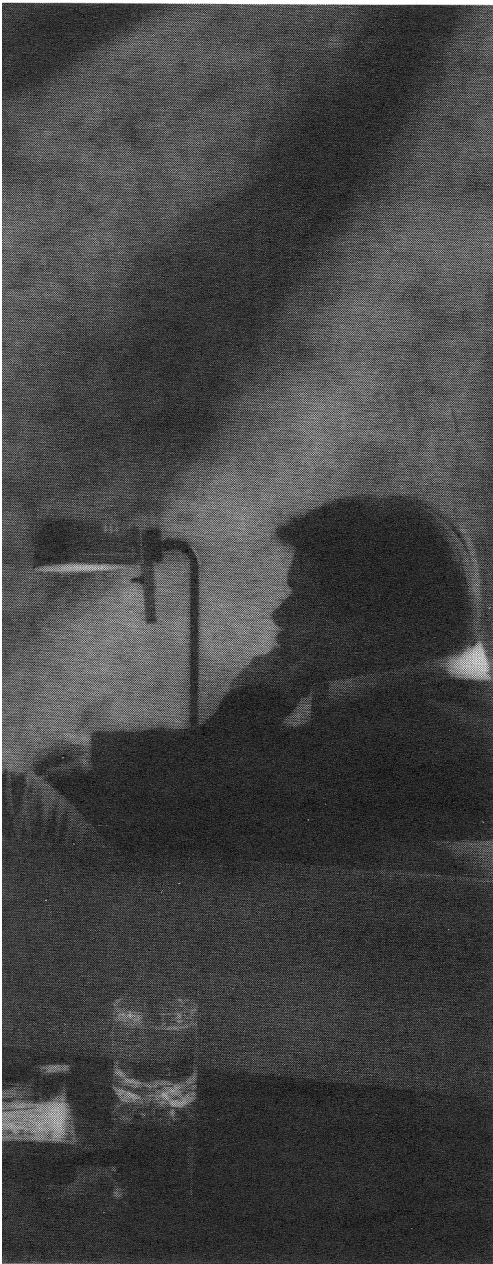
Q. How can The Amazing Loudspeaker put out so much powerful, extended bass?

A. Brute force. A total of 8 subwoofers, each with 4 times the excursion of regular bass drivers for a total displacement (area times excursion) of almost 2000 cubic inches. The low frequency 3dB point is 18Hz!

Q. Why use a ribbon driver?

A. Because the sound of a ribbon is nothing short of glorious! Free of individual driver anomalies and crossover problems, the Amazing Loudspeaker's extended line source driver delivers a majestic sonic image that literally floats in 3-dimensional acoustic space. Simultaneously, it reproduces an amazing amount of musical detail that's simply unmatched by any point source driver.

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This is not a typical speaker ad. Because The Amazing Loudspeaker is anything but a typical speaker.

This isn't even a typical *Carver* ad.

True, the Amazing Loudspeaker breaks so many conventional speaker rules — and succeeds so spectacularly at it — that we're tempted to fill this ad with a litany of hertz, watts and exotic buzz words the way our competitors' ads do.

"Its overall sound is spectacular, its bass performance surpasses that of almost any other speaker one might name."

STEREO REVIEW

Because there's bound to be quite a story behind a speaker that's 5½ feet tall and yet just 1½ inches thick. Especially when Bob Carver has a hand (or rather two hands, both feet and a year or so of lab time) in its creation.

But ingenious design is only our means to an end. The beginning of a dramatic awakening that will re-define for you the very essence of music.

"The image is as wide, deep and multi-layered as I have ever heard. Only Infinity's \$35,000 Reference Standard impressed me more."

Henry Hunt
Hi Fidelity Editor
HOUSTON POST

The Amazing Loudspeaker can etch a sonic image so detailed you can almost see rosin drift from a bow onto the polished surface of a violin.

It can brighten your listening room with the sheen of a #4 drumstick on a Ziljan hi-hat cymbal. Or darken it with the smokey midnight growl of a battered baritone sax.

It can stun your senses and rearrange your furniture with thunderous salvos of tight, perfectly controlled low bass.

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THE AUDIO CRITIC

It can meticulously separate every instrument and vocal on a dense, multi-track mix and project each in sharp relief at precise points across the sound field.

In short, the Carver Amazing Loudspeaker restores what time and reading too many speaker ads often takes away.

Sheer wonder.

We have merely touched on the highlights of this truly amazing loudspeaker. We'd be happy to send you more information including reprints of several great reviews.

"It's price is ridiculously low for what it does and... what comparable products cost!"

Julian Hirsch
STEREO REVIEW

However, if your immediate interest is the sensation of a listening room melting away to reveal the crystalline clarity of pure music, you need only visit your nearest Carver dealer.

Your amazement will begin when you discover just how affordable the Carver Amazing Loudspeaker really is.

CARVER
ACCURATE

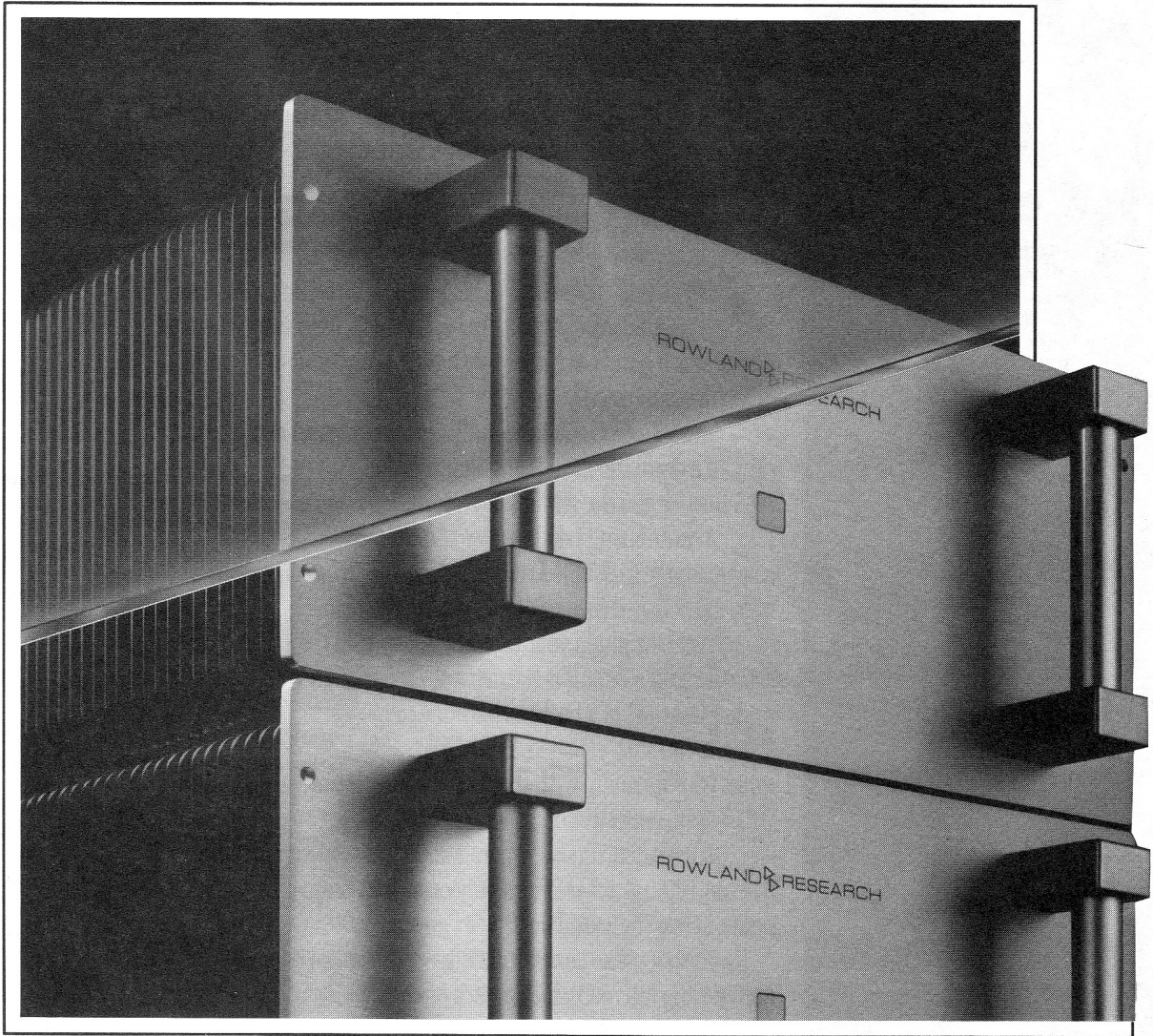
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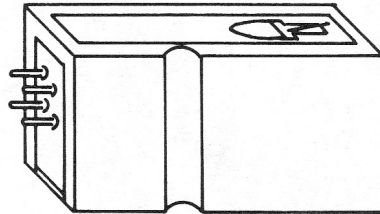
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Rosewood Signature. A classical audio component, and a reference by which all others are judged.

Onyx Sapphire. *Koetsu* stone body cartridges are renowned for their extended dynamics and frequency response.

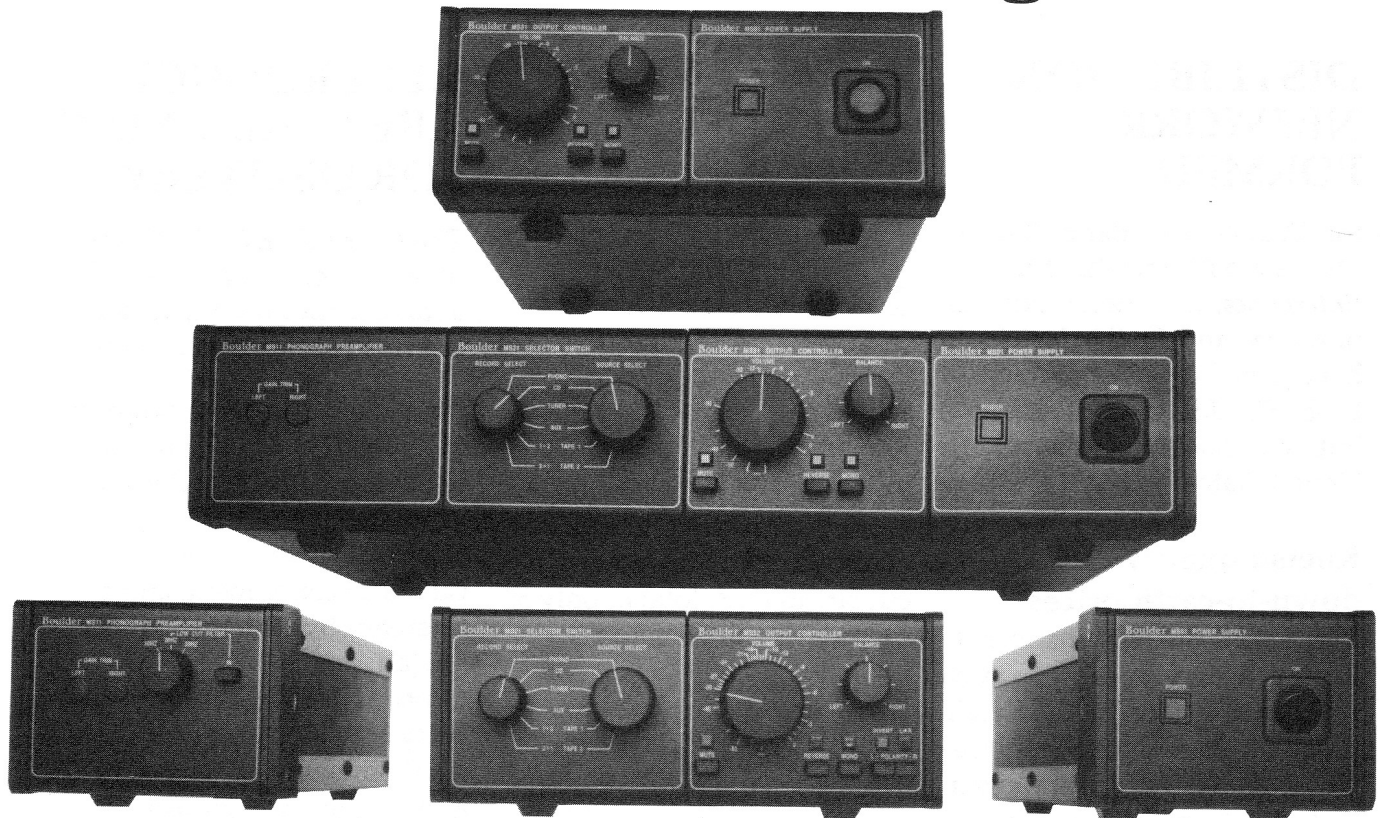
Onyx Signature. An onyx body fitted with the Signature motor/cantilever assembly. This cartridge combines the grace of the Rosewood Signature with the attributes of *Koetsu* stone body cartridges.

Contact your dealer for more information regarding both of these one-of-a-kind cartridges.

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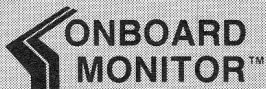
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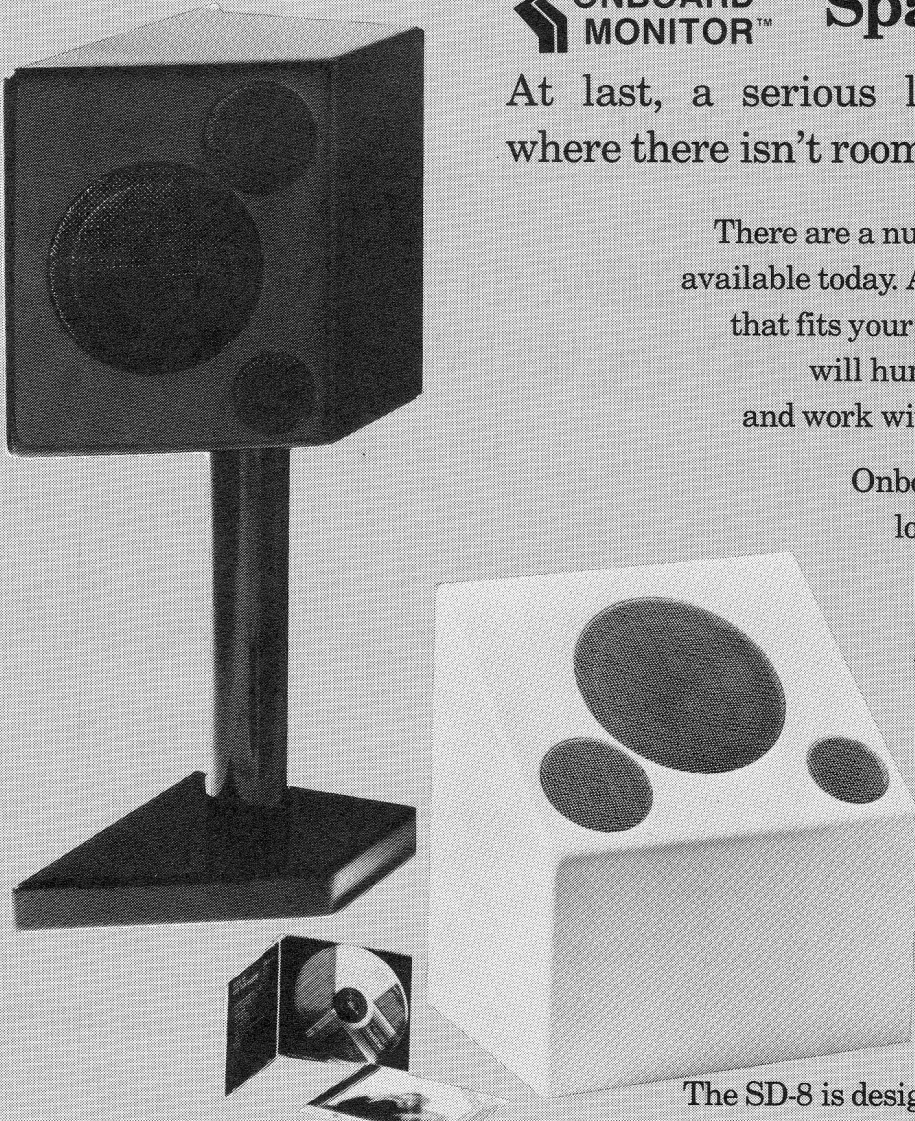


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Two unique products for the ultimate signal path and five other really good ones are not a bad haul for any reviewer. Here there is even the entirely new experience, in one instance, of electronic engineering as a satiric art form.

We had enough philosophy on audio amplification in Issue No. 10 to last us and our readers awhile, so we shall plunge right into our reviews this time, but not before musing wistfully about one thing.

You cannot have more power supply per cubic inch for high-quality audio amplifiers than is possible with the Carver magnetic-field technology. Furthermore, a magnetic-field power supply can be designed to deliver any amount of current into any kind of load, even if the existing Carver models are limited in that respect. Another thing you cannot have, at least not to our knowledge, is a more accurate and stable stage of amplification than the JE-990 discrete operational amplifier. Would it be too much to ask for a power amplifier with an all-990 audio signal path and a magnetic-field power supply? It would be very compact, not terribly expensive and awesome in performance. The 990 circuitry is in the public domain, and the Carver technology is available under license, probably for a smallish royalty. Any takers?

Boulder Modular Preamplifier (interim report)

Boulder Amplifiers, a division of Silver Lake Research, 4850 Sterling Drive, Boulder, CO 80301. MS11 Phonograph Preamplifier, MS21 Selector Switch, MS32 Output Controller, MS01 Power Supply, \$2744.00 the system. Tested samples on loan from manufacturer.

We received this entirely new and eagerly awaited all-990 preamp/control system a bit too late for completing the tests we need before publishing a full-fledged review, which you can expect in Issue No. 12. Here we just want to report that the equipment exists and that our initial impressions of it are very favorable.

The packaging of the Boulder "front end" is in very professional-looking separate modules, each 14" deep and occupying just under 5" of horizontal shelf space. The

MS21 Selector Switch and MS32 Output Controller modules, although separate in construction, are generally delivered as an integrated double module; the MS11 Phonograph Preamplifier module is always separate and can be placed right next to the turntable. The MS01 Power Supply module can power up to four amplification modules through computer-type connector cables.

We have not even listened to, let alone tested, the MS11, which was delivered with a built-in Deane Jensen step-up transformer for MC cartridges, thereby creating an apples-and-oranges comparison problem vis-à-vis the active pre-preamp stages we have been using lately. Boulder will also come out with an active MC pre-preamp option; we hope to be able to report on both versions. What we have been using with a great deal of satisfaction is the MS21-cum-MS32 line-level control unit. The best way to describe it is as an upstream extension of the Boulder 500 power amplifier; it has the same 990 sound or rather lack of sound as the voltage-gain stage of the 500 and ends all discussions regarding the desirability of a passive line stage because it is equally inaudible but provides the few dB of gain needed to augment the output of CD players, etc. Various neat little touches like individual left- and right-channel polarity inversion, stereo channel reversal and suchlike goodies, all with indicator lights, also distinguish the unit from the run-of-the-mill, as does the dead silence in the absence of a signal, regardless of switch and control positions. Balanced output is an important professional option.

The price may seem steep for what is basically still "just a preamp" (of course, so is the SP11 at twice the price), but the quality of construction and parts is extremely high, and the modular format, while more costly in terms of metalwork for the separate chassis, allows you to buy only what you need and specify the options you can use. As the Boulder literature a bit facetiously points out, "With modularity, obsolescence is not part of the design. For instance, when CD's are no longer available and you need a Phono

Module after all... well, use your own imagination.” (Are Jeff Nelson and Randy Gill closet digitophobes?)

Speaking of Boulder’s prices, Randy took us to task for wishing out loud in print that the \$2875 Boulder 500 were available for around \$1995. He feels that the amplifier is an extraordinary bargain and asserts that any number of well-known high-end manufacturers would not hesitate to charge \$6000 for a product built from a comparable list of parts. Randy, we believe you, but to prove your point you should get competitive bids from Bill Johnson and, say, Dave Hafler.

Carver “Silver Seven”

Carver Corporation, P.O. Box 1237, Lynnwood, WA 98046. “Silver Seven” vacuum-tube monophonic power amplifier, \$8750.00 (\$17,500 the pair). Tested samples on loan from manufacturer.

Imagine you are canvassing the farthest-out fringes of the high-end audio cult and asking the freakiest, tweakiest and richest equipment fetishists what they would consider to be the absolute ultimate power amplifier, regardless of cost or practicality, if someone were willing to make it for them. Almost certainly they would ask for a vacuum-tube design—more “musical” than solid state, right?—but much more powerful than any currently available, maybe 500 watts per side, monophonic of course, made with a whole forest of 6550’s (the most expensive output tubes), bigger transformers than the world has ever seen, various cultist-brand polypropylene capacitors, Van den Hul silver cable throughout—remember, these tweakos seriously believe in all that stuff.

Now, one amplifier designer who definitely does not believe in all that stuff is Bob Carver. As any reader of our Issue No. 10 surely knows, Bob is totally convinced that he can achieve exactly the same audible results with transistors and his magnetic-field power supply, at a comfortable three-figure price. We were completely flabbergasted, therefore, when we found out about the Carver “Silver Seven,” which is exactly the power amplifier hypothesized above but very much a reality—and priced at seventeen and a half kilobucks the pair! For a moment we thought that Bill Johnson or possibly Dan D’Agostino had started to do business in a Bob Carver rubber mask. We quickly cornered Bob and demanded an explanation. His reply to us, not verbatim but in essence, went something like this:

“No, intellectually I don’t believe in this engineering approach, it seems to me quite unnecessary, but I had so much fun doing it this way. Why should only the esoteric amplifier designers have this kind of fun? Not that I took the Silver Seven project lightly—the amplifier is as good as I know how to make, as good as anybody knows how to make, in fact better. The tweaky features can’t possibly hurt—I’ve never been able to hear one iota of difference between copper and silver wire for example, no matter how hard I tried, but silver is at least as good, so if somebody

believes it’s better that’s okay with me. I’m easy. More important is that I know I can t-mod a regular Carver solid-state amplifier to sound indistinguishable from the Silver Seven, and I’m going to do it because that’s what I really want to sell. But the Silver Seven is the kind of amplifier I used to dream about when I first got involved in audio, and now I’ve got one!”

Thus spake Bob, approximately. We detect a trace of ambivalence in his posture; sure, he now has his Fantasy Island amplifier and his “ultimate” transfer function, but he is also parodying the engineering style of the lunatic fringe as a satirical commentary on the high-end audio business. The satire is no less poignant for being essentially harmless. The net benefit to all of us will be the Carver M-4.0t solid-state power amplifier, the Silver Seven clone Bob is currently working on. At \$799 or \$850 or whatever (we are told it will be in that general price bracket), it promises to be an interesting item indeed.

As for the Silver Seven itself, it is almost pornographic in its visual impact, the sexy tube look carried to orgiastic extremes. Each channel is on two separate chassis, power supply and audio, so that a complete stereo amplifier comes in four monstrously heavy units. These have a very high-gloss black finish with discreet silver accents and are suspended on special isolation feet, which rest on marble slabs cut to the size of the chassis. No kidding. There are 15 (count them) huge “milk bottles” lined up in three rows on each audio chassis; 14 of these are output tubes, 7 up and 7 down in push-pull. In front of them are three smaller tubes and a special heat sink for the latter. Each audio channel has not one but two giant output transformers, the rich man’s way to buy deep bass *and* extended highs without the usual trade-off between transformer size and leakage inductance. Even bigger is the power transformer on each power-supply chassis, but the sexiest feature there in our opinion is the slanted panel with two 1950’s-style round meters for voltage and current. Absolutely sinful—there ought to be a law against it.

Measuring the Silver Seven is made somewhat complicated by the fact that it has three output transformer taps for various load impedances and three bias settings that affect not only the class of operation but also the output impedance. That means nine possible transfer functions and therefore nine times the usual amount of work on the lab bench. (Lots of luck with the t-mod, Bob!) We stopped quite a bit short of the whole nine yards, sampling only a few typical lash-ups. The results were sufficiently revealing to satisfy our curiosity. The official power rating of the amplifier is 475 watts into 8 ohms from 20 Hz to 20 kHz with less than 1% THD. At the 4-to-8-ohm tap with the middle bias setting, we measured less than 0.25% THD at that power from 27 Hz to 15 kHz. Only at the frequency extremes does the distortion rise anywhere near the specs. Clipping at 1 kHz under the same conditions is seen at 547 watts with 0.1% THD; power bandwidth referred to 475 watts with 1% THD is 17 Hz to 28 kHz. The small-signal (1 watt) frequency response has its -3 dB points at 1 Hz and

125 kHz, and there is no transformer peak whatsoever. THD at that signal level is in the 0.02% vicinity at all frequencies except the lowest. Square waves look as good as we have ever seen, without the slightest evidence of transformer coupling, and super stable with capacitive loads. At the 1-to-2-ohm tap with a 1-ohm load, the picture is equally impressive. Square waves still look great. Clipping with a 1-kHz CW input occurs at 625 watts, with 22 Hz at 600 watts, with 15 kHz at 529 watts. Using a signal with a lower duty cycle, we measured even much higher 1-ohm clipping wattages. This is not a load-sensitive amplifier.

Our listening tests resulted in the rather unexpected finding that the Silver Seven sounds uncannily like a big brother of the MESA/Baron M180 reviewed in our last issue. That, of course, is very high praise, as we had never before heard a tube amplifier as good as the modified M180, and the Carver has the same utterly convincing, suavely musical quality but with considerably greater authority, solidity and dynamic impact on account of its higher power. Especially with inefficient or very low-impedance speakers, the higher attainable SPL and superior low-frequency sock put the Silver Seven into an even more exalted category. For the \$16,200 difference in price, the highly religious community to which the Carver amplifier is addressed may in addition be deeply moved by an extra measure of that ineffable midrange liquidity, by new epiphanies of imaging... but we must stop being so nasty. Let us simply say that both the M180 and the Silver Seven are *correctly* designed, the latter with about 4 dB more power, and correctness is not a highly variable quantity. Again we have to note that the sound is not particularly "tubey," very neutral in fact, although the focus is ever so slightly softer and the subjective balance a little warmer than with the ultrahigh-definition but less powerful Boulder 500. A lovely sound by any criterion and, of course, an adult toy beyond compare.

One more comment. Although much more expensive than the Audio Research M300, the Carver "Silver Seven" is not overpriced in the same sense. It is merely overdesigned and unaffordable—not the same thing when you think about it.

Citation 21

Harman/Kardon Incorporated, a Harman International Company, 240 Crossways Park West, Woodbury, Long Island, NY 11797. Citation 21 Control Preamplifier, \$549.00. Tested sample on loan from manufacturer.

Citation is a name fraught with early-1960's nostalgia to your Editor and his generation. Harman/Kardon originally launched the late Stew Hegeman's cost-effective state-of-the-art tube designs under the Citation name, and as you know we still think very highly of the Citation I preamp after all these years. We also recall, but not as fondly, a solid-state Citation preamp designed by Stew a number of years later, still in the iron age of transistors. In the early 1980's, Harman/Kardon resurrected the name in an attempt to market a

price-no-object high-end line designed by Matti Ojala. These electronic birds of paradise, the Citation XX power amp and Citation XXI preamp, never flew—wrong product at the wrong price at the wrong time from the wrong source—but they were extremely high-tech and made an impressive statement. The current Citation line is closer to the original in concept, offering advanced engineering and quality construction at reasonable prices slightly above the Harman/Kardon scale. In the case of the Citation 21, the designation seems to echo that of the Ojala super preamp, although there is no real resemblance, the new unit being simpler, more practical, more versatile. It is definitely a child of recent progress, illustrating how much preamp you can buy in 1987-88 for a little over \$500 when a good company tries hard.

We like the understated black look of the Citation 21, accented by tiny green LED's placed *inside* the unit's small (but big enough) push buttons. There is a large number of the latter to implement the unusually wide range of control functions—yes, even defeatable bass, treble and loudness controls are included, and may the purist gods have mercy on Harman/Kardon's soul—indeed, we cannot think of anything omitted except such far-out features as polarity inversion or stereo channel reversal. A nice little bonus is the CD Direct switch, which bypasses all active and passive stages to permit direct connection of a CD player to the power amplifier without unplugging and reconnecting any cables. We could live with this kind of input, output and control flexibility for a long time and never feel deprived.

The circuit-board layout, signal routing and grounding used in the Citation 21 show a great deal of thought and genuine awareness of what can happen to a fragile signal before it reaches the output jack. The circuit philosophy is ultrawideband, as you would expect of the company that made bandwidth a marketing issue, and the RIAA equalization is effected passively in the open loop with further fine-tuning in the feedback loop, resulting in superb accuracy. Our measurements revealed ± 0.0 dB equalization error from 40 Hz to 20 kHz (i.e., literally none), with an apparent boost of perhaps 0.3 dB at 20 Hz which may have been an artifact of our test setup. Overall, that betters the manufacturer's specs and also beats our September 1987 sample of the more than three times costlier Krell PAM-5 (at least in that one respect). In general, all our measurements corroborated the specs, which of course are those of an extremely high-performance, no-compromise unit and therefore quite unnecessary to nitpick on individually. The only design detail we disagree with is that the flat-gain MC amp, which can be switched in ahead of the equalized phono stage, has an input impedance of only 56 ohms. We prefer to see several hundred ohms here for a variety of reasons; loading the cartridge down is the easy way out for cartridge and circuit designer alike. A small quibble, since the MC sound of the Citation 21 is highly respectable by any standard.

As we explained in Issue No. 10, we see a gradual convergence toward a single standard of sound quality in this type of audio component, and it would therefore be inappropriate for us to emulate the onanistic descriptive style of

some of the underground reviewers in an attempt to define the sonic profile of the preamp. We tried some rather quick and not entirely conclusive ABX comparisons instead; in the case of the MC and MM stages we ran into an apples-and-oranges dilemma because of input impedance and RIAA equalization differences that were more significant than any actual amplification differences we might have heard. The line-level stage of the Citation 21, however, acquitted itself quite nobly against all comers, including the new Boulder super preamp. Our statistical sample was much too small, in the number of trials as well as the number of listeners, to even tempt us to jump to a sweeping conclusion, but we can certainly state that the 21 is not "blown away" by the very best, regardless of price and notwithstanding the fondest hopes of the high-endniks. When switched into and out of the tape loop of the Boulder, the line-level signal path of the Citation seems to add a barely audible layer of smearing or veiling, but this is a horrendously severe test, in effect comparing A against A+B, rather than A against B, and the effect is truly minuscule. We also noticed when trying to adjust the volume control of the Citation for unity gain in this test that the pot did not track quite as precisely as the expensive P&G in the Boulder. Once again—no free lunch.

Our net impression of the Citation 21 is very much on the positive side—a well-engineered, handsome, versatile piece of equipment at a surprisingly affordable price. We think Stew Hegeman would have approved of it.

Citation 22

Harman/Kardon Incorporated, a Harman International Company, 240 Crossways Park West, Woodbury, Long Island, NY 11797. Citation 22 High-Voltage/High-Current Power Amplifier, \$999.00. Tested sample on loan from manufacturer.

This one is a genuine bargain—two very nicely built 200-watt mono power amplifiers on one chassis, sharing only the line cord, loaded with features, for less money than many a pricey moving-coil cartridge.

We know the kind of engineering thinking that went into the design, having had some interesting discussions with designers Richard Miller and Marty Zanolino, both of whom are hardened veterans of the Matti Ojala era at Harman/Kardon and have thoroughly digested the Citation XX experience. This is the kind of amplifier design you would expect to emerge from that background: 250 kHz small-signal bandwidth, only 12 dB of overall negative feedback, high instantaneous current capability, symmetrical circuitry and layout, discrete solid-state devices in the signal path. A special feature is a high-voltage operating mode, available via a rear-panel switch, which allows an 8-ohm speaker to draw as much power from the amplifier as a 4-ohm one, thus making the power specs the same into either load. The idea is that an additional high-voltage rail is cheap whereas high current capability is expensive, so why not let someone who has already paid for the latter get the full benefit of it regardless of the higher impedance of his speaker? Rich

and Marty are obviously using the old noodle. Bridged mono operation into 8 ohms is another switchable option, with 400 watts output available in that mode.

In the July 1987 issue of *Stereo Review*, that favorite bogeyman of the high-endniks, Julian Hirsch, published a very thorough test report on the Citation 22, with accurate laboratory measurements now fully confirmed by our own. As our older readers know, we hate to reinvent the wheel and then talk about it; suffice it here, therefore, that the amplifier meets its specs comfortably but is not quite as straight-wire-like on the lab bench as the Boulder 500, which was the only other high-powered, solid-state, true-voltage-source power amplifier we had available for logical comparison (at more than three times the price, to be sure). We were very happy, even so, with the Citation's bench performance; we found no eyebrow-raising anomalies.

We also used the Boulder 500 as the foil for the Citation 22 in a brief ABX listening test. Levels were carefully matched within ± 0.1 dB. As long as we knew which was which, we could have sworn that the Boulder sounded more solid and authoritative, with a deeper soundstage and a warmer character, the Citation giving an ever so slightly thinner impression by comparison. Whenever X was selected, however, neither your Editor nor a very capable associate could reliably distinguish the two. We suspect that if we kept recycling the same 20 seconds of some particularly revealing piece of music and worked at it for hours, we could zero in on the difference, which is obviously very small or possibly nonexistent. Again, our statistical sample was far too small to yield conclusive results, other than the unquestionable fact that the Citation 22 is no slouch against high-priced competition. (Maybe better than the old XX?)

There is one thing about the amplifier that we heartily disliked, indeed resented. That is the perversely "different" speaker terminal hardware Harman/Kardon is forcing on the user. It requires unscrewing a so-called end post, stripping the end of the speaker wire, spreading the bare wire strands radially around a gold-plated hole at the back of the end post, then screwing the latter back into the terminal—four times over to complete the two red and two black connections! If you have fancy banana plugs soldered to your fancy speaker wires, hey, cut them off. We ended up preparing banana-jack adapters, but we can assure you that the Hungarian maledictions that ensued in the process would have scorched the ears of a sergeant of the hussars. Incidentally, Julian Hirsch complained about the same thing. Maybe we are all getting old, deaf and ill-tempered.

That aside, the Citation 22 has our full endorsement.

Citation 23

Harman/Kardon Incorporated, a Harman International Company, 240 Crossways Park West, Woodbury, Long Island, NY 11797. Citation 23 Active Tracking Tuner, \$599.00. Tested sample on loan from manufacturer.

This is not really a review. We do not review tuners for two reasons: we have no RF laboratory and we have

some serious doubts about today's FM stereo broadcasts as a high-fidelity medium. As we wrote more than eight years ago, "Why would you want to buy expensive new shoes when all the streets in town are unpaved and muddy?" The Citation 23 tuner is so nice, however, that the least we can do is to acknowledge its existence as part of the new Citation line and briefly report our experience with it.

The claim to fame here is exceptionally high rejection of FM adjacent-channel interference without the usual trade-offs in stereo separation and THD. Theoretically, there should be no such thing as an adjacent channel in a given broadcast area, since FCC frequency assignments to stations are supposed to be at 400 kHz intervals (alternate channels), leaving a vacant 200 kHz channel between any two local stations. The FCC definition of "area" collapses, however, in the suburban sprawl between our cities, so that the real-world spacing of stations from the point of view of a typical residential antenna is indeed at 200 kHz (i.e., 0.2 MHz) intervals. Frankly, it has never happened to us that we were just dying to hear a station blanketed by a more powerful neighbor only 0.2 MHz away, but the Citation 23 could have satisfied such a craving. It is, in effect, two FM tuners in one: a very good conventional tuner with the usual broadband-tuned IF filters and an entirely new kind inspired by aerospace communications technology, without passive filters of any kind. The latter takes over when Fine Tuning is selected and uses a phase-locked loop (PLL) circuit to lock onto the FM carrier and track its modulations within very precise limits, reading only the signal necessary for good stereo separation and low distortion. If you insist on all the gory details, there is an excellent technical brochure available from Harman/Kardon on the entire Citation line and also a highly competent review of the tuner by Leonard Feldman in the January 1988 issue of *Audio*. Unlike us, Len is a good RF man, and in this context we must voice the same confidence in him as we accorded Julian Hirsch above. These guys know how to measure.

More interesting to us was listening to the Citation 23, with a high-quality live broadcast of an orchestra as our program source, well captured by our Dennesen two-element indoor antenna (which is all we need for the garbage even the better stations put on the air 99% of the time). It was distinctly our impression that the Citation gave us deeper, tighter, more detailed bass and a sweeter, more musical top end than a number of not very recent but respectable tuners we had kicking around the lab and a larger number we had gone through over the years. We realize that this is not a particularly precise and authoritative statement, but then FM stereo is not a particularly precise and authoritative medium. We could certainly live happily with such a tuner; we even like its styling and controls, which match those of the Citation 21 preamp. One minor complaint: the never lit "FM" and "AM" status indicators on the display panel should have been removed, not just disabled, when their functions were reassigned to LED's on the selector buttons.

Oh yes, the Citation 23 also incorporates an excellent and relatively wideband AM tuner.

Citation 24

Harman/Kardon Incorporated, a Harman International Company, 240 Crossways Park West, Woodbury, Long Island, NY 11797. Citation 24 High-Voltage/High-Current Power Amplifier, \$649.00. Tested sample on loan from manufacturer.

The best way to describe this power amplifier is as half a Citation 22 at two thirds the price. For that reason, it is not nearly as good a value, although it still includes the extra high-voltage rail and is just as nicely made; we doubt, however, that our type of reader would opt for it merely to save \$350.

Two Citation 24's in the bridged mono mode would still be slightly bettered by a single Citation 22 for \$299 less; the smaller amplifier has that much less power supply (one power transformer for the two channels, etc.) and not quite the damping factor, not quite the waveform perfection, not quite anything of the bigger one. The whole thing is an attempt to mimic the flagship amplifier at half power for marketing purposes. We are even willing to concede that the attempt is successful—barely successful—electronically and sonically, but the excitement is simply not there. We never order the 7-ounce steak, either.

Hafler XL-280

The David Hafler Company, 5910 Crescent Boulevard, Pennsauken, NJ 08109. XL-280 "Excelinear" Power Amplifier, \$600.00 wired (\$525.00 kit). Tested sample on loan from manufacturer.

This is not exactly news; various reviewers and editorial letter writers have been having fun with Dave Hafler's straight-wire differential test (SWDT) and the "Excelinear" tweak on the XL-280 for well over a year now. The reason for this brief report is that the Hafler people, after reading in Issue No. 10 about our involvement in the various and notorious Carver null tests, sent us an XL-280 and one of their XL-10 passive switchboxes "to play with." Contrary to their tacit expectations, we found a serious fly in the ointment.

The XL-280 does not have a flat frequency response. Why this was never mentioned in the voluminous writings on the subject is a total mystery to us. The fact is that above the audio range the response starts a gradual rise to a peak of almost 7 dB somewhere between 360 and 370 kHz, with a Q of approximately 2, in the worst-case position of the Excelinear variable-capacitor trimmer. In the best-case position of the trimmer the peak is still in excess of 3 dB but at a somewhat higher frequency. The square-wave response of the amplifier always shows a severe leading-edge spike as a result, so that one could never in a technical sense talk about straight-wire-like behavior, since straight wires pass square waves unaltered, *n'est-ce pas?*

We know exactly how this came about, but that does
(continued on page 37)

Phono Paradise Regained, or Sao Win Rides Again

If you are looking for your last record player before the vinyl disc disappears from the face of the earth, the Burmese physicist/poet of the phonograph has great news for you.

The finest flowering of an epoch sometimes occurs in its waning years, as a swan song, rather than at the peak of its vigor; Johann Sebastian Bach, for example, was both the last and the greatest of the baroque composers (his sons considered him old-fashioned but ended up being the old fogies of the next fashion). Such are the thoughts that come to us as we contemplate the decline and fall of the empire of the phonograph and examine the latest and best work of Dr. Sao Zaw Win, Burma's loss and the nuclear community's gain, phys-chem whiz, æsthete and phono technologist extraordinary. It would have been truly wonderful to have this kind of record-playing equipment when we bought our first stereo LP of *Also sprach Zarathustra* with Fritz Reiner and the Chicago Symphony Orchestra. Today Sao Win's crowning achievement will be judged against the best CD sound, and that is tough competition, sonically as well as fashionably.

It should be pointed out that Win Laboratories, the original Win audio company known for its uniquely creative engineering as well as its manufacturing and marketing ups and downs, has been superseded by the Win Research Group, which is a diversified high-tech operation deriving its income primarily from the medical/surgical market. We feel that this will be a stabilizing influence on the company's audio division and that certain Win products will now have the potential to become bread-and-butter items in the audio salons. In other words, it looks like Sao Win has his act together and is taking it on the road.

Win FET-10

Win Research Group, Inc., 7320 Hollister Avenue, Goleta, CA 93117. FET-10 Field-Effect Transducer with Source Module, \$1850.00. Tested sample on loan from manufacturer.

This is the first genuinely new and different phono transducer system we have seen since we have been reviewing audio equipment. The pickup is neither moving-magnet nor moving-iron nor moving-coil nor ceramic nor crystal nor capacitive nor strain-gauge (like the old Win SDT-10) nor any other kind that comes with expert prejudices already appended. Sao Win has moved into virgin territory here. The idea is to translate the motion of the stylus direct-

ly into a fairly robust electrical signal through a FET input stage, without the intervening agency of a generator. This specially constructed input FET is contained entirely within the cartridge body, the gate being physically separated from the semiconductor substrate and attached to the stylus cantilever, while the substrate containing the source and the drain remains fixed. Separate FET's are used, of course, for the left and right channels. The displacements of the stylus are imparted to the gate, thereby varying the electrostatic field strength in the device; that in turn results in variable current flow through the substrate, so that an electrical analogue of the cantilever motion appears at terminals. A power supply and a dedicated "source module" are part of the system; the latter incorporates a voltage gain stage and a special RIAA equalization network for each channel. A more precise and comprehensive explanation of the theory, design principles, construction techniques and calibration methods pertaining to the FET-10 can be found in the two excellent manuals available from the manufacturer.

The cantilever-stylus assembly, always Sao Win's long suit, is of a uniquely advanced design in the FET-10 and quite possibly contributes just as much to the superior performance of the system as the transducer itself. The cantilever is made of synthetic ruby (i.e., corundum), specially doctored during crystallization to enhance certain desired characteristics; the grain-oriented, laser-etched diamond stylus has a tip polish of 40 angstroms (!) and an entirely new tip geometry called "super ellipsoid." Designated as the Win SE-10, the stylus could be classified in the broadest sense to belong to the hyperelliptical or line-contact family, which also includes the Shibata (now obsolete), Van den Hul, Namiki Micro-Ridge and Paroc styli, but differs from these in several important respects. The SE-10 is smoothly rounded in the contact area; the cross section of the tip is a much flatter ellipse than in the case of the others; the footprint is longer than that of any other line-contact stylus, but the extension is upward along the groove wall rather than toward the bottom of the groove. In other words, it is an exceptionally wide, flat, tall and smooth-edged tip, designed to reduce misalignment, bottoming, mistracking and pinch effect to an unprecedented minimum. More than nine years ago we wrote that Sao Win "makes the most beautifully

crafted styli known to us; they make others look like muddy baseball bats under the microscope." That remains basically true to this day. Stylus cantilever damping is inherent in the transducer design, eliminating the need for the usual rubber damping pads that tend to deteriorate with age.

Speaking of beauty, the aesthetic hallmark of the Win line is unmistakably evident in the FET-10 system, the cartridge being encased in transparent Plexiglas (with ruby accents) to match the Win turntables and their speed control units, whereas the source module has tasty little touches such as the power-on LED in the middle of the Win logo, which upon closer examination turns out to be not a red dot but a tiny, delicate W. "Understated elegance" may be a trite expression but applicable here.

Like the Win strain-gauge transducer of the 1970's, the FET-10 is an amplitude sensor, in contrast to MM, MC and other magnetic cartridges, which are velocity sensors. The RIAA preemphasis characteristic is not too far from constant amplitude, requiring only 21 dB of equalization from 20 Hz to 15 kHz with an amplitude sensor, as against 36.5 dB with a velocity sensor. Furthermore, unlike typical velocity sensors, an amplitude sensor has essentially linear response down to DC. In the FET-10, the RIAA equalization is both mechanical and electrical, split between the cartridge and the source module; a dual servo loop takes care of unwanted DC and infrasonic response. The source module has sufficient output to drive a power amplifier directly, without a preamplifier; for those who wish to use it that way, a pair of attenuator-controlled variable output jacks is provided, in addition to fixed outputs for connection to a preamp. The variable output connection results in the best signal-to-noise ratio, but we had absolutely no problem with the fixed outputs, either.

Measuring the FET-10 proved to be a bit difficult. To begin with, the RIAA de-emphasis characteristic, as such, cannot be divorced from the transducer response and measured separately, as in the case of a magnetic cartridge going into an RIAA-equalized phono stage. A further problem is that all the standard test records are designed with velocity sensors in mind and show various little peculiarities when measuring amplitude sensors, in addition to all the expected vinyl inaccuracies. Sao Win does not use test records at all but a very high-tech measurement system involving a laser vibrometer, a bidirectional vibration exciter (actually a specially adapted Neumann SX 74 stereo cutter head) and all sorts of electronics including some elaborate digital data processing equipment. We are totally upstaged and out-classed here; all we can report is the general trend and thrust of our relatively crude tests with the Win SDA-10 tonearm.

We are satisfied that the FET-10 system, when playing RIAA-preemphasized records, is dead flat in response between, say, 90 Hz and 9 kHz, which is basically all that matters. The topmost octave was slightly elevated above the reference level in our measurements, but this may have been entirely vinyl-related as the test records disagreed on the magnitude and slope of the deviation. We also measured a bass boost beginning at approximately 90 Hz, unrelated to

tonearm resonance, but here again the test records may have been at fault with possible inaccuracies in the constant-velocity shelf of the RIAA characteristic below 50 Hz. The individual calibration curve delivered with our sample, made on the Win super test rig, shows ± 0.25 dB response from 20 Hz to 20 kHz, and we have no airtight evidence against it. The channel separation figures we obtained were also considerably worse than the Win specs; we measured in the high teens and low twenties through most of the spectrum, whereas Win claims a minimum of 32 dB at 1 kHz (per Neumann SX 74 excitation). We are in no position to speculate on the reasons for the discrepancy.

Regardless of measurement techniques, the proof of the design is in the listening, and there the FET-10 is very convincing indeed. We can generally state that we have never heard a moving-coil or any other kind of cartridge quite as transparent in sound and free from all suggestions of a mechanically vibrating device as this one. Somehow the physical contact between the stylus and the groove walls is not as audible here as in other phono transducers. The top end is fast, delicate, unstrained and airy; the midrange is completely natural, uncolored and believable; the bass is a bit full on some, but not the best, records (aha!) and remains consistently tight and detailed regardless. The stereo perspective is excellent and raises no questions about channel separation. As of right now, this is the one to beat, at least within the confines of the shrinking phono universe.

The price of the Win FET-10 is unapologetically high, but what it buys you is a complete volume-controlled front end for playing records, not just a cartridge. If you subtract from it the price of a preamp, it begins to look a little more reasonable. Besides, rabid phono supremacists will have to buy it willy-nilly.

Win SEC-10

Win Research Group, Inc., 7320 Hollister Avenue, Goleta, CA 93117. SEC-10 Reference Transcription Turntable, \$4000.00. Tested sample owned by The Audio Critic.

Sao Win was kind enough to send us all the parts required to turn our old SDC-10 turntable into the exact equivalent of the current SEC-10. The most important change is from belt drive to direct drive. The same high-torque motor is used as in the old Technics SP-10 Mk II but with an all-important difference: a sophisticated optical encoder has been added to provide a tachometer system of unprecedented perfection. The result is a turntable drive totally free from cogging without the trade-off of possible belt slippage. Other improvements are a superior acoustic mat, developed through laser interferometry and triboelectric research, and a beautiful little speed-control consolette.

The sound? We have given up comparing Before and After from memory like the undisciplined rank and file of underground audio, but we can truthfully state that we enjoy the turntable even more than before and feel that maybe, just maybe, that extra torque has improved the bass. \diamond

Top-of-the-Line Digital Components: CD and Beyond

Those who expect one CD player to “blow away” another in the current generation of 16-bit, 4-times oversampling, high-end models should read what follows here with particular attention.

Before we can meaningfully discuss individual pieces of equipment, we must clarify certain basic facts of digital audio which appear to be confusing or painful to a surprisingly large number of audiophiles. We touched on these topics in Issue No. 10, but our mail indicates a need for further elaboration.

In general, audiophile attitudes, insights and reflexes honed on analog components are often the main intellectual obstacle to the understanding of digital technology. The rules of the game are suddenly unrecognizable. The analog purist is obsessed with a multitude of subtle details because he knows that the tiny intricacies of the signal are highly vulnerable to any kind of coarseness or inaccuracy in the electrical/mechanical signal path. It becomes difficult to grasp that such concerns are irrelevant to the digital reproduction of music, a process in which the accuracy of detail is an automatic assumption if the system is working properly. That leaves no opportunity for the compulsive little gestures and rituals of perfectionism; any slob can press a button and get just as good results as the nerd with the anti-static gun, stylus brush and pocket microscope. There is no poetic justice in the digital domain.

Let us take a quick look at some of the major points that keep coming up in this context.

Quantization.

Many audiophiles seem to be under the impression that a 16-bit linear PCM system is some sort of borderline compromise, as if the number of bits were a figure of merit and 16 a barely adequate number, not as good as 18 or 24 or what have you. That is a simplistic and misperceived view of the subject. The fact is that 16 bits will give you absolute perfection, as long as you are willing to live with a signal-to-noise ratio of 98.1 dB. If you want 110.1 dB, you need 18 bits. If you can be satisfied with 86.0 dB, all you need is 14 bits. It is not a question of good or bad but simply of signal-to-noise ratio. The proof of this involves probability theory and is not within the editorial purview of *The Audio Critic*, but you can take our word for it. (Oversampling and noise shaping in the D/A converter introduce further complexities but do not negate the validity our basic point.) Needless to say, a signal-to-noise ratio of 98 dB is

incomparably better than anything ever dreamed of by the analog purist. The most sophisticated direct-to-disc recording systems, supposedly better than tape, claim 80 dB or thereabouts, and that assumes totally flawless vinyl.

Now, it is perfectly true that all 16-bit D/A converters (at least all those known to us) exhibit some degree of low-level nonlinearity, so that the standard 16-bit encoding on CD and DAT may not result in true 16-bit resolution in the playback. One of the few good things ever to come out of the now defunct CBS Technology Center (birthplace of the discredited Copycode system) is the CD-1 test disc, which has among other goodies a track with a series of dithered low-level signals for measuring linearity and distortion. The smallest error we have measured so far at the -90.31 dB level was 3 dB (0.5 bit); a more typical deviation is 6 dB (1 bit); 9 to 12 dB (1.5 to 2 bits) and worse can also be found. Is that sort of thing audible? Only in a passage recorded at a whisper level and then amplified to the point where a subsequent normal passage would have to be turned way down again. The Yamaha quasi-18-bit conversion system (probably an interim design) and the new Sony true 18-bit linear D/A converters are intended to achieve better low-level linearity, in effect full 16-bit resolution with 18-bit decoding; we hope to be able to report the specific details and exact amount of the improvement in our next issue. In any event, 16-bit A/D encoding is here to stay, and you can relax about it—there is no fly in the ointment.

Sampling frequency.

We get more flak on this subject than any other (see, for example, the last letter in the “Box 392” column in this issue). Many audiophiles have trouble understanding how a sampling frequency (or Nyquist rate) of 44,100 Hz can generate a sufficient number of samples to define signal components up to 22,050 Hz in both magnitude and phase. At the limiting frequency that is only two samples per cycle; what if they are both taken at the zero crossing, they ask, or both at the peaks, or both somewhere in between? How big or small is the 22,050-Hz signal then, and where does it start and stop? Again, the mathematical proof of the Nyquist-Shannon sampling theorem is outside the scope of this publication, but that does not make it less valid. It may

be better not to try to understand it intuitively but simply to accept it as true. We have, however, one little hint and a somewhat trivial demo to ease the pain of the doubters.

The hint: 22,050 Hz in the above case is the absolute limit, in effect the first frequency that *cannot* be reconstructed, because the sampling theorem actually requires that just a little *more* than two samples per cycle be taken. Let us look at 21,048 Hz, for example, which is represented by 2.095 samples—very little more than two, right?—and can be shown to be totally reconstructible within the system. How? The demo: 1002.27 Hz is the frequency of the square wave recorded on CD-1 and reproduced in the oscilloscope photo that appears in just about every CD-player review in the slicks. You must have one lying around somewhere. Take a look. A square wave consists of a fundamental sine wave and all of its odd harmonics. The 21st harmonic of 1002.27 Hz is 21,048 Hz, and you can easily count the 21 little blips over a full period of the square wave, all of them correctly placed. The 23rd harmonic (23,052 Hz), the 25th (25,057 Hz), etc., are not there because they are above the limiting frequency (Nyquist frequency) of 22,050 Hz. That is why the square wave ripples on top and bottom instead of being completely flat. We rest our simple little case.

Thus, a 16-bit system with a sampling frequency of 44.1 kHz is of the most heavenly and incontrovertible perfection (barring vulgar hardware and software foul-ups, of course) if one is willing to accept just two limitations: a signal-to-noise ratio of 98.1 dB and a top-end cutoff of 22.05 kHz. Those whose hearing is so exquisite as to require better figures are out of luck.

Bad vibes and Reed-Solomon.

Does a good CD player have to be as precisely built and acoustically dead as a good turntable? Must the disc itself be mechanically damped? Analog-conditioned purists fervently believe so, needless to say, and the industry caters to their compulsions without embarrassment. Look at the various steel-and-plastic sandwiches, other high-tech plastic and ceramic materials, mechanical stabilizers, isolation feet, etc., among the features touted by the manufacturers, as well as the gizmos you are supposed to put on top of, around the rim of and who knows where else on your CD's. The underlying assumptions are that some mechanical shock and vibration will be inevitable (true), that the tracking of the laser mechanism will be affected as a result (true), that the disc itself might vibrate to some degree (true), that some of the "pits" in the disc will consequently be skipped or misread and digital errors will ensue (true), and that these errors will degrade the signal to the point where clarity, depth, imaging, etc., will suffer (false).

We recommend the article in the October 1987 issue of *High Fidelity* by David Ranada (who, incidentally, is the unsung hero of the successful fight against the Copycode), titled "Error-Correction Myths Exploded," which explains among other things the glories of the Reed-Solomon error-correction code incorporated in the CD system. The main thrust of Reed-Solomon has little to do with the relatively

trivial shock and vibration issue, defects in the disc itself being by far the most important concern; however, the same basic principles apply to digital errors due to any cause. The damping fetishists believe in effect that fewer errors result in better sound because the error-correction system is less busy. David Ranada points out very tellingly the fallacy of that belief, but we also want to report an independent experiment which yielded the same conclusion.

In collaboration with one of our consultants, a prototype CD player (brand irrelevant) was set up in such a way that the error-correction circuit could be closely monitored. The high-quality Burr-Brown IC in this model has "flags" identified as Reed-Solomon 1, Reed-Solomon 2, Interpolation and Muting, permitting counters to provide readouts of the separate error totals. Now Reed-Solomon 1 and 2 (the distinction between them is unimportant for our purposes) are by definition 100% accurate restorations of the original data, without the slightest loss of information, thanks to the massively redundant recorded data on the disc and the sophisticated mathematics of the error-correction system. At this level of correction, the original binary numbers before the occurrence of error and the corrected numbers are identical. Several dozen CD's were played without any ritualistic precautions, and there was not a single interpolation registering on the counter, let alone muting. Nothing but Reed-Solomon 1 (extremely busy) and Reed-Solomon 2 (less busy). In other words, correctable and therefore inaudible digital errors are constantly with us, under all conditions, and errors requiring concealment (i.e., interpolation) are very, very rare. Finally one heavily abused and badly gouged CD tripped the interpolation counter a few times; the effect was completely inaudible even then. Kindly spare us, therefore, the caveats about microscopic disc flutter, chassis damping, etc.; all that is grist for the Reed-Solomon mill.

To avoid causing distress to small firms selling CD damping gadgets in small quantities, we have decided not to bring up specific names, although we have tested such items on our ABX setup and found them meaningless. They are solutions in search of a problem. We also want to add, just in case someone has totally misunderstood what we mean by the shock and vibration issue, that we are very much in favor of the kind of construction in a CD player that provides immunity to minor bumps and jars during play, now fortunately the rule rather than the exception.

The sound.

Speaking of ABX comparisons, they are an absolute necessity when evaluating equipment as similar in design and performance as the CD players discussed below. We simply cannot understand the reviewer who removes, say, the Tandberg player from his reference system, inserts the Denon, listens to the latter at a level that comes naturally and then delivers strong opinions on the big difference in sound. That is an approach left over from the days when big differences actually existed; today it borders on the irresponsible unless the comparison is between components as divergent as loudspeakers or pickups (see also our com-

ments on the same subject in the context of amplifiers). In this particular instance, a complete round robin structured to ABX each of the four CD players one by one against the others would have entailed six series of comparisons; plugging available digital outputs into the D/A converters of the Denon DAP-5500 preamp would have created nine other such series. You can imagine that we did not go through the entire ordeal; we did enough ABX-ing, however, to conclude—without much statistical authority, to be sure—that *there exist no readily audible differences* within this group of players, plus or minus the DAP-5500. We concede the possibility that many more long-suffering hours of auditions might have uncovered identifiable minidistinctions of little importance, but we can assure you that not one of these units “blows away” any of the others.

Before you decide to cut off the head of the messenger who brings you this blasphemous news, consider the given facts of the situation. What is the mechanism or process whereby these CD players could sound different? They all have separate left- and right-channel 16-bit D/A converters with 176.4-kHz sampling and digital filtering. The analog low-pass filter at the converter output also appears to be the same in all of them (except the DAP-5500, which is not really a CD player). Three of the players are Philips-based and presumably have identical lasers. In low-level linearity as well as in mechanical construction there are some differences, granted, but of quite unlikely audibility as already explained. The main difference from model to model is in the analog circuits, which are well designed in all of these top-of-the-line units and not terribly critical because of the very low gain. Why, then, should they sound different?

By the way, they all sound wonderful. Better, at least to our way of thinking, than any phono system we have heard (*pace* Sao Win).

Denon DCD-1500 II

Denon America, Inc., P.O. Box 5370, Parsippany, NJ 07054. DCD-1500 II compact disc player, \$675.00. Tested sample on loan from manufacturer.

This model represents the top of the line only temporarily, while the DCD-3300 (\$1700.00) is being phased out and until a new ultrahigh-end model is introduced. Meanwhile, in combination with the DAP-5500 digital preamp, it is as high-end as anyone could reasonably ask for and Denon's current recommendation to the audio perfectionist.

Even by itself, without the preamp, the DCD-1500 II leaves very little to be desired. Its front-panel features are at the very least the second best in this group, in terms of control facilities and display information; only the Philips could be argued to be ahead of it and not indisputably. For example, the Denon is the only player we have seen that indicates on the front panel whether or not the de-emphasis circuit is active—now we know which CD's have been recorded with preemphasis. The DCD-1500 II is also one of the two in the group with reassuringly sturdy disc drawers that go “clunk” instead of “click” (the other is again the Philips); this has nothing to do with playback quality but

rather with the promise of durability in the same sense as a good car door. The chassis of the Denon is also one of the two most solidly built and heaviest (the other is once again the Philips); immunity to bumps, jars and knocks is good.

Our measurements indicated pretty decent low-level linearity in the D/A converters; interestingly, the small errors in the two Denon models are all positive—in other words, the decoded levels are higher than the encoded levels—whereas in all the Philips-based models the errors are negative. Square-wave reproduction is OK but not perfect; the waveform shows a slight asymmetry reminiscent of previous generations of converters, before the four-times oversampling digital filters, but not as pronounced. The analog low-pass filter may be the reason; there is also a very non-Japanese -45 dB beat tone of 24.1 kHz when a test tone of 20 kHz is being reproduced. No big deal.

On a per-dollar basis, the DCD-1500 II is very hard to beat. It even has variable volume buttons on the remote control (quite rare) and an optical as well as a coaxial digital output. Highly recommended.

Denon DAP-5500

Denon America, Inc., P.O. Box 5370, Parsippany, NJ 07054. DAP-5500 digital audio preamplifier, \$1400.00. Tested sample on loan from manufacturer.

There are two entirely separate chassis within this unit, sharing only the line cord and the front panel. Divided between them, with some necessary encroachments, are two quite different audio components. One is a more or less conventional preamp/control unit minus the phono stage. It has a very fine unity-gain buffer output amp (designed without feedback), a switchable 16.5-dB gain stage which shows some transient overload problems, a choice of balanced and unbalanced inputs and outputs, and the usual tape loops. The other component is a digital processor/interface, which includes 4-times oversampling digital filters, 16-bit “Super Linear” D/A converters—two in push-pull per channel!—followed by analog 7th-order low-pass filters in each channel (yclept “Computer-Analyzed Linear Phase”—CALP that is), plus digital inputs for CD, DAT, DBS (satellite) tuner or any other digital creature that may come down the pike. The sampling frequency of 32, 44.1 or 48 kHz is automatically selected according to the source. Our favorite deployment of the DAP-5500 is to feed one of its digital inputs from the digital output of a CD player and then take the signal from its DAC Out jack (*not* the Pre Out) into our line-level amplifier stage of choice. That is the simplest possible signal path, leaving the quality of analog amplification entirely under our control.

In terms of digital quality, the DAP-5500 is outstanding. The Super Linear D/A converters are actually no more linear at the lowest measurable levels than the ones in the DCD-1500 II, maybe even a smidgen less so, but that is linear enough (1-bit error, maximum). The square-wave reconstruction, on the other hand, is of the utmost perfection, and 20 kHz is reproduced without any 24.1-kHz beat tone. That CALP filter really works. This is a solid piece of

equipment that creates confidence even if the audible benefits are more elusive than the sheer hardware power.

Euphonic Technology ET650PX

Euphonic Technology, 207 Mountain Road, Wilton, CT 06897. ET650PX compact disc player, \$995.00. Tested sample owned by The Audio Critic.

Long before we tested any CD players for review purposes, we selected this one as our interim reference because of its obviously outstanding qualities. We have not regretted our choice. The Euphonic Technology does everything well, even by our latest yardstick. It is a completely reworked version of the Magnavox CDB650, until recently the flagship of the Philips fleet. Michael Goldfield, a dedicated audio perfectionist of the old school, has made major changes in, and additions to, the power supply, the analog circuitry and even the mechanical construction of the stock Philips unit. The innards bristle with new boards, premium-quality capacitors and resistors, toroidal transformer, etc., and the workmanship is beautiful. The only thing that bothers us, just a little, is the flimsy disc drawer common to all the CDB-type chassis; the control/program/display facilities, on the other hand, are close behind the latest by Philips or Denon in versatility except that there is no optical output.

In our measurements, the ET650PX beat both Denons and the Tandberg in low-level linearity, equaled the Philips and the Tandberg in square-wave reconstruction (very slight positive-negative asymmetry), and reproduced 20 kHz with the typical 24.1-kHz beat tone. Everything else was perfect.

Philips CD960

N.A.P. Consumer Electronics Corp., I-40 & Straw Plains Pike, Knoxville, TN 37914-1810. CD960 compact disc player, \$949.00. Tested sample on loan from manufacturer.

After stamping out excellent but somewhat flimsy Magnavoxes, Sylvania's and Philcos with a cookie cutter, Philips finally decided to market a super deluxe CD player under their own name. It is the most solidly built, most elaborately control- and display-equipped, ergonomically best-designed and generally most reassuring of the models we tested (no Mickey Mouse disc drawer here!); perhaps also the handsomest. Its low-level linearity was the best of them all (0.5 bit maximum error); square waves showed a tiny positive-negative asymmetry (exactly as in the ET and Tandberg); 20 kHz still produced the 24.1-kHz beat tone.

The only worm in the apple is that what we tested was not the current version, as we were suddenly informed at press time. The "improved" CD960 will be sent to us for a follow-up, but we wonder—if it ain't broke, why fix it?

Tandberg TCP 3015A

Ortofon Inc., 122 Dupont Street, Plainview, NY 11803. Tandberg TCP 3015A compact disc player, \$1895.00. Tested sample on loan from manufacturer.

At almost twice the price of the Euphonic Technology, the Tandberg (1) is built on the same CDB-type Philips

chassis with the dinky disc drawer, (2) has considerably more Spartan controls with a slightly better feel but no decimal keys, (3) gives less display information at a glance, (4) measures exactly the same except for much poorer low-level linearity with 2-bit errors, (5) has no digital output of any kind, (6) looks less "commercial" and (7) has different analog circuitry with discrete devices and no feedback. That was enough for the underground reviewers to canonize it, but we think it represents questionable value. Yes, it sounds fantastic but so do the others. ◊

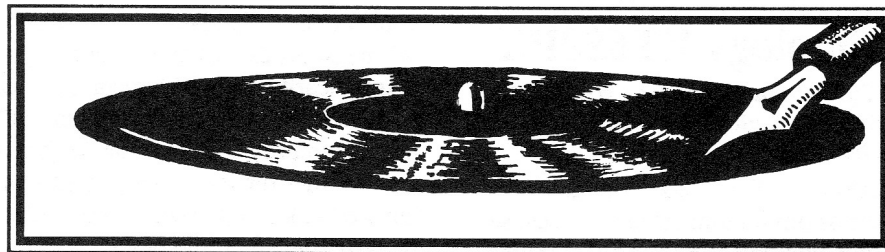
Analog Components

(continued from page 31)

not mean we approve of the situation. What we are dealing with here is a bit of Marketing Man's Engineering. The marketing man wants to be able to say that his amplifier is more like a Straight Wire with Gain than anyone else's. He will never tell you that those words are a popular and convenient figure of speech rather than an exact electrical definition of the perfect amplifier. The scientific truth is that the perfect amplifier is better represented by a low-pass filter with gain, the filter having flat response up to a certain high frequency and rolling off with a controlled slope above that point. The delay through such a filter is a law of nature and a fact of life, not something undesirable to be gotten rid of for the sake of music. The peculiar response profile of the XL-280 is an attempt to reduce the delay that shows up as an I/O difference in the Hafler SWDT setup to *less than that of a theoretically perfect amplifier*—just to look more like the popular icon of the Straight Wire with Gain. Marketing triumphant over physics.

We are in no way suggesting that the Excelinear gimmickry affects the audio range and thus degrades the audible performance of the amplifier. The XL-280 is a well-engineered MOS FET power amplifier in all other ways; its 200-plus clean watts per channel into 4 ohms and very fine sound could easily sell it without any hotshot legerdemain. For our quickie ABX listening tests we set the variable capacitor in each channel to yield the smallest possible high-frequency peak, not the best SWDT null. The results were much the same as in the case of the Citation 22; there appears to be no such thing as a high-powered, solid-state, true-voltage-source power amplifier that is "blown away" by any other of the same breed, unless there is some major foul-up somewhere. The similarities within the category are so much greater than the barely (if at all) perceptible differences that it will take us a lot more work than we have done on the subject so far before we can commit ourselves to any definite preference. The facile A-is-better-in-the-midrange-than-B kind of audio journalism seems downright irresponsible to us at this point. We do prefer the XL-280 to the Citation 24, however, simply because the Hafler offers more clean output for less money, although it may not be quite as beautifully built—American kit design versus Asian consumer packaging. ◊

Records&Recording



As those who used to read this column in the old days will probably remember, our reviews of recorded music are basically audio-oriented, but that does not mean we have nothing to say about the compositions and the performances. Our taste runs to classical music primarily, jazz secondarily, rock/pop/folk strictly for laughs. Your Editor is writing this comeback installment of the column under his own by-line, mainly as a temporary escape from the tyranny of the editorial "we." We occasionally yearn to be I.

At the Leading Edge of the Symphonic Recording Art: the Delos CD's Engineered by John Eargle

By Peter Aczel
Editor and Publisher

When digital recording was still new and confusing, the man who gave me the most levelheaded advice and straightened out my somewhat befuddled thinking on the subject was John Eargle. He did not tell me that the digital technology meant "perfect sound forever" (Philips) nor that it was "musically disastrous" (Doug Sax). He calmly and patiently explained the pros and the cons, the theoretical potential and the real-world practice, the probable progress and the possible setbacks. He seemed to be the only serious practitioner in the industry who was not totally shrill on the subject, one way or the other. Much more recently, in a short article titled "Do CDs Sound Different?" (*Audio*, Nov. 1987), he elucidated the ongoing controversy about digital versus analog sound with better documentation and more convincing logic than I have seen or heard from any other source in all these years.

You seldom, if ever, see the name of John Eargle dropped by the flakier underground audio journalists; he is a professional's professional whose credentials are widely known in circles where audio is a discipline rather than a cult. He has written three highly acclaimed textbooks on the hardware and technique of sound recording, in addition to a large body of technical articles and engineering papers; he is a leading authority on microphones; his credits as a recording engineer go back to the golden years of Mercury and RCA; he has been president of the Audio Engineering Soci-

ety; he has done extensive loudspeaker development work for JBL; he is also a teacher, organist and pianist. Currently he is Director of Recording for Delos International, the mostly-classical label founded by Amelia Haygood and one of the earliest to go all-digital and then all-CD.

It is John's most recent efforts at Delos to reproduce the authentic sound of the symphony orchestra on compact discs that prompt me to write this column. I have always felt that the stereo experience in the living room was infinitely more satisfactory when restricted to soloists, trios and string quartets, intimate jazz combos and similarly small-scale sound sources than when a huge orchestra or an entire opera company was being shoehorned between the two speakers. John's latest Delos CD's are beginning to change my mind, at least to some degree. When played through the best electronics and loudspeakers, these recordings come very close to transporting me to a tenth- or twelfth-row center seat in the concert hall. The dimensional signature of the recording venue, the timing cues of the sound field and the dynamic nuances of the orchestral playing are so well captured by John's microphones and transmitted through his digital recording channels that the basic limitations of the living-room medium are to a considerable extent overcome. There is depth here and width and natural space between the instruments; the pianissimi are always audible and the fortissimi have lifelike impact without

strain. My older son, who has a good ear and has been exposed for many years to some very good recordings and reproduction, was so carried away after our first Delos CD audition that he said, "You know, this is not only the best I've heard, but the second best isn't even close." I more or less concurred, but not without muttering something to the effect that in all fairness I would have to listen again to some other good ones. (The Audio Critic is expected to think like an elder statesman, even *en famille*.)

John's recording technique can be described as eclectic, pragmatic and opportunistic—he is not interested in proving one particular method superior to any other, since he is comfortable with them all, and he will use any available means to end up with the sound he wants, improvising around local conditions if necessary. His basic aim is to open up the apparent space behind the stereo speakers so that the orchestral image is truly panoramic, unconstricted and concert-hall-like. The main microphone in his standard symphonic setup is the unique Sanken CU-41, a Japanese cardioid design incorporating two condenser capsules, one large and one small, for totally flat (± 1 dB maximum) response from 20 Hz to 20 kHz. A pair of CU-41's in a quasi-coincident array is placed in the center approximately one meter from the front row of strings and three meters above the floor of the orchestra. A pair of Schœpfs omnidirectional condenser microphones flanks the center array two meters to the left and right in a more or less straight line. These are mixed in at a level 6 dB below that of the Sankens. Accent microphones, 8 to 12 dB below reference level, may or may not be placed in proximity to some of the softer instruments, depending on their audibility. Still another pair of microphones may or may not be necessary, about eight to ten meters further out in the hall, to capture elusive reverberant detail. Once these balances are set, the controls on the console (lately a Soundcraft 200B) are never touched again; digital dynamics take care of the rest. The digital recording and editing equipment is mostly Sony, with frequent updates, but recently John has begun to phase in the remarkable new Colossus digital processor.

Here are some of his most recent Delos orchestral CD's that made an impression on me.

Delos Sampler

"The Symphonic Sound Stage: a Listener's Guide to the Art and Science of Recording the Orchestra" (eleven selections by R. Strauss, Respighi, Falla, etc., from the recent Delos catalog). Delos D/CD 3502 (made in 1987).

This is a good quick introduction to the best of Delos and, in nine out of the eleven selections, to John Eargle. The two beautiful Haydn excerpts are from recordings made by Marc Aubort, no slouch himself in the pecking order of orchestral recordists. John provides some interesting how-and-why-we-did-it notes for each track of the sampler, but since seven of his own nine tracks are from the CD's reviewed below, I might as well proceed to those directly.

Richard Strauss

Richard Strauss: Thus Spake Zarathustra, Dance of the Seven Veils (Salome), Four Symphonic Interludes from Intermezzo. Seattle Symphony Orchestra, Gerard Schwarz, conductor. Delos D/CD 3052 (made in 1987).

Also sprach Zarathustra was my private property as a very young man; most of my contemporaries had only heard the name but not the music, so seldom was it performed. It was just perfect for a Wagnerian punk—pretentious, decadently romantic/heroic, incredibly brilliant and quite clearly beyond the bounds of good taste. I remember playing the ancient Koussevitzky/Boston version on scratchy 78's in a booth of the Columbia University music library and later making a special point of attending a Dimitri Mitropoulos performance of the piece with the New York Philharmonic in Carnegie Hall. At the beginning of the stereo era, two different Reiner/Chicago versions on RCA were the gold standard, and I played them a lot. You can imagine my outraged indignation when, in 1968, Stanley Kubrick turned the opening "sunrise" passage into a Top 40 jukebox banality through the huge success of his *2001: A Space Odyssey*, even though I had to admit that he had used the music with stunning effect.

With that as a background, I lay claim to the right of having strong opinions on new recordings of *Zarathustra* and do not hesitate to endorse the Gerard Schwarz performance on this CD. It is very, very different from the 1962 Reiner recording I compared it with; that one is a much more deliberate and solemn interpretation, almost liturgical in its gravity, perhaps a little old-fashioned (after all, Fritz Reiner was my long-deceased father's schoolmate, one grade ahead of him, in Budapest). Schwarz takes a lighter, less reverential view of the music, which I happen to agree with (this is not Beethoven's *Missa Solemnis*); he presents a more episodic, less monolithic account of the work, but with unfailingly musical phrasing and many felicities of detail. The Seattle Symphony plays beautifully for him, maybe with a little less virtuosity than the Chicago Symphony but also without the latter's disturbingly vehement string attack of recent years. In fact, the spread, weight and sheen of the Seattle strings in their big moments must be singled out for special praise; Gerard Schwarz deploys the first violins, violas, cellos and second violins in that order from left to right, with the basses behind the first violins on the left, and the resulting stereo effect argues powerfully for his seating preference. As for the "2001" opening, it is one up on just about all other versions; the organ pedal point has immense authority, and the declamatory strokes of the timpani project with amazing impact from the back of the orchestra. According to John Eargle, five sets of timpani sticks were auditioned before the recording session through the microphones and the recording equipment to find the ones that would sound just right without accent miking.

When it comes to Salome's dance, I am about as indifferent to it as a piece of music as I am partial to the

composer's Nietzschean whoopee. It is unquestionably the world's best-orchestrated striptease accompaniment but not much more than that. Here it comes through with superb clarity of texture and highly impressive dynamics. The seldom-heard *Intermezzo* pieces are scored for a much smaller orchestra, but they are quite lovely and allow the Seattle forces to show their stuff in a more chamber-like vein that is the other side of the Straussian coin. All told, 71 minutes of music, good to the last drop.

Oregon Debut

"Bravura." Ottorino Respighi: Roman Festivals; Richard Strauss: Don Juan; Witold Lutoslawski: Concerto for Orchestra. The Oregon Symphony, James DePreist, conductor. Delos D/CD 3070 (made in 1987).

The Oregon Symphony? You can scarcely expect the name to be meaningful to a Euro-Northeasterner like me. It turns out they have been around since 1895, but this 1987 album is their first one ever. Surprise, surprise—they are great! James DePreist, a Bernstein and Dorati disciple who happens to be the nephew of the immortal Marian Anderson, deliberately structured the program to be as demanding as possible for the orchestra's recording debut. He makes his point; the playing is definitely major league on this CD and perfect grist for John Eargle's mill.

The Oregon Symphony appears to have a somewhat smaller string choir than our largest orchestras, and the Arlene Schnitzer hall in Portland is not very large, but the recorded sound is nevertheless big, warm and full-bodied, at the same time preserving the intimacy of the acoustics. The opening Respighi work is not really my cup of cappuccino, more surface than substance, although I like the melodious third movement ("Ottobrata"), which would fit right into *The Godfather*. On the other hand, Toscanini used to perform all of these Respighi tone poems *con amore*, as if they were towering masterpieces, and who am I to contradict the Old Man? Suffice it to say that DePriest does full justice to the piece, which is studded with awesome sonorities tailor-made for audio testing. Speaking of Toscanini, it is his 1951 mono recording of *Don Juan*, one of his finest efforts at the end of his career, that I used as the foil for DePriest's interpretation of the music. Astonishingly, the 84-year old maestro sounds younger than the fiftyish American in this unmistakably youthful work, possibly the most brilliant composition by a 24-year-old since Mozart, Schubert and Mendelssohn. Toscanini's drive, tautness of inflection and sheer exuberance are the essence of "bravura," next to which DePriest sounds a little careful and fussy, although in some passages his phrasing is almost identical. Overall, the Oregon performance is surpassed but not blown away (to use the favorite audio-freak expression) in this severest of available comparisons—not a bad result at all.

The Lutoslawski recording is the only version in print

of this borderline commissar music, which won a government prize in Poland in 1955, a year after its completion and just before the beginning of destalinization. It is based on folk themes, assumes the name but not quite the quality of Bartók's great "Concerto for Orchestra," displays a Shostakovich-like skill in orchestration, sounds "contemporary" without making excessive demands on the listener, and generally provides light but intelligent entertainment while letting the orchestra romp with abandon. A couple of years later the composer was writing 12-tone music—you get the picture. DePriest apparently loves this piece and gives it the performance of a lifetime—simply stupendous.

This is the perfect audiophile album for three reasons: (1) the music is good without being as spellbinding as, say, a Beethoven slow movement, so that one's attention does not stray from the fabulous sound, (2) the selections are complete opuses, rather than frustrating sampler-type chunks and (3) the orchestration is so varied from piece to piece that the audio equipment is exercised in every possible way. All that (a full 70 minutes of it) and John Eargle's very latest techniques, too—what are you waiting for?

Manuel de Falla

Manuel de Falla: Nights in the Gardens of Spain, The Three-Cornered Hat (complete ballet). London Symphony Orchestra, Gerard Schwarz, conductor; Carol Rosenberger, piano; Della Jones, mezzo-soprano. Delos D/CD 3060 (made in 1987).

I have no strong opinions about this music; I never paid too much attention to it, never bought a recording of it but always liked it, sort of, in the sense that I would turn up the volume of the car radio when it was playing. The concluding jota of the ballet score is, of course, a pop-classical war-horse.

I have several reasons for including this CD here, not the least of which is the outstanding playing of the London Symphony Orchestra, showing what Gerard Schwarz can do as a guest conductor, away from his home team. Another reason is the unique recorded sound achieved by John Eargle in the stone-floored, church-like acoustics of St. John's Hall in London, a sound combining amazing clarity with just the right amount of reverberation. Still another is the special texture of Falla's orchestration, which is ideal for testing the transparency and transient response of audio equipment. Having auditioned this album last among the four reviewed here, I came to the inevitable conclusion that my favorite John Eargle recording is the one I happen to be listening to.

As for the interpretation, it is satisfactorily idiomatic to someone whose understanding of things Iberian does not extend much beyond *Don Quixote*, Luis Buñuel, paella and Rioja wine. Carol Rosenberger plays her *concertante* piano part beautifully; Della Jones is also excellent in her minor role; the playing time is 64 minutes, a little short for Delos but long for most other labels. Good show. ◇

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