

# The Audio Critic

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## In this issue:

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We further explain our philosophy.

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We conclude our preamplifier survey (as much as it will ever be concluded), with special attention to the moving-coil scene and to previously untested units. Final recommendations are made.

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We bravely confront the almost invincible ignorance surrounding loudspeaker bass response and review some of the newer subwoofers.

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We begin our comparative survey of power amplifiers.

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Plus our regular features, including some interesting letters to the Editor.

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**For subscription information and rates, see inside back cover.**

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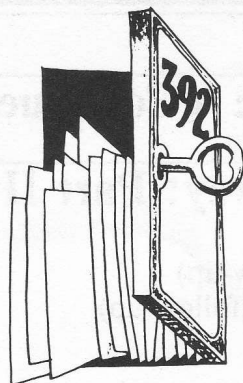
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## Box 392

### Letters to the Editor

*The response to our first issue has been simply overwhelming. We're still in the process of digging ourselves out from under a mountain of love letters. We're reproducing a few of them here (call it an ego trip) before proceeding to the meatier stuff you're likely to be looking for in this column. The letters we publish may or may not be excerpted, at the discretion of the Editor. Ellipsis (. . .) indicates omission. Address all editorial correspondence to The Editor, The Audio Critic, Box 392, Bronxville, New York 10708.*

The Audio Critic:

I have just finished reading your first issue and I am greatly impressed. I subscribe to six other magazines and yours is by far the most comprehensive and straight-forward of them all . . .

Sincerely,  
Greg Hergott  
Islington, Ont.

The Audio Critic:

Your magazine is really stunning. For the first time I find a correlation between the theoretical and the practical basis of reviewing philosophy in an "ear-oriented" magazine . . .

Sincerely,  
Gerard Harjadi  
Aachen, West Germany

The Audio Critic:

Before paging through your first issue I was very skeptical about your ability to live up to your prepublication promises. I now see that you are as good as StereOpus, Sound Advice, Stereophile and The Absolute Sound combined (I subscribe to all four of them). Your evaluations are fair and thorough without going through page after page of meaningless comments . . .

I look forward to your next issue.

Sincerely,  
Len Hupp  
Ferguson, MO

The Audio Critic:

Congratulations! You done it, by damn! (Of course, I knew you would. Anyone with guts enough to launch a journal of opinion on such a basically esoteric subject—at that price, too!—would have no way of knowing it couldn't be done.)

All the best,  
Oeveste Granducci  
Virgin Islands

The Audio Critic:

I'd just like to congratulate you on the quality of the first issue of The Audio Critic. It's readable and informative, intelligent and witty. I'm glad I'm a subscriber . . .

Keep up the good work.

Mike Stewart  
Galveston, TX

The Audio Critic:

I have just completed reading the first issue of your analysis (I am aware that calling your publication a magazine causes you displeasure, and as a result I will refrain from doing so) and must comment that I am indeed pleasantly surprised to find that you have refused to succumb to the general fallacy that if a product measures well in relation to laboratory tests, it follows that it will be a musical-sounding component.

For too many years I have stood alone in this area by stating that such products as Marantz preamplifiers were better suited for book ends than as a means of musical reproduction. I have cooled many relationships when asked to critique a friend's system by commenting, "Hear that boom? Hear that tinkle? You've obviously got a JBL."

I realize that many people attach a great deal of personal sentiment to a particular piece of equipment merely because it has served them well (or so they thought) in the past. I think this is best illustrated by the large number of people who equate McIntosh, excuse me, McIntosh with state-of-the-art. It is indeed

The Audio Critic:

. . . Your first issue was great just as I had hoped . . .

Keep it up as I can't wait to mainline the very next issue as soon as possible. Those who complain about the price are just looking for something to gripe about. The Audio Critic is worth twice, that's right, twice the price . . .

Ralph T. Feath  
Charleston Heights, SC

a pleasure to find a publication that calls 'em as you see 'em. I have never read a bad review of any piece of equipment in any of the so called "slick" audio magazines. If I were completely naive the only conclusion I could reach would be that (a) only state-of-the-art equipment was tested, or (b) anything I happened to purchase as a result of these reviews would have to be good.

I have reached two conclusions that differ somewhat from these. (a) The reviewers were biased because of the manufacturer's purchase of advertising, and to a smaller degree because of the free equipment they had received from the company in question. (b) Why should I take the word of people who as yet have not proven themselves qualified in that they have not even stated their philosophy of what criteria were used in their analysis. In short, keep on givin' 'em hell.

Dave Nichols  
WGAD  
United Press News Network  
Gadsden, AL

The Audio Critic:

My hat is off to you! I was a skeptic (aren't we all now), but now I *believe*. Keep it up—your honesty is so necessary in today's market. I was very close to parting with a few kilobucks for "high-end" equipment when I decided to go ahead and spend \$28. What a smart investment. I am convinced I'll wait a while, read a few issues and *save* many times my initial output. I'm so glad you folks are not afraid of any big toes. The equipment critiques are clear, analytical and fair, even though I detect a note of awe for serious, high-order scientific methods . . .

I can only say I am anxiously awaiting every issue. Keep it going!

Sincerely,  
Capt. Douglas S. Stoll  
Spokane, WA

The Audio Critic:

In a day and age when \$28 doesn't even buy a decent dinner or an evening's entertainment, your publication's price seems quite reasonable. In an industry that does indeed scabble for superfluous things and then does battle to defend what it doesn't need, yours is a welcome light. Keep up the good work.

Dr. H. M. Masek  
Copperas Cove, TX

The Audio Critic:

I must admit . . . in seeing your advertisement in *Audio*, I said to myself "This guy (or guys) must be crazy."

Well, I've just spent an evening reading your publication. You know something?

You are crazy!!!!

Enclosed is my check for the required amount. As you may well know, money is getting tighter all the time. Somehow I feel that this is going to be the *best* \$28 I've spent in many a year.

Good luck.  
Michael Avery  
Brooklyn, NY

The Audio Critic:

I applaud your first issue. You seem to have met your objectives clearly—and, as an editor myself, may I congratulate you on the *literateness* of your copy. You have a good copy editor on the job . . .

James N. Rogers  
Indianapolis, IN

*We don't have no copy editor. What do you think this is—one of them pansy literary magazines?*

—Ed.

The Audio Critic:

Congratulations on your new magazine. It's far better written and laid out than the usual run of things.

But I did find one tiny error. There *is* a straight arm with a detachable shell: the Connoisseur arm used on the BD1 and BD2 turntables, and imported by Hervic.

Regards,  
Ivan Berger  
Senior Editor  
Popular Electronics

The Audio Critic:

Careful! As I read you, on page 13 of Volume 1, Number 1, you are guilty of clairvoyance—prejudging that a group of imported preamps cannot be worthwhile, without listening to them.

Understand that I am not saying these are good products. It's just that I haven't heard them, thus can make no judgment at all. I don't believe you can either, until you listen to them. A product must be judged on its objective merits, not on advertising bullshit. Thus you must not prejudge that a product cannot be good just because its advertising is all bullshit. You may be disgusted with the ad copywriter, but that doesn't mean that the engineering department isn't trying to do its honest best. The proof can only be in the objective performance—does it reproduce music in a worthwhile manner?

I have no great arguments with your preamp ratings, except for two. I wonder if the Advent is really that good. We have compared it here with the phono sections of ordinary receivers, such as the Rotel RX150 at \$150, and find the Rotel wins. I suspect you are caught up in Mr. Holman's impressive writings to a certain degree. We don't really think the PAT-5 deserves such a harsh critique either. First of all it is inexpensive, about \$170 at many discount houses, and the customer's alternative is to spend two or three times as much for something better. Second, Dyna has had for some time a quality improvement program through their warranty stations where any PAT-5 will be improved *free of charge* with new phono transistors and output IC's, which go a long way towards making all of them sound like J. Gordon Holt's early samples.

In the past I have found underground magazines to tend to overemphasize the differences between components and The Audio Critic is no exception. (Commercial magazines tend in most cases to underemphasize differences.) I think we all hear the same differences; it's just how we relate to them, whether small sonic improvements are worth the money, and how much

weight we put on differences that is important. After all, some people love Klipschorns, others love Magneplanars; the two couldn't be more different sonically, and I defy you to tell a K-Horn lover that Maggies are better, or vice versa.

Issue 1 had interesting engineering thoughts. We agree with Mr. Rappaport that TIM is critical, but disagree that a preamp need be slow to work with most amplifiers. The Van Alstine Preamp is damn fast, but still drives a Dyna ST-70 tube amp beautifully. We agree with Mr. Deneen of Paragon that *any* RF filtering does bad things sonically (we ought to tell the Feds that before they screw up our products), but lack of RF filtering need not cause RFI problems.

The Van Alstine Model 1 preamplifier will soon be sold on the East Coast. You will probably hear about it when it gets there.

Sincerely,  
Frank Van Alstine  
Van Alstine Audio Systems  
Burnsville, MN

*Since Frank Van Alstine is an acknowledged expert who is certainly entitled to his technical opinions, we have only some broadly philosophical comments to make.*

*One is about the "page 13" issue (our dismissal of the Pioneer-Kenwood-Sansui category of preamps). Let's put it this way: If we were trying to determine which is the world's fastest land animal, we'd investigate the cheetah, the Thoroughbred horse, various gazelles and antelopes, some hounds like the greyhound and the whippet, and so forth. We wouldn't bother with the yak or the baboon unless a very reliable observer assured us that he has seen them traveling at comparable speed. No one whose ear we trust has ever suggested to us that the sound of, say, a Pioneer comes anywhere near that of a Mark Levinson or even an AGI. If someone of the stature of Frank Van Alstine should report that, we'd certainly look into it; otherwise life is just too short for such academic exercises in open-mindedness.*

*As for the Dynaco PAT-5, the free overhaul policy is news to us; it appears to be not only a tacit admission of the faults we observed in the product but also a form of tokenism in assuming responsibility. Why hasn't the availability of this service been pointed out to customers who are suffering their substandard PAT-5 in silence? We haven't heard a peep out of Dynaco since we published our review. Mark Levinson recently saw fit to institute an official recall of JC-2's for incomparably less important reasons.*

*Lastly, if the Klipschorn and the Magneplanar sound totally different with the identical input, at least one of them is wrong. Or both are wrong. Accuracy isn't a matter of personal preference. Just a problem in verification.*

—Ed.

The Audio Critic:

Congratulations on your first issue. You have almost lived up to your advance claims and that is high praise.

You did however break your own "golden ear" avowed purpose when you took a cheap shot at the William Watkins dual-drive woofer based upon hearsay theory. I have heard the Watkins woofer in a number of configurations, in addition to the QLS, and in my opinion it is a distinct improvement over other leading woofers. I know of no woofer of equivalent size that will deliver as low-distortion acoustic power in the 24 to 36 Hz range and remain flat up to 500 Hz.

Yours truly,  
James A. Mitchell  
Kingsport, TN

*Only the language of the reported put-down was hearsay (although recently confirmed). The theory itself is there for anyone to study in the numerous recent engineering papers that analyze loudspeakers mathematically in terms of filter analogies. It now appears, however, that not all theoreticians are equally opposed to the Watkins woofer, so that both sides of the controversy will have to be covered in a forthcoming test report. Infinity has promised us a QLS to compare against other high-end speakers.*

The Audio Critic:

I was disturbed by your knuckle rap of the BIC Venturi advertising tactics. Perhaps if you knew something of the history of the company you'd have a bit more respect. (Pronounced ARE-EEE-ESS-PEE-EEE-SEA-TEE.)

The Venturi principle was discovered simultaneously in Woodbridge, Connecticut, and Terminal Annex, California, giving rise to the expression "East Coast sound vs. West Coast sound." (Anyone who doesn't know that the East Coast *sounds* different from the West Coast obviously hasn't been around.) Contrary to popular opinion, the Principle was not named after world-class miler Ken Venturi, although Ken did contribute much to speaker design philosophy with the observation that people (and yes, speakers) breathe in and out alternately in a one-to-one ratio!

The Principle was named after its inventor, the famed Israeli mystic Uri Garragin, who was designing a new speaker cabinet when his Poppa walked into his workshop and said, "By you dot's a vent, Uri?" The Garragin atelier turned out both single-vented and double-vented enclosures from its Seventh Avenue factory before it was acquired by British Industries and Uri retired to the mountains to count his money.

British Industries itself acquired its name when Penny Peapecker, Eastern Airlines' star stewardess, suggested to Prime Minister Heath that he could revive the flagging British economy by "flicking the Bic." The company has been trying to isolate itself from its ball-point-pen-and-cigarette-lighter French cousins ever since . . .

By the way, I think you are the MLAS of publications: expensive, holier-than-thou, and worth every penny. Keep up the good work.

Mike Randall  
New York, NY

The Audio Critic:

... Having read your first issue, I agree with everything you say, especially your procedure for making fine comparisons between fine components. However, about that procedure, what of the deformations in discs, after being played, that are supposed to persist for 24 hours or so. If you play the same music over after five minutes as you say, these deformations will be there after the first playing, not having had enough time for the resiliency of the vinyl to "bounce back" . . .

Dale M. Smith  
Reno, NV

*Theoretically, you may be right (although very few sophisticated audiophiles we know seem to suffer from vinyl deformation hypochondria). In practice, the difference in sound between any two components appears to be greater than between a "deformed" and a "rested" groove. If you give the theoretical average to the less good component, it still won't sound better.*

—Ed.

The Audio Critic:

A most interesting debut, and well worth the \$4+ it cost. I appreciate your plans to test many products at one time. Until the day that reliable bypass or objective tests are developed, we will still be picking components because one "sounds better" than another; testing many units at one time should increase the usefulness and reliability of the comparisons.

I cannot judge your honesty by whether or not you accept store ads, but by whether or not I hear what you claim to hear when I audition. If accepting store ads lets you buy more equipment for testing, then I approve.

I rather like vituperative letters. Bongiorno's are a pip, and it's amusing to think that he might single-handedly destroy his own company with them! You may be amused by my reply to his letter in the third issue of Sound Advice.

Dick Calderhead's drawings are just not nasty enough to go with the incisive captions they accompany. (Is that what HP looks like?)

I see a lot of preamps that should have been included: Analog Engineering, Bose (don't be prejudiced against the amps just because the speakers are crummy), Bravura, Bozak, Crown, Heathkit, Nakamichi, Spectro-Acoustics. Your reasons for rejecting "low-end" manufacturers' products is reasonable, but why should a company's failure to claim that their product is SOTA be a reason not to test it? If you believe that most high-end equipment is overpriced, you owe it to yourself to test as much moderately-priced equipment as you can.

I'm glad to see you are looking for measurements which correlate with what we actually hear. You could put yourself out of business!

First you say "shit", then you say "built like a brick outhouse." Please don't be hypocritical. Either use all euphemisms or all Anglo-Saxonisms.

*(We never use four-letter words editorially, only when we're quoting somebody else. And anyone who doesn't appreciate such fine stylistic distinctions can go fornicate himself.—Ed.)*

This business of matching the slew rate of the preamp to the power amp is silly. An amplifier's slew rate is merely a *potential*; it does not mean that all signals coming out of the amp will *have* that slew rate. What Mr. Rappaport really should have said was: "The slew rate of any stage in a chain of amplifiers must be no less than the product of its gain, times the maximum possible slew rate of the *signal* which can be applied to it from the preceding stage." Let's take an example:

Ignoring equalization, suppose that a preamp has a voltage gain of 200, and that the highest slew rate from some cartridge/disc combination is .01 V/uS. The greatest slew rate of the preamp will then be 2 V/uS. The fact that the preamp may have a capability of 200 V/uS is completely beside the point; we have to match the slew rates of the *signals*, not of the *components*.

There is, however, another angle to this problem. A preamp with excessive TIM may produce very high slew rate distortion components. If the power amp cannot amplify them, injury will be added to insult. Under such conditions, lowering the slew rate of the preamp may be of benefit, but only because the design is inherently faulty. Since both Messrs. Rappaport and Curl have fine preamps, they both can't be completely right.

*(According to Tom Holman, the highest achievable disc/cartridge signal slew rate is currently 0.026V/uS. Multiplying that by the gain of typical home music systems from the phono input to the speaker terminals suggests that slew rate limiting of the signal itself may not be an uncommon occurrence somewhere along the signal path, most probably in the power amplifier. That's why a fast power amp is generally a good idea.—Ed.)*

I recently heard the Advent and Quad preamps. The Advent does indeed win: less hardness, more extended high end, much more open and spacious. It might be a good idea to let Advent thoroughly exploit your favorable review—it would really put other manufacturers on the spot! It might also encourage Advent to produce a separate preamp with really versatile tone controls, filters, and switching, to sell at a reasonable price.

The Phase Linear Andromeda is a dreadful speaker. It has a distinctly nasal sound, which I heard both from PL's records and my own. A well-known speaker designer said he couldn't stand to listen to it for more than a few seconds.

I've heard the Infinity QLS, although not with my own records. The high end seemed distinctly "sharp". I was not tempted to trade my DQ-10's. I object to line radiators, for the laws of physics suggest that they will have response aberrations, for the same reasons that a large tweeter has an inherently rougher response than a small one. (Although the aberrations are confined only to the vertical axis, of course.)

The Beveridge Cylindrical Sound Electrostatics are about the most uncolored speakers you'll ever hear, but most people will find them too "polite"-sounding. They, too, are line drivers, and they seem to be lacking the aberrations I accuse line drivers of having. Well . . .

If you ever get around to bypass tests, I hope you can do them as long-term comparisons, rather than with rapid switching. Like you, I have my doubts about rapid A/B comparisons.

Do I need to add that I am anxiously awaiting your next issue?

Sincerely,  
William Sommerwerck  
Baltimore, MD

P.S. This mess (*eleven lines crossed out—Ed.*) occurred because I've run out of paper and time. I decided that some of my remarks were not suitable for publication, and rather than asking you to remove them if you should publish this letter, I have bodily excised them. Since you look like you're going to be very iconoclastic, I don't want to provide any possible verbal ammunition for my own or anyone else's embarrassment.

Note the *High Fidelity* review of the Advent 300. One of the problems with not telling the truth about bad components is that it encourages not telling the truth about really superior components, especially when they're cheap. Christ.

#### The Audio Critic:

I just received your issue number one. Thanks for 48 pages of the most self-congratulatory prose I've encountered since my last issue of *Sound Advice*. Actually, I haven't read anything this smug since Harry Pearson's EMT review. "Sucked out midrange," indeed! Why do all of you people have to write as though you had just invented truth? That's what's so refreshing about J. Gordon Holt; he gives his opinions as opinions and not as Papal Encyclicals.

So, you tested all the preamps using that model of transparency, the DQ-10? Wonderful! Outside of a hard, irritating top, funny bass and a few midrange anomalies, the perfect speaker. No reason to try any other speakers with the preamps—what the hell. What happened? Did you run out of money after you bought all those preamps? "Our sepaker . . . a purist device." You didn't have to buy pedestals for your DQ-10's: I'm sure you have them mounted on an altar in your living room. Do you have evening services instead of listening sessions? Did it ever occur to you at all that there might be some connection between the Dahlquist's problem areas and the faults you attribute to the SP-4? I guess every new periodical (try that word) has to "discover" at least one great, unknown component.

Further, consider "The Admonitor." Please leave this filler out of the next issue. Boy, talk about that little David *Audio Critic* taking on those big, old audio Goliaths. Talk about beating a dead horse. You know very well no self-respecting audiophile takes seriously or even gives a second glance to Pioneer gatefolds or B.I.C. speaker ads. Yes, sir, you've really exposed them for the shameless, commercial giants that we all knew they were.

Finally, I am not interested in three pages of Max Wilcox's reminiscences. Record reviews? Yes. A short paragraph on his credentials? Perhaps. I found his "insight" into the recording industry very uninteresting. Moreover, under EMI he could have included Pathe Marconi and Electrola, both companies that have truly had "consistent"—and excellent—sound for a number of years.

Please accept the above as constructive criticism. It is a little acerbic, perhaps; but then, I've been snowed in here in Buffalo for over a week.

Sincerely,  
L. P. McGovern  
Buffalo, N.Y.

*The letters in response to our first issue ran well into three figures, but this was the only totally negative one. We searched our pages for self-congratulatory prose and dogmatic revelations of truth, but found only repeated disclaimers of infallibility. (Including the infallibility of the DQ-10—see pages 10, 39 and 40.) The "sucked-out midrange" phrase simply wasn't there—nor in the EMT review referred to! It seems to be a figment of L. P. McGovern's imagination.*

*We can only conclude that (a) he deeply dislikes all strong opinions other than his own or that (b) the asperities of the high-end audio scene have so rigidly programmed his resentments that a code word like "purist" will automatically trigger him into aggression, a la Manchurian Candidate.*

—Ed.

#### The Audio Critic:

Congratulations on keeping (so far) your first promise. Having been finally seduced by your ads, I ordered my subscription in late January fully expecting the "normal" delay of months associated with other "underground" publications. Less than ten days later, however, the little gem (Volume 1, Number 1) arrived on my doorstep—keep up the good work.

I believe, however, that the jury is still out on the content of your "service" as to which I offer the following comments:

There is no indication of *any* dissent among your staff concerning judgments made as to any of the units tested—a situation which, in my eyes, stretches your credibility somewhat. The most useful publications I have found have been those which contain several reviews (sometimes dissenting) of one unit. In terms of usefulness, I have found that I have been able to align (more or less consistently) my opinions, "taste", likes and dislikes of various units with those of a particular reviewer. I am able, therefore, to "weight" the respective reviews of a unit for my own purposes. If reviewer A with whom I agree tells me that a certain combination of components is synergistic, resulting in a good sound, and I am unable to listen to that particular combination—which happens more often than not—I tend to put a great amount of faith and trust in his conclusion. Dissent can, therefore, be a useful tool for the consumer—which leads to my second comment.

While several reviewers may agree on "objective" sonic characteristics of a particular unit (i.e. top end roll-off or brightness, midrange hump, ultratight bass, etc.), their differing conclusions as to which unit is "better" often are based upon what they "subjectively" perceive as the most natural (musical) sound. Although I recognize that sonic characteristics are certainly intertwined with the ultimate musicality of a unit in terms of



it sounding "real", the definition of reality in sonic terms is not singular. Boston Symphony Hall (my favorite) "sounds" different than, say, Carnegie. To use a grossly oversimplified example—the Maggies (in an all ARC system) sound more like the Boston Hall than do the Fulton J's (Ampzilla II, JC-2 system), which sound more like Carnegie. The point is, TAC (*Ouch! Let's not start an inside-dopesterish alphabet soup. Please?—Ed.*) does not indicate whether your conclusions are based upon your collective agreement as to sonic characteristics, your agreement as to "liking" the sound of a unit—colorations and all, or both. My own experiences in critical listening have generally resulted in agreement as to characteristics but much less so with respect to individual tastes (he likes Carnegie but I like Boston)—which leads to my third comment.

The senior editor of one underground publication has admitted (in print) his "feeling" that tubes somehow sound (to him) inherently better than transistors. That statement as to his *personal* preferences establishes his bias in terms of his reviews. I therefore take his reviews of transistor units with a grain of salt—but at least I know where he stands. In reading the first issue of TAC (*Double ouch!—Ed.*), I sense the implication that you folks (collectively, individually or just the Ed.?) prefer a good transistor over a good tube. ". . . It tends to soften piano transients. . . . In other words, it's *still* a tube preamplifier . . ." (Review of Paragon Model 12, emphasis mine.) Are you really trying to tell us something or am I overreacting? Now, I am not a "tube freak" (I happen to be in love with the Rappaport PRE-1—with Maggies—for me the combo is synergistic), but the sound of the Boston Hall also softens piano transients. In fact, to me, the entire upper end in that hall is somewhat "soft"—but beautiful. Logically, then, one has to make a value judgment concerning the "reality" when one makes such a judgment concerning the sound of a particular unit or system. I have yet to see an audio publication articulate the former when setting forth the latter in a review. That type of analysis would be useful for us who are not able to make such judgments because of obvious limitations of equipment availability.

Finally, I would like to see an amended review concerning the ARC SP-3A-1, *with* the latest mod. While the difference is not as satisfying as I had hoped, the difference is *not* "subtle" as claimed by the manufacturer (at least one other publication so agrees). I questioned ARC's claim in that respect in light of their new line of "state-of-the-art" equipment released close in time to the announced SP-3A-1 modification. Their money maker by design is now solid state and not the old "continued" tube line.

I hope that you will fulfill all of your lofty expectations for your new publication. Good luck—I really *do* like what you have done so far.

Sincerely yours,  
Roy D. Toulan, Jr.  
Beverly Farms, MA

*Should there ever be serious dissent among our staff regarding the sound of a component, we'll certainly spell it out. The point is, though, that so far there has*

*been no such dissent. We're inclined to believe that strong differences of opinion in this area are due mainly to a lack of knowledge and/or experience. As we said in the introductory article of our first issue, an intense interest in audio equipment is insufficient qualification for judging it. A group of enthusiasts gathered in a room doesn't constitute an expert panel. Do they know an oboe from an English horn? Or a condenser microphone from a ribbon? Or a capacitance from an inductance? Or are they just looking for sonic lollipops that agree with their palates?*

*The Boston Symphony Hall/Carnegie Hall analogy is most unfortunate. An accurate audio component should have no acoustical personality. (That most components do have one is completely beside the point and mustn't influence the search for accuracy.) If a recording was made in Carnegie Hall with, say, Neumann microphones and your speaker makes it sound as if made in Symphony Hall with AKG microphones, you've got a bad speaker even if you like the sound.*

*In other words, accuracy isn't a matter of taste. It isn't a matter of taste whether the body shop has correctly matched the color of your repainted car door to the color of the car. Either they did or they didn't. The fact that it's very difficult to make such determinations in audio has nothing to do with the basic validity of this point of view.*

—Ed.

#### The Audio Critic:

You are so quick to pick on commercial advertisements, which seems to me to be a waste of time as most audiophiles are sophisticated enough to deal with their distortions and hyperbole.

On the other hand you completely ignore an equally questionable practice.

In your very first issue you recommend the purchase of the Rappaport preamp. When I first heard this preamp a few months ago it cost \$475; now it costs \$575, a rise of over 20%—but that was not enough for them. Making a separate power supply for this preamp gave them the opportunity to make an even greater rise in price. The new power supply costs \$200 (while let me note that the DB Systems power supply costs a reasonable \$75, less than half the cost of the Rappaport's), thus allowing them to raise the total price of the original unit, \$475, to a new high of \$715; in other words around a 50% increase for virtually the same electronic components.

I understand that there are costs involved in Research and Development, and costs involved in initiating production of a new item, but of course it seems reasonable to assume that the initial price took into account such expenses.

Therefore, while small price increases due to inflation are acceptable, I can't help but feel that large price increases are simply an attempt to soak the audiophile, to take advantage of him after a piece of equipment has gained a following.

Though I have no personal knowledge of the actual facts involved, I think it fair to mention that I heard

that the Paragon preamp also underwent an astronomical price rise; the reason, so I was informed, was that a rave review in an audiophile publication made it irresistible regardless of price, a situation the company could not restrain themselves from taking advantage of.

Not every lover of music is rich (the great composers themselves, were they transposed to our time in their respective economic situations, would not, for the most part, be able to afford much of this audiophile equipment); in other words, many people must make financial sacrifices in other areas to buy the best equipment; their purchase, in addition, may represent a lifelong investment. I think therefore that it is incumbent upon *The Audio Critic* to expose and comment upon such practices as I have brought to your attention so that the purchaser of audio equipment may be in a position to assure himself that he is getting fair value for his expenditures.

Sincerely,  
Jeffrey Panken  
New York, NY

*First of all, your summary of the Rappaport preamp's price increases is somewhat simplistic; we refer you to the Rappaport PRE-1A/MC-1 review in this issue for the full story. Then you err in assuming that the current Paragon Model 12 is the same unit as the original and cheaper Paragon Model 10. It isn't.*

*But the most interesting assumption in your letter is the music lover's inalienable right to super equipment at a reasonable price. Come on, Jeffrey. A Rappaport or a Paragon is still a material possession, although certainly of greater humanistic value than, say, a mink coat. But, as food for the musical soul, it just isn't in the same category with cheap concerts, student tickets, second-hand instruments in good condition, dedicated music teachers who don't overcharge, etc. As a boy, the Editor worshipped Toscanini through a \$9.95 table radio and didn't consider himself deprived. The Rappaport and the Paragon do sound a lot better, and as far as **The Audio Critic** is concerned, their makers can charge for them whatever the traffic will bear. If they get carried away and price themselves out of the market, that's their lookout. At least they make outstanding equipment.*

*What incenses **The Audio Critic** is a \$500 unit like*

*the Marantz 3600 that just plain sounds bad—at any price. And that's a totally different kind of indignation.*

—Ed.

The Audio Critic:

While sharing my copy of Volume 1, Number 1 with a co-worker, he presented me with some questions regarding your basic system and your listening environment which only you can answer.

1. Do you consider your listening room to be a "perfect" listening room? Shape? Dimensions? Reverb time?

2. Is your basic system equalized? What equipment? What (or whose) method of equalization is employed?

3. Do you equalize the system for each piece of equipment under test?

These questions are born of the consideration that an unequaled system in a less-than-perfect room can make the "bad" peaks in a chain of not-so-good equipment sound good, and can make really good equipment sound inferior.

While awaiting your reply, congratulations on still another idea whose time has come. I consider my 28 bucks well invested even though I may never afford the audio-freak prices of the stuff you critique.

Sincerely,  
Mark Scoville  
Commercial/Industrial  
Division  
Alco Paramount  
Electronic Corp.  
San Jose, CA

*No listening room is perfect and ours is no exception, although it's pretty good unequalized and, more important, we're thoroughly familiar with its characteristics. Active equalization is no panacea, as it can introduce as many problems as it solves. What good is a flatter frequency response in the room if the equalizer circuitry adds a sound of its own? Every little "black box" in the signal path can hurt. In extreme cases, active equalization may be the only answer, but we'd be inclined to try acoustic treatment first.*

—Ed.

# Know Your *Audio Critic*: A Continued Discussion of Our Philosophy

By Peter Aczel  
Editor and Publisher

As a sequel to the introductory statement in our first issue, we cover a number of points that have come up in response to our debut.

Let's just continue the laundry list format of the first article, itemizing our points in no particular order. We'll even continue the numbers where we left off, for easy reference in the future.

\* \* \*

**11** We have come under criticism by about 0.1% of our readership (three persons, to be exact) for the professional involvement of some of our staff consultants in the audio industry. Doesn't that constitute a conflict of interest, we were gleefully challenged, in view of our simon-pure posture of independence?

Ah, that's a good one. The basic reason for the amateurishness of the "underground" audiophile reviews is that they are staffed by amateurs. It would be very nice if one could come to valid conclusions about, say, the transient response of an amplifier by consulting music-loving dentists, accountants and shoemakers. Unfortunately, such independent experts seldom know what they're talking about. That's why we have a professional record producer, a physicist/audio engineer, an audio-electronics technician and other qualified professionals on our staff. Sure, some of these people derive part of or all of their income from the audio business, but not one of them is a chief executive officer or majority stockholder, so that the worst that can happen is that the views they privately communicate to us deviate from the self-interest of their bosses. Tough. It just so happens that **The Audio Critic** has already dealt rather severely with products made or sold by said bosses.

The important thing is that the *management* of **The Audio Critic** is completely divorced from commercial audio. The Editor/Publisher deliberately severed all connections with the

industry before coming out with the first issue. Our subscribers are our sole business interest.

As a matter of fact, if you hear any malicious gossip about **The Audio Critic's** conflicts of interest, or especially about our taking bribes for favorable reviews (one of the ever-recurring fabrications about nearly all audio reviewers, perpetuated by a few pathetic little would-be authorities), we suggest you let us know, provided you're willing to identify the source. There's nothing a Hungarian loves better than a good lawsuit.

\* \* \*

**12** We must also reiterate and amplify our previous statements about our publishing schedule. It's quite obvious that some of our subscribers haven't read Point 5 on page 3 of Volume 1, Number 1, where our position is explained. "It's March 1st. Where's my March/April issue?" they write. It doesn't work that way.

As we said before, our commitment is to six issues in 1977. This issue is a little late; we're doing everything in our power to get the third 1977 issue out before the midpoint of the year (June 30th). Then we'll get out three more issues in the second half of the year. If it's October and you haven't received Number 4 (July/August) yet, then you'll have cause to worry—we won't be able to catch up. But it isn't going to happen. On the other hand, you must understand that investigative technojournalism against completely unyielding deadlines is virtually impossible—unless you're the size of Consumers Union. It's the kind of work we must split into six unequal portions; some tests and write-ups just take longer than others.

We realize that our prepublication ads and correspondence were a bit more optimistic on

this subject; we also made the mistake of forgetting that magazines carrying our ads are often published almost a month ahead of their cover date, so that some of our announcements appeared prematurely. But the important thing is that you'll still get six issues for your money and you'll get them in 1977.

One thing we must disclaim all responsibility for is the credibility gap created by the totally irresponsible publishing schedules of various audiophile reviews that long preceded us. We can't help it if you're a subscriber to a quarterly that turned into a yearbook; we didn't make you do it. It's your problem and their problem, not ours. We have absolutely nothing to do with them, and we refuse to share their guilt. So please don't mention our delays of a few weeks in the same breath with their missing winters and springs. Okay?

\* \* \*

**13** In case you haven't noticed, a definite polarization seems to be taking place in the attitude of high-end manufacturers toward the kind of sound they want to sell you. The lines are being drawn to split them into two distinct camps. (We're talking about responsible manufacturers; there's also a third camp of common opportunists who just want to cash in on the high-end explosion.)

One faction, exemplified by Mark Levinson and Dahlquist, is devoting its efforts to designing equipment that reproduces the input as accurately as possible, whether you like it or not. If the Neumann microphones used in a recording have a peak, these manufacturers give you the peak loud and clear. If the recording is smooth as silk, so is the reproduction. In other words, the equipment gives and asks no quarter.

The other faction, also defensible and best represented by Bongiorno's GAS Company, appears to believe that when the customer pays so much money he must be protected from all nasty sounds, no matter where they come from. Detail must still be reproduced realistically, but that peaky recording must be made to sound a little nicer. In fact, everything must sound nice and round and "musical." If the input is cruddy, the output must be a little less so. Of course, it's all done very subtly, with a great deal of engineering finesse, so that even the keenest ears will have to admit that with good program material the sound is "good." But not quite like the input.

This design philosophy is far from contemptible; it could easily be argued that it constitutes the perfect adjustment to an imperfect world. Many musicians, suspicious of "hi-fi" to begin with, are more comfortable with this type of equipment. We aren't. Because when we play our very best records and tapes, the first category of reproducers will make them sound clearer, more real, more detailed. And that's what high fidelity is all about. Accuracy. The second category of equipment lets the software makers off the hook and delays the day of reckoning when only accurate recordings will be marketable.

Once you realize and accept the existence of these two categories, most high-quality equipment can be readily assigned to one or the other, although some will of course tend toward the border line. For example, the D B Systems preamp is definitely category one, whereas the Fulton J speaker fits quite nicely into category two.

\* \* \*

**14** Our insistence on accuracy, rather than just "the best sound," makes our job both easier and more difficult. Easier because the opinions of listening panelists who are obviously into euphonious colorations or soft-focus pleasantness can be quickly discounted. More difficult because, as we explained in Part I of our preamp survey, there's no *objective* method of determining the total sonic content of a record groove or tape, i.e., what it *ought* to sound like. It helps, however, to have access to live recording sessions, the resultant master tape, the subsequent mixes, the test lacquers, as well as the eventual vinyl disc. A generalized concept of accuracy emerges, supported by repeated experience with such program sources using a particular cartridge, preamp or what have you. It's not quite the same as matching two color swatches (Ed Villchur's original example to illustrate that accurate reproduction isn't a matter of opinion), but it goes a little deeper than "hey, I like that."

The relevance of laboratory measurements to all this is fairly obvious. If a piece of equipment sounds "good" but shows serious anomalies when measured, it can't be accurate and the "good" sound becomes suspect. If it sounds obviously inaccurate but passes all lab tests with flying colors (a perfect example is the Dynaco PAT-5), there must be a missing measurement, even if nobody knows what it is.

Only when the accuracy is both audible and measurable are we dealing with a genuinely accurate reproducer.

\* \* \*

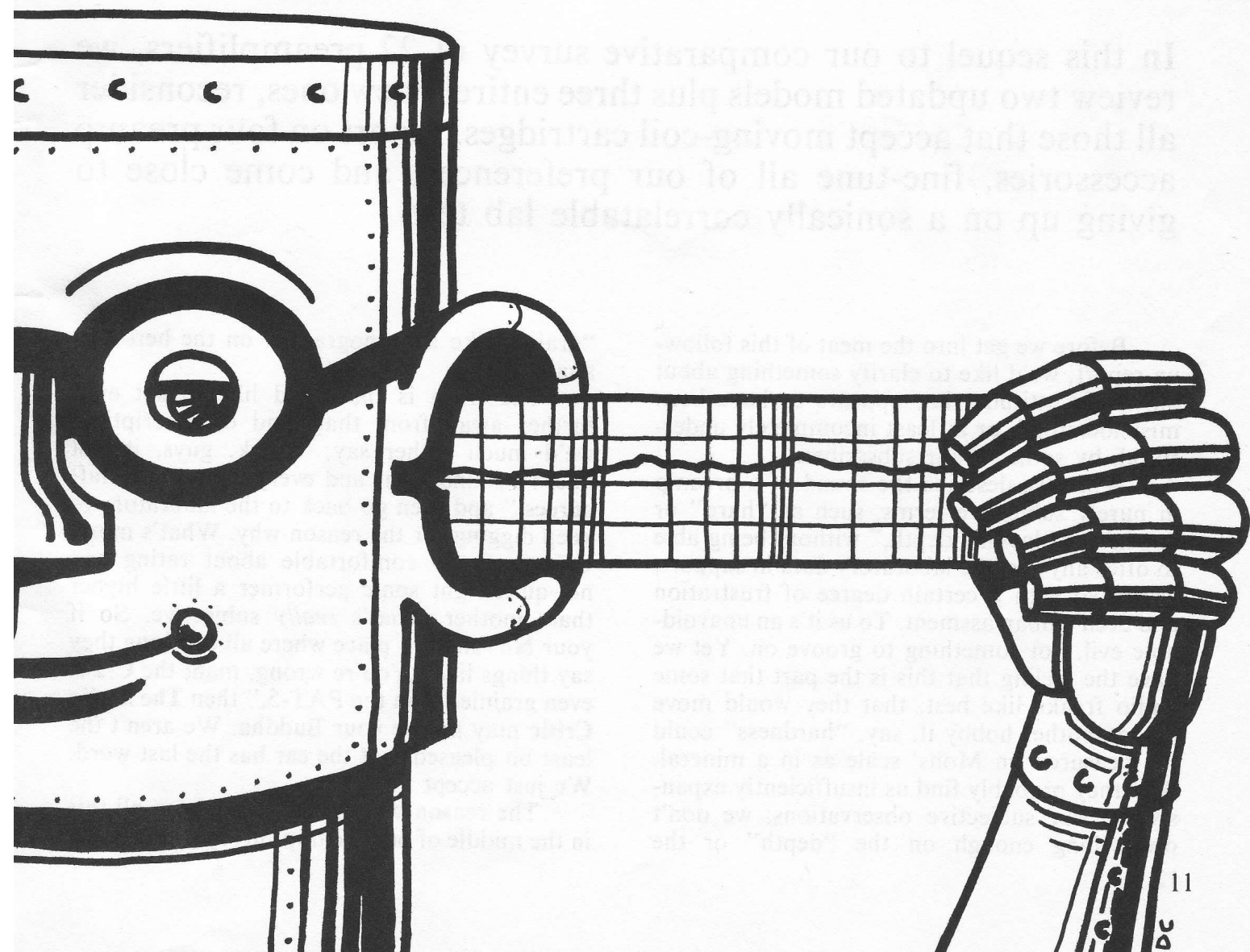
**15** The frequent difficulty of correlating measurements with sound quality—or, if you will, science with art—brings us to one of our pet subjects. Have you noticed how differently various practitioners react to this dilemma?

Some find it very painful and are doing everything in their power to hasten the day when all audible differences will have a technical explanation that can be verified in the laboratory. (Much the same way as visible differences in photography can be pretty well accounted for in today's optical laboratories.) Others seem to be pleased as hell with the situa-

tion because it gives them sorcerer status—or call it artistic freedom in engineering—without the necessity of studying the latest research on the subject.

Adherents of the latter school of thought jauntily tap the old ear with an index finger and say, "That's my spectrum analyzer, baby." We feel that even if some of these golden-eared wizards do come up with excellent results from time to time (regularity being automatically precluded by their method), their days are definitely numbered. The new generation of audio engineers and acousticians, having discovered that differential equations don't make you deaf, will wipe them off the map. We can hardly wait.

Enough of this lovemaking. Let's take a look at some audio equipment.



## The Great Preamp Survey: Part II

By the Staff of  
The Audio Critic

In this sequel to our comparative survey of 22 preamplifiers, we review two updated models plus three entirely new ones, reconsider all those that accept moving-coil cartridges, report on four preamp accessories, fine-tune all of our preferences, and come close to giving up on a sonically correlatable lab test.

Before we get into the meat of this follow-up report, we'd like to clarify something about our basic attitude that appears to have been misunderstood, or at least incompletely understood, by some of our subscribers.

When we describe the sound of a preamp in purely subjective terms, such as "hard" or "open" or "lacking depth," without being able to offer any specific laboratory data in support, we do so with a certain degree of frustration and even embarrassment. To us it's an unavoidable evil, not something to groove on. Yet we have the feeling that this is the part that some audio freaks like best, that they would move on to another hobby if, say, "hardness" could be measured on Mohs' scale as in a mineral. And they probably find us insufficiently expansive in our subjective observations; we don't dwell long enough on the "depth" or the

"grain," like a pornographer on the heroine's anatomy.

The truth is that we'd like to get even further away from that kind of description; we'd much rather say, "Look, guys, it just doesn't sound right and everyone on our staff agrees," and then go back to the laboratory to keep digging for the reason why. What's more, we're not too comfortable about rating one not-quite-right sonic performer a little higher than another. That's *really* subjective. So if your Nirvana is a place where all day long they say things like "You're wrong, man; the C-2 is even grainier than the PAT-5," then **The Audio Critic** may not be your Buddha. We aren't the least bit pleased that the ear has the last word. We just accept it.

The reason why we're bringing up all this in the middle of our preamp survey is that we're

at our wit's end trying to find a correspondence between the measurable and audible characteristics of preamps, whereas we find excellent laboratory support for the differences we hear among speakers or even power amps. (See our power amplifier report in this issue.) Is it because preamps are more nearly perfect than other components? But then why do a few of them sound so much better and a few of them so much worse than all the rest? We're absolutely certain that, since the ear is a sensor of a certain resolving power, measuring instruments of even higher resolution can give us even more precise answers, if only we knew how to ask them the right questions. Until then, it's your golden ear against my golden ear, fella, and frankly that's not good enough for us.

### Who's got the test?

We made a point of quizzing some of the most highly regarded preamp gurus and circuit designers about the electronic reasons for a preamp's sound in general and correlatable lab tests in particular. They included Mark Levinson and Tom Colangelo of MLAS, Tom Holman of Advent (now on his own), Dave Spiegel of AGI, Dave Hadaway of D B Systems, John Curl (independent consultant), Carl Marchisotto of Dahlquist, Mark Deneen of Paragon, Andy Rappaport of A. S. Rappaport Co., Stew Hegeman of Hegeman Labs, Ike Eisenson of Audio Dimensions. Each of them has very strong opinions about correct and incorrect circuitry, but not one of them is willing to name a laboratory test, or even a series of tests, that will unequivocally separate the best-sounding preamp. That leaves us in a rather lonely quandary trying to follow through on the issues we raised in Part I (pages 7, 8 and 9), so we'll have to be somewhat circumspect as we report what we have, and haven't, found out since.

The Holman square-wave test has been pretty conclusively laid to rest by Dr. D. Preis of Harvard (*Journal of the Audio Engineering Society*, January/February 1977, pp. 9-12), and we note that Tom Holman himself is obviously soft-pedaling the subject in his most recent article (*Audio*, February 1977). We furthermore suspect that the Otala "sine-square" test, which isn't mentioned by Dr. Preis, also suffers from the limitation pointed

out by him, namely that impulse testing that drives a circuit into transient overload doesn't provide useful information about the performance of the circuit under normal operating conditions. We certainly haven't been able to make the Otala test work for us. As for the Hetrich gated asymmetry test and the proposed Rappaport square-sine-square test, we're still working on their implementation. (We'll keep testing preamps one by one, of course, even if there won't be another broad survey for quite a while.)

### Real depth vs. phony depth.

We do feel fairly confident, however, about one correlation between measurement and sound that we've had a chance to look into since the publication of Part I. We believe that harmonic distortion in the preamp can create an impression of greater spatial depth in the reproduction than was actually captured by the microphones and engraved in the record groove.

An early, unfinished prototype that passed through our laboratory provided the best example. This preamp exhibited second and third harmonic distortion in the top octave (10 kHz to 20 kHz) of the order of 0.1% to 0.25%, depending on the frequency, at rated output (meaning nowhere near clipping). Its sound had stupendous depth, along with just a suggestion of fuzziness ("hair" on the highs) that eventually proved to be slightly fatiguing. Weeks later we heard a cleaned-up version of the same circuit, with much lower harmonic distortion, beautifully focused highs—and considerably reduced depth, not very different from what we could hear through other good preamps.

Several more preamps we have measured recently fall into the same pattern. The CM 300, for example, has easily measurable low-order harmonic distortion (although well within the conservative 0.05% spec), and its sound has great depth as well as—wouldn't you know it—a slightly edgy quality.

On the other hand, certain preamps with ultralow harmonic distortion and "grainless" highs, such as the Mark Levinson JC-2 and the D B, are frequently accused of deficient depth perspective, even when they undeniably reproduce depth in recordings that were microphoned with special attention to the front-to-

back dimension (e.g., the English “Siegfried” on EMI). So the question is, how much depth *information* is there in the groove itself and how much depth *illusion* is added by the playback electronics? (Yes, we know; we too faulted the JC-2 for spatial compression—but hold your horses, there’s more.)

The question has two sides, as usual. It has been argued that extremely low harmonic distortion is achievable only with circuit design techniques that increase the chance of TIM, which in turn creates a time smear that obscures depth information. Hence a *little* harmonic distortion and good depth imaging go hand in hand. Andy Rappaport is an exponent of this point of view. (His preamp has low, but not vanishingly low, high-frequency distortion and outstanding front-to-back definition. He claims to have judiciously fine-tuned the trade-off.) The other argument denies that all circuit designs without exception involve such a trade-off and implicates harmonic distortion as a source of false ambience information, since the majority of commercial recordings are lacking in genuine ambience. Mark Levinson takes this position and points out an interesting phenomenon that has been observed by a number of audio experimenters. In an optimally biased amplification circuit, turning the bias down to the point where nonlinearity sets in and harmonic distortion begins to rise creates an impression of greater depth in the reproduction. Turning the bias up again creates the impression that the depth perspective has been “ruined,” until one realizes that the restored linearity makes the sound less fatiguing, more nearly “right”—in other words, accurate. All this without circuit changes.

We’re strongly inclined to accept Mark Levinson’s argument, and the clincher is provided by his latest product. The new, revised JC-2 (the one with Lemo connectors and a new power supply) combines what sounds to us like accurate reproduction of ambience information along with even purer, more luminous highs than before. Apparently the subtle spatial compression in the older version was a power supply problem, since the latest circuit modules in the signal path incorporate only minor clean-up changes—and certainly not an extra sprinkling of THD.

We’ll rest our case on this subject, until further evidence accumulates.

One other measurable characteristic that we

believe correlates with listening quality is bandwidth limiting, provided it’s sufficiently severe. A preamp that completely lops off the corners of square waves will sound like what it *is* electrically: a transient filler. The Bravura, reviewed for the first time below, is a perfect example.

### The moving-coil tests.

To complete our preamplifier survey, we retested each preamp that accepts a moving-coil cartridge, whether through its “mag phono” input by virtue of sufficient gain or through its own moving-coil electronics (preamp or head amp, built in or accessory). The cartridge used for these tests was the EMT Model XSD 15, the best-sounding MC cartridge known to us; indeed, probably the best-sounding cartridge of any type. Both the inner detail and the dynamic range revealed by the EMT are extraordinary; however, it seems to be less forgiving of not-quite-superb electronics than most others, which of course made it particularly suitable for our tests. The Denon DL-103 and DL-103S were used as backup cartridges; these are also outstanding units of course, but the EMT is our favorite.

It could be argued that, since all of the above MC cartridges have relatively high output, we weren’t testing some of the pre-preamps and head amps to the limit of their gain and noise characteristics; also that input overload might have raised its ugly head in some instances. Our answer is that (1) we were trying to zero in on subtle differences in sound quality and therefore had to use the best-sounding cartridges known to us, and (2) all of the more sophisticated MC circuits tested had some kind of provision for adjusting their gain to suit the cartridge, so there’s every reason to believe that their relative ranking would have been the same with a low-output test cartridge.

(Incidentally, let no one assume that we have turned our back on the remarkable Grado Signature magnetic cartridge, which has undergone something of an evolution since our previous comments. We plan to report on the “final” version as soon as Joe Grado stops messing with it.)

The tone arm we used with these cartridges was the Dynavector DV-505, a highly unorthodox, elaborate and costly pivoted arm, slated



for review by **The Audio Critic** in the very near future. It has some flaws, but we were able to make it perform extremely well for us; furthermore, the adjustments that must accompany cartridge changes are unusually quick and precise with this arm.

**In fact, the especially stringent demands we made on our cartridge/arm combination for these tests changed our perspective to some degree on the subject of tracking error. In the tone arm article in our first issue we glossed over the audible effects of tracking error, while deploring it as a symptom of mathematical know-nothingism. We're now of the opinion that both lateral and vertical tracking error *must* be minimized to the inherent limits of pivoted-arm geometry when setting up a critical listening test. (See also the letter from Mitchell Cotter we have published here, which touches on this subject in its exegesis of the moving-coil cartridge.)**

In all other respects, our methods, testing philosophy, source material, pet peeves and platinum ears were the same in these tests as in the mag phono comparisons covered previously. To refresh your memory, refer back to Part I of this survey in our first issue; we won't repeat ourselves here. In fact, the follow-up reports below on eight previously tested items may not be sufficiently informative without reference to the original reviews; these we have marked with an asterisk (\*). Among the new units reviewed, the Mark Levinson and the Rappaport are only partially new, evolutionary models that also require reference to the original reviews for complete understanding.

With that caveat, we can begin.

## **AGI Model 511\***

*For manufacturer, price and other particulars, see original review in Part I.*

We have upgraded our estimate of this preamp since listening to it with the EMT cartridge, for which it has adequate gain. The peculiarities of front-to-back imaging we had noticed with the Grado Signature cartridge seemed to be less evident with the EMT, and

we were impressed by the smoothness and openness of the sound, especially in comparison with other preamps we had previously put in more or less the same class. The EMT has a way of making marginally good preamps sound "electronic," but the AGI passed the test very nicely. (That still doesn't make it a Mark-Levinson-buster, as some have suggested.)

Considering its ability to deal with both magnetic and high-output MC cartridges, the AGI looks to us like an outstanding value at \$400.

## **Audio Research SP-4\***

*For manufacturer, prices and other particulars, see original review in Part I.*

The plug-in head amp announced for this unit was not available in time for these tests. Instead, we received word of a \$200 increase in price—without head amp. That makes the SP-4, at \$895, one of the most expensive mag-phono-only preamps on the market. It will, however, play the EMT moving-coil cartridge without running out of gain, and we did retest it that way.

Since our original report, the SP-4 has considerably declined in our esteem. For one thing, the slight hardness and sibilance we pointed out has a way of growing on you—negatively. By now we think of the SP-4 as positively zippy. (Of course, the EMT is a very sensitive zip detector.) Then we were disappointed to discover that the "matching" Audio Research D-100 amplifier doesn't make the SP-4 sound better; it makes it sound zippier than the Quatre does, despite the D-100's somewhat bandwidth-limited response (see our power amp survey in this issue). On top of that, a number of very keen-eared people have assured us that we have an exceptionally good sample of the SP-4, the best one they had heard. It appears that most of them in the field sound worse.

The clincher, though, came when we connected the Hegeman HIP Input Probe (see review below) between the cartridge and the

mag phono input of the SP-4. With the probe set for unity gain, the sound became sweeter and the bass considerably better. That seems to indicate that the first stage of the SP-4 circuit leaves something to be desired, since the Hegeman unit is of no use where everything is perfect to begin with.

Incidentally, we haven't heard a peep out of Audio Research since we challenged them to deny that the Analog Modules are nothing more than IC's. We can't help but interpret their silence as an admission. Our suggestion is that they consult someone like Mark Levinson or Andy Rappaport about good discrete transistor circuitry.

## Bravura

*Nexus Engineering, 9116 Orlando Place Northeast, Albuquerque, NM 87111. Distributed by Audio Arts, 4208 Brunswick Avenue North, Minneapolis, MN 55422. Bravura Stereo Preamplifier, \$500. One-year warranty; customer pays all freight. Tested #B110, on loan by courtesy of Audio Den Ltd., Stony Brook, NY.*

Before we tested the Bravura, we were warned by its partisans and promoters that the *only* way to evaluate it was with the Shure V-15 III G cartridge and the Fulton J speaker. Furthermore, the instructions direly warn that the use of any cartridge with a DC resistance of more than 2600 ohms, or any pre-preamplifier that is AC-coupled, will void the warranty. "Best operation," according to the makers, is with a cartridge having a DC resistance of 1400 ohms.

This led us to speculate about a preamplifier that must only be used for listening to Tibetan music while sitting on yakback. We've heard all about compatibilities and incompatibilities in audio components, but in the case of the Bravura we seem to be dealing with quarantines and allergies.

In the firm belief that, if the Bravura was any good at all, it would sound fairly decent in our reference system, we inserted it into the setup used for Part I of this survey. It didn't sound fairly decent.

The best way to form an idea of the sound of the Bravura is to think of it as a transient filter. It makes everything sound nice and smooth, without a trace of harshness, but the transient detail that makes music come alive is simply missing. For example, in flamenco guitar music the strings sound dead because the starting transient of each pluck is obliterated. As a matter of fact, any kind of music sounds disturbingly lackluster through the Bravura. No transients, no sparkle, no life.

Our laboratory investigations revealed a real mess inside the little black box. For example, the phono input overload is around 12.5 mV. Ever heard of such a thing? But that's not all. When you try to find out what's wrong with the phono stage, it turns out that nothing is wrong. It's the high-level stage that's overloading, beginning at about 300 mV input. Since that's the approximate output of the phono stage with 12.5 mV input, there's the explanation—but not the rationale. Actually, the phono amplifier by itself sounds quite decent, but you have to tap it electrically to be able to listen to it, since the tape output is placed past the high-level stage. (Ha-ha, fooled you.)

It's in the balance control network, though, that the Bravura goes bananas. With the balance controls (there are two of them, for left and right channel levels) turned all the way down, there's a 50% *overshoot* on square waves. With the balance controls turned all the way up, the square waves are severely (and we mean *severely*) lopped off. To us, this circuit looks like an afterthought, as if the designer hadn't liked the sonic results up to that point and decided that it was too late to go back to the beginning, but something had to be done before the output. The instructions recommend that we use the blunted-square-wave range of the balance controls ("9 o'clock is excellent"). The mind boggles.

We really don't know what to make of the Bravura. If you're into the Fulton J scene, you probably know all about it, since it's distributed by Audio Arts, one of whose owners is named Fulton. In that case you don't need to ask our advice. If you do, don't ask.

## CM 300

*Audio International, Inc., 3 Cole Place, Danbury, CT 06810. CM 300 Stereo Control Center, \$549. Tested #1008, on loan from manufacturer.*

Like the CM 912a power amplifier reviewed elsewhere in this issue, the CM 300 is made by the successor of the former C/M Laboratories; in fact, its chassis is styled to match that of the companion power amp, big handles and all, making it a little inflated in size considering its innards.

As in the case of the CM 912a, the CM 300 was in our possession for a very limited time only, but long enough for us to establish definitively that it's neither the best-sounding preamp in our survey nor even the best per dollar. But it's good; you could even argue very good.

One nice feature of the CM 300 is that the gain of the phono stage is adjustable; it can be matched for optimum S/N and overload (within its capabilities) to almost any cartridge, including MC types with medium to high output. The sound is very spacious, well-focused and just the least bit edgy (or call it fizzy); we have already noted in our general discussion of depth perspective the correlation between this kind of sound and the amount of harmonic distortion measurable in the CM 300 (0.03% to 0.04% at the higher frequencies). In addition, the square wave response of the CM 300 shows an asymmetry (normal on positive part of cycle, quite rounded on negative); according to the Audio International engineering department this is inaudible and would need an extra stage to eliminate, with more noise to pay as the penalty. Okay, but what about preamps that have beautiful square wave response *and* low noise?

We're being somewhat critical of the CM 300 just because we feel that it could be even better, and to the best of our knowledge the design is still in a state of flux, since the unit has so far been produced only in small quantities.

Who knows, maybe its makers will diddle with it until it's a real winner.

## D B Systems DB-1/DB-2/DB-4\*

*For manufacturer, prices and other particulars, see original review in Part I. Add-on unit reviewed here: DB-4 Pre-preamp, \$150. Tested #4130721, owned by The Audio Critic. Backup sample #4051226, on loan from manufacturer.*

Retesting the D B preamp with a moving-coil cartridge through its add-on pre-preamp has left our opinion of it virtually unchanged. The DB-4 doesn't seem to alter the basic sound of the DB-1; only the noise level goes up a little bit.

We still believe that the D B sounds somewhat more aggressive and "electronic" than, for example, the Mark Levinson JC-2; the latest, revised version of the latter makes the difference even more obvious. Our promised investigation of the D B's apparent lack of low bass impact hasn't yielded any conclusive result, but that was never our principal reservation about this unit. Its failure to sound utterly unstressed and natural (but only in comparison with a *very* few others) is the only damper on our unqualified enthusiasm.

Dave Hadaway has sent us an interesting preamp bypass test box, with which it can be demonstrated that the insertion of the D B into a signal path does *not* result in any audible change in sound quality. Very impressive; but we aren't convinced that the buffer chip that remains in the test circuit in all modes interfaces with the preamp in exactly the same way as a phono cartridge. Nor that it doesn't mask key information in the bypass mode. But the test is certainly a powerful argument in support of the D B's accuracy. We're virtually certain that, deep down, Dave Hadaway believes that it's the program sources that are "aggressive" and that other preamps may have a prettifying effect on them.

Luckily, the argument need not be urgently resolved, since the DB-1/DB-2/DB-4 combination is the only preamp system today selling for \$575 that can process any phono signal, from the lowest to the highest level, with this degree of quality.

## GAS Thaedra\*

*For manufacturer, price and other particulars, see original review in Part I.*

We said in our original review of Thaedra that testing it with a moving-coil cartridge would be a whole new ball game, since the "servo-loop" head amp feeds directly into the high-level stage instead of being in tandem with the mag-phono preamp. We were wrong. The Bongiorno sound came through just the same.

It's a very good sound, mind you. Round, smooth, grainless and just plain nice, without any obvious loss of detail. Just what the high-end customer likes to hear when he walks into an audio salon. But it still isn't an accurate sound. It wraps stark transients in whipped cream, as we said; or maybe in zabaglione. . . ?

When A-B-ed against the new, revised Mark Levinson JC-2, the Thaedra doesn't even put up a good fight. The JC-2 sounds significantly more open, transparent and real, much more in palpable contact with the music.

Incidentally, the Stax SR-X Mark 3 electrostatic headphones spell out the difference even more vividly than speakers, but did you ever try to make an anthropoid ape put on a pair and really listen?

## Hegeman HIP Input Probe

*Hegeman Laboratories, Inc., 555 Prospect Street, East Orange, NJ 07017. Model HIP Input Probe, \$135 with battery pack, \$160 with AC power supply. Two-year warranty. Tested #70, on loan from manufacturer.*

*What is it?* It's a little box that goes under, or next to, your turntable, with the shortest possible leads from your tone arm plugged into it

and its output connected through any length of cable to the mag phono input of your preamp.

*What does it do?* In some cases absolutely nothing. In other cases it improves the sound considerably. You won't know till you've tried it.

*How does it do that?* By means of a circuit that has unity gain, virtually zero input capacitance, extremely flat and wideband response, and very low output impedance. If the first stage of your preamp has some faults, this may be exactly the kind of interface between it and the phono cartridge to make those faults inoperative and irrelevant. (It will also give you a gain of 12 dB at the flick of a switch, which makes it a kind of low-gain—but not particularly low-noise—pre-preamp.)

*What else?* It's powered through an umbilical cord from a separate little power supply box. It will also accept a tape head input. And it was engineered by the legendary A. Stewart Hegeman, who was designing accurate speakers and audio electronics back in the days when most people's idea of good sound was a Stromberg Carlson.

We tried the Hegeman probe with a number of preamps and obtained varying results. For example, it didn't do a thing for the Rappaport PRE-1; if anything, it introduced a slight amount of veiling. On the other hand, it improved the Audio Research SP-4 (which isn't exactly a piece of garbage) quite spectacularly; the highs became much sweeter and the low bass suddenly emerged, with impact and detail. And our jaw dropped.

What this unit will do for your run-of-the-mill stereo receiver or integrated amplifier, we have no idea. Its price makes it an affordable upgrade for that type of installation, even if sonically it cuts across the high-end scene as well.

We left the best for last. A complete Hegeman preamp, with an input stage very similar to the HIP, is in the works. We've heard the prototype, and it's more than just good. It promises to be a state-of-the-art contender. Mind you, we didn't say challenger, let alone winner. We don't know. But it will have to be carefully A-B-ed against the best. And it won't even be terribly expensive.

Stew Hegeman still seems to have the touch.

## Mark Levinson JC-2 (new)

*Mark Levinson Audio Systems Ltd., 55 Circular Avenue, Hamden, CT 06514. JC-2 Preamplifier, with plug-in System A3 for magnetic cartridges and System D5 or D6 for moving-coil cartridges, \$1475 complete. Five-year warranty; customer pays all freight. Tested #2221, owned by The Audio Critic.*

In an editorial postscript to our original review of the JC-2 in Part I of this survey, we twitted Mark Levinson for what looked like an extravagant and impractical new version, the news of which had just reached us. Well, a number of weeks later the revised JC-2 reached us, and now we're singing a different tune.

This is simply the finest preamplifier heard so far by our staff. Will you ever forgive us, Mark, for our peevish indiscretion?

Here are the changes in the JC-2: New power supply (PLS-150), totally different from the old one. New power supply filter module. Lemo connectors, instead of the standard RCA-type phono jacks (more about that in a moment). Reworked amplifier modules, with even higher slew rates (Andy Rappaport, please note) than before. New (and more versatile) plug-in cards for mag phono and MC. And a second phono input instead of the previous "remote" input. All this begins with serial number 2148.

The Lemo connectors are incompatible with the standard RCA connectors of the audio industry. We spent in the neighborhood of \$100 for adapters, just to connect up the most important units in our system. And we still don't have enough of them.

And yet—we just love the Lemo. It's a little jewel, made with watch-like precision in Switzerland. If you're familiar with BNC connectors (the kind used in signal generators, oscilloscopes, etc.), imagine a highly miniaturized, gold-plated version of it and you have an approximate idea of the Lemo. It makes the ground connection first and breaks it last, so you won't get horrible pops. It can't be pulled out by tugging on the cable, only by grasping it firmly with your fingers. So it really stays put. We could go on and on. If somebody

high up said, "One, two, three—go!" and the entire industry switched to Lemo connectors overnight, it would indeed be paradise. That it isn't going to happen doesn't seem to bother Mark Levinson. He and his engineers are very much into the diode effects and other horrors of bad electrical contacts, and they really hate standard phono plugs and jacks. In fact, they feel you ought to remove the phono jacks on all your components and install Lemo female connectors instead. They'll tell you how to do it, too, if you consult them. Religion knows no obstacles.

We were especially amused by the instructions that accompany the phono cable adapter block. This \$21 Lemo adapter goes between the tone arm cables and the phono input. The instructions tell you to chop off the plugs on your tone arm leads and solder the latter directly into the block. That of course marries your tone arm monogamously to the new JC-2. In his devotion to sonic purity, Mark Levinson is asking you to put a chastity belt on your system to which only he has the key. But we outfoxed him. Instead of mutilating our \$500 tone arm, we soldered very short leads ending in female RCA connectors to the adapter block. Who says you can't have a little fun on the outside, even in the best of marriages?

Okay, let's talk about the sound. In the unanimous opinion of our staff, it's in a class by itself. The occasional compression or miniaturization of the sound stage for which we faulted the earlier JC-2 is gone. According to Mark Levinson, it had to do with the power supply, not the amplifier modules. The depth perspective still isn't in, say, the Paragon category, but in our judgment the ambience information that's actually in the record groove is correctly extracted. (See also our discussion of depth, above.) And the overall transparency, openness, inner detail and sheer purity of the sound, throughout the frequency range but most notably on the upper end, cannot be called anything but unique. No other preamp in our experience gives you the same degree of feeling that you can touch the singer or the instrumentalist. Switching to any other preamp seems to create the impression of more electronics and less reality. And that goes for both the mag phono and the moving-coil modules. Of course, if you feed garbage in, you'll get garbage out. This is no prettifier of inferior program sources.

The obvious question that arises, then, is why this new preamp is called the JC-2. Why not the JC-2a, for example? Mark Levinson's answer is that any owner of the earlier JC-2 can have his unit converted, in steps or in toto, until it either approaches or is indistinguishable from the new model. It all depends on how much you want to spend—whether you want the Lemo connectors, the second phono input, etc. For example, \$65 will get you a new power supply filter module for your old JC-2, which is probably the biggest single change you can make to take it closer to the new version. We tried it and heard an improvement, but not quite like the whole new unit. Mind you, we aren't endorsing this marketing philosophy, just reporting it.

But until we hear something better, the new JC-2 is our reference preamplifier.

## MAS 1

*Mel Schilling Enterprises, Division of Music and Sound of CA, Inc., 7205 Pomelo Drive, Canoga Park, CA 91307. MAS 1 Stereo Moving Coil Preamplifier, \$229. Five-year warranty; not clear who pays freight. Tested unnumbered sample, owned by The Audio Critic.*

This is an individually available, self-powered pre-preamp, offered as the last word in MC amplification. We find it to be something less than that.

On the laboratory test bench, the MAS 1 is just about perfect. We couldn't find even one little thing wrong with it; it simply won't misbehave with any input of any waveform.

The sound of the MAS 1 is another matter. It's a little hard and strident, just enough to cause subtle discomfort on extended listening. It also introduces a slight amount of veiling or opacity as compared to a bypassed connection.

If we knew why this unit doesn't sound absolutely superb, we'd be a long way toward a sonically valid laboratory test of low-level amplifier circuits.

## Paragon Model 12\*

*For manufacturer, price and other particulars, see original review in Part I.*

Since the Paragon has a lot of gain, it readily accepts a high-output MC cartridge like the EMT. Retesting it that way has only increased our respect for it; unlike the Audio Research SP-4, for example, the Paragon wears well and grows on you. Not that we have significantly changed our assessment of either its unique virtues or its characteristic shortcomings; however, we have more or less come to accept it as *one* legitimate approach to state-of-the-art, though not the one we would have taken.

The lack of a really tight, controlled bass and lower midrange remains our number one quibble, but it turns out that Mark Deneen *wants* it that way. He told us he could easily tighten up the bass of the Paragon but that, to him, it doesn't sound "real" that way. There, in a nutshell, you have the philosophy of formatted sound, designed to a subjective aesthetic standard. That's why we're so desperately searching for an objective criterion of accuracy.

All this has become less of a judgmental agony for us since the arrival of the revised Mark Levinson JC-2. Until then, we felt there was a possibility that we just *might* have been wrong and the Paragon-ueber-alles faction right. Next to the new JC-2, however, the Paragon definitely sounds a little "electronic." No doubt about it.

But don't forget that the last word hasn't been heard yet from Mark Deneen. As we mentioned, he is working on the tube preamp to end all tube preamps, which will sell in the four-figure range. In the end, it may well turn out to be the Battle of the Marks.

## Rappaport PRE-1A with MC-1

*A. S. Rappaport Co., Inc., Box 52, 146 Bedford Road, Armonk, NY 10504. Model PRE-1A Stereo Preamplifier,*

\$515, with PS-1 Power Supply, \$200, and MC-1 Moving Coil Phono Stage, \$300. Three-year warranty; manufacturer pays two-way freight. Tested #1003-01/#2007/#3013, owned by *The Audio Critic*.

The remarkable Rappaport, which was our reference preamp until the arrival of the new Mark Levinson JC-2 and still is our backup unit, has undergone a surprising but not illogical evolution in complexity and price.

The original mag-phon-only version, the self-powered PRE-1, was introduced to a few dealers at the mind-blowing retail price of \$475. Before anyone had bought even a single unit from these dealers, the price went up to \$495 and then almost immediately to \$575, at which price (still a bargain) the first few were sold. There was a minor hum problem with these early samples, cured in current production models; then, partly to eliminate the slightest trace of hum and partly in anticipation of a new head amp, the power supply was taken out and redesigned as a separate chassis, the PS-1. Minus the power supply but otherwise identical, the preamp became the PRE-1A, to be followed shortly by the MC-1 head amp (separately R1AA equalized), which also plugs into the PS-1.

So now you can choose either the PRE-1 at \$575, or the PRE-1A/PS-1 combination at \$715 (no bargain since now the PRE-1 doesn't hum either), or the MC-1/PS-1 combination at \$500 (terrific, but you need a volume-controlled system to plug it into), or the whole shebang on three chassis (PRE-1A/PS-1/MC-1) at \$1015, which ain't hay.

The most important thing to report here is that the MC-1 through the "aux" input of the PRE-1A sounds even better than the PRE-1 (or PRE-1A) alone through mag phono, not only because of the general superiority of MC cartridges but also because of some minor refinements in circuit design. The MC-1 has a tremendously dynamic, juicy sound with great front-to-back perspective and deep, deep bass. Rock freaks will flip over it and classical buffs respect it, but we lean strongly toward the new JC-2.

Interestingly, the two preamps sound quite different; the Rappaport being darker and richer in sound; the Mark Levinson more refined, luminous, etched, and somehow more

real. Some will disagree, we know, but that's the way we hear it. Of course, when two reproducers of the same program source sound different, at least one of them has got to be wrong. Most likely, both are slightly wrong, and all we can try to decide is which one is more nearly accurate. Until, one day, we'll know how to do it in the lab—but then every manufacturer will catch up within a year and we can start picking even smaller nits all over again . . .

We must add that our sample of the MC-1 measured well within specs, while of course exhibiting the low slew rate (approximately 1 V/uS) which is the Rappaport hallmark. And that, aside from the revised JC-2, we don't really know of anything we'd rather listen to, even at \$1015, than this preamp.

But it all goes to show that SOTA is a sometime thing.

## Stax SRA-12S\*

*For manufacturer, price and other particulars, see original review in Part I.*

The preamp part of the Stax has enough gain, with the so-called inter-stage amplifier switched in, to accept MC cartridges like the EMT or the Denon, but retesting it that way didn't change our rather negative opinion of it one iota.

On the other hand, we became very fond of the main amplifier stage, which can be used separately with the fabulous Stax electrostatic headphones to listen to any source, including better preamps.

Stax should know better. If their picture window weren't so clean, people couldn't see how messy their living room is.

## Supex SDT/180

*Sumiko, PO Box 5046, Berkeley, CA 94705. Supex SDT/180 Step-up Transformer, \$150. One-year war-*

ranty; customer pays all freight. Tested sample owned by *The Audio Critic*.

A step-up transformer is the simplest add-on component to provide your preamp with MC capability—and it need not be a compromise, as the example of the Verion proves (see below). But not as this example proves.

The Supex SDT/180 is labeled “Excelent High Quality” (sic), which gives you an idea of its sophistication. The measurements tell the rest: almost 3 dB down at 50 Hz, 5 dB down at 30 Hz, 7.5 dB down at 20 Hz. You call that bass? What’s more, at 10 mV out, the THD at 30 Hz is 1.13%, nearly all of which is third harmonic. Even at 100 Hz, there’s too much third harmonic (about 0.5%). And at 2 mV out, these figures aren’t even halved.

The high-frequency characteristics of the SDT/180 happen to be quite good, but just imagine what the whole thing sounds like with that kind of bottom end.

Yes. That’s what it sounds like.

## Trevor Lees

*Mr. Audio, PO Box 4489, Berkeley, CA 94704, or 4 Admiral Drive (#431), Emeryville, CA 94608. Trevor Lees Preamplifier kit, \$175; faceplate, \$25; Dynaco PAS-3X kit, discounted at approx. \$120. This modification voids Dynaco warranty.*

**Editor’s Note: This is not a review or test report, but merely a brief commentary to follow through on our previously announced intention to include the Trevor Lees preamp in our survey. Meanwhile this product has, in our opinion, revealed some serious credibility problems, and we feel that treating it as a bona fide competitor of other preamplifiers reviewed here might constitute a risk to our own credibility.**

The circuit of the Trevor Lees tube preamplifier is an exact duplicate of the phono stage of the Paragon, up to the latter’s tape output. That means tube for tube, resistor for resistor, capacitor for capacitor. The values are

mostly identical; in a few instances they differ by a negligible amount. The only circuit component of appreciably different value we were able to discern is a grid resistor that affects gain only.

If you hung a volume control across the tape output of your Paragon and fed the signal from it directly into your power amplifier, you’d be the proud owner of a Trevor Lees preamplifier with a better power supply—and better built, of course, since the Paragon isn’t made from a Dynaco kit.

Now we have absolutely no intention of reviewing the performance of half a Paragon, any more than that of half a Thaedra or half a D B or half an AGI, even if someone had the gall to come out with one in cheap kit form, since the circuits are there for anyone to copy. (Maybe that’s why Mark Levinson, Andy Rappaport and others have their circuit modules potted in epoxy resin. It’s hard to do that with tubes, though.) You can, of course, bypass the high-level stage of almost any preamp by using the tape output and thus eliminate the contribution of that stage to the total distortion. You don’t need an audio reviewer for that.

As for the expertise of those who originally hailed the Trevor Lees preamp as something totally new, different and wonderful, you can also form your own opinion.

## Verion MK1

*Verion Audio Inc., 75 Haven Avenue, Mount Vernon, NY 10553. Stereo Pickup Transformer MK1, \$250. Five-year warranty. Tested #1S329497, owned by *The Audio Critic*.*

Since a step-up transformer is unquestionably the quietest means of elevating the output of a moving-coil cartridge to the point where an ordinary phono stage can take over, the only question is whether it can have the frequency response and waveform fidelity of the best low-level amplifier stages. We had never seen a transformer that did, until we came across the Verion.

This little 6-inch metal brick is something of a tour de force, since if you simply treat it as a “black box” (actually it’s blue) with



## Moving Coil vs. Moving Field, Transformer vs. Head Amp

*Editor's Note: One of the leading experts of our acquaintance on the subject of extracting information from a record groove (not to mention 57 other subjects) is Mitch Cotter. When we asked him why on earth he bothered to design an ultrasophisticated transformer when head amps are getting so good, he sent us the following reply, which includes the best argument we've seen so far in favor of the moving-coil cartridge.*

### The Audio Critic:

There occurs the thought that what is probably the most important aspect of my interest in moving coil pickups is not clear in the fact of the transformer that I have designed for them. Why attend upon the problem? Since the electrons that flow as the output signal care not a whit about the nature of the transduction that produces them, what is there about the difference between moving coils and the others that compels me?

The answer rests largely upon a little-discussed but important process occurring in playing a record. It is related to friction. The same frictional force that causes the well-known inward skating force in offset arms is due to a significant drag on the stylus, pulling the stylus cantilever out of the pickup in the direction of the motion of the surface of the record. The average force is about a third of the vertical tracking force. This force is not constant but rather varies with the recorded signal. In fact this variation is not like the signal but is a highly distorted form of the groove modulation. This varying force causes what has been called "needle drag distortion."

This distorted force can cause distorted output in two ways. *First*, if the stylus can move appreciably axially (down the record groove path), then the position of the stylus is not steady but is modulated by the signal in this distorted way and causes a self-FM or a time smearing of the reproduced sound. Whatever transducer might be used, if its stylus so moves then the sound is smeared. *Secondly*, even if the axial motion is minimal, the transducer system (pickup) may produce some electrical output from this needle drag force. If this occurs even to a small extent, then a serious aural flaw enters, since these FM-like effects are far more objectionable than non-time-dispersive distortions. This is so even for slight amounts of these effects.

It is worth noting that in fact *all* the serious distortions in phonograph play-

back are of time-dispersive character. Tracking error, both the vertical and lateral kinds, cause a similar effect. The signal FM's itself as a result of the back-and-forth component of motion if the stylus does not move in the same plane as the cutting stylus. Tracking distortion similarly arises from the finite curvature of the playback stylus contact region on the surface of the groove, causing the region to move forward on the uphill portions and backward on the downhill portions of the modulated groove. The time-smearing character of all these disturbances is what gives the all-too-usual phonograph sound, which is audible even over limited frequency range systems. In that respect it acts somewhat more like flutter than the usual non-time-dispersive distortions.

To return to the moving-coil pickups and my reasons—it should be said that all present examples share in having very rigid, wire axial supports, as opposed to the rubber-tire suspensions of many other types of pickups. More importantly, in the MC pickups the coil moves in a constant magnetic field. All magnetic pickups work by having the field vary in a coil of wire. In the MC types the coil moves to do this. In the others the coil is stationary and the field is varied. All the others, regardless of the cute names to describe the device, vary the field in the magnetic path through a fixed coil of wire.

We can see then two distinct types: the moving coils and the moving fields. There is a very important difference between them, however. The moving coil is inherently *insensitive* to axial force output effects, whereas the moving field types all are inherently rather sensitive in this way. The greater clarity of sound for which knowing audiophiles have pursued the MC types arises very much from this aspect of the difference. This difference is innate and will persist as further developments push criteria higher. A phonograph record need not sound poorer than tape—in fact it can sound *better*.

There stood a barrier to realizing this promise, and it was the interface between the inherently low voltage (but high current) property of the MC pickups and the higher impedance required for the best signal-to-noise ratio from pickup preamps. Present-day MC pickups are actually possessed of higher S/N than are the other types. The advantage is typically about 10 to 20 dB. Head amps cannot achieve that promise. Gain does not accomplish the full S/N unless the amplifier has noise below that of the device to be amplified. The only way possible, and the best way ultimately, is to transform the pickup's energy to an optimum impedance and then use it in the standard phono preamp, which should then give better signal-to-noise ratio than when used with the moving-field pickups in common use today.

I consider it essential for clarity in record reproduction today to use a moving-coil type of pickup. The full signal-to-noise ratio requires a transformer that does not add losses or restrict the bandwidth, and those problems are the challenge that I feel I have been able to meet.

Further, the reduction of the vertical and lateral tracking error is quite as important in order to appreciate the dynamic range possible, since it then becomes acceptable to listen to the full, realistic loudness of the recorded music. I feel strongly that the long neglect of these interrelated factors has dulled the awareness of even the devoted as to just how terrific the quality of the phonograph disc is in a very large number of cases. In fact it will be surprising to many that so many discs are that good. That is certainly a very useful thing to most, since there exists such a wealth of recorded music that is not as lost as may have seemed.

Thank you for your interest in my views and this opportunity to air them.

Very truly yours,  
Mitchell A. Cotter  
Verion Audio Inc.

an input and an output, it's hard to tell in the laboratory whether or not it's an amplifier. Low-frequency square waves are amazing, the high-frequency response extends several octaves above the audio range, and distortion of all types is extremely low.

We were sufficiently intrigued by the Verion to address some wide-eyed questions to its designer, Mitch Cotter, whose reply is reproduced here, making further technical comments unnecessary.

There remains the sonic performance of the Verion to be discussed. It must be remembered that a chain is only as strong as its weakest link, so the sound you'll hear from the Verion can't possibly be better than that of the preamp you plug it into. To our ears, this transformer adds nothing to and subtracts nothing from the sound of the signal it passes. Inserting it between the EMT and the Paragon, for example, and compensating for the difference in signal level (you can do this with the Paragon on account of its fairly high gain and adjustable input level) results in a change in background hash only, without any change in the actual sound. But careful—hash can be easily interpreted as "more air" or as better high-frequency response. It's our impression that a quieter background nearly always creates a more neutral, and to some people less glamorous, effect.

Of course, the Paragon isn't our reference preamp, and we'd much rather A-B the Verion-plus-A3-system against the D5 system in the new Mark Levinson JC-2, or Verion-plus-mag-phono against the MC-1 stage in the Rappaport PRE-1A, in order to resolve the basic issue of head amps versus transformers. That isn't as easy as it seems, however. It's impossible to plug circuit modules into and out of the JC-2 quickly; as for the MC-1, we believe it's slightly better than the mag-phono stage of the PRE-1A, so it would be to some extent an apples-and-oranges comparison.

Suffice it to say, therefore, that the Verion is the best phono cartridge transformer known to us and the simplest way to add truly superior MC capability to your preamp.

## Yamaha C-2\*

*For manufacturer, price and other particulars, see original review in Part I.*

Since the C-2 has a flat-gain MC preamp in tandem with its equalized phono stage, you wouldn't expect its basic sound quality to change a great deal in the MC position. It doesn't.

The high-frequency transients remain aggressive as hell, making the numerous attractions of this beautifully packaged unit quite irrelevant.

## Yamaha CA-1000\*

*For manufacturer, price and other particulars, see original review in Part I.*

To the best of our knowledge, the MC amplifier chip in this unit is the same as in the C-2, and so is its position in the circuit. So our previous assessment of the CA-1000 was unlikely to be upgraded. If anything, testing the preamp section of this integrated amplifier with highly revealing moving-coil cartridges has lowered our opinion of it by half a notch or so.

Once an integrated amplifier, always an integrated amplifier.

## Recommendations

Without abandoning our search for still better preamplifiers, which from now on will be tested one by one as they come in, we're ready to present the overall conclusions of our two-part survey.

**Best sound with either magnetic or moving-coil cartridges, regardless of all other considerations: Mark Levinson JC-2, serial number 2148 or higher.**

**Alternate choice (in view of the exorbitant price of the above): Rappaport PRE-1 or PRE-1A/PS-1/MC-1, depending on your phono needs.**

**Best sound per dollar (mag phono only): Advent Model 300.**

**Best add-on device for moving-coil capability: Verion MK1.**

# In Your Ear



*"The midrange has tube-like depth . . .*



*. . . the bass has that solid-state tightness . . .*



*. . . the signal-to-noise is in a class with the best IC's . . .*



*. . . but of course it would all sound better with Analog Modules."*

## Fishing for Bass: A Look at the Subwoofer Scene

Our initial haul consists of two somewhat flawed specimens that go very deep and an almost faultless one that doesn't.

For openers, we'll try to make you angry or at least frustrated. Did you know that the recipe for attaining ruler-flat loudspeaker bass down to 30 Hz and below, with high efficiency, low distortion and optimum transient response, in a large but still manageable enclosure, is available—and has been available for a good many years? And that it involves no special tricks, gimmicks, inventions or costly high-technology shenanigans? And that no manufacturer has taken full advantage of it to this very day? Huh?

Neville Thiele originally presented his brilliant paper, correlating filter synthesis with the equivalent circuits of speaker systems, to a convention of engineers in Australia 16 years ago. This highly practical, 100% usable information lay around neglected for ten years, after which it was miraculously rediscovered by the Audio Engineering Society and followed by the even more complete and rigorous studies of the redoubtable Richard Small. At about the same time, other researchers like Robert Ashley and Don Keele also made important contributions to this body of knowledge, which, taken together, just about completely defines the electromechanical operation of a speaker system, so that it no longer holds any mysteries or

surprises or opportunities for “breakthroughs.” This is especially true of the woofer.

The mathematical model of the woofer has been for some years now so complete and accurate that one needs only to define the maximum tolerable box size and minimum acceptable efficiency in order to obtain exact design parameters for the theoretically unexceedable frequency response, distortion and transient characteristics. The whole process is about as dependent on the personal “creativity” of the engineer as the zeroing in of a piece of artillery. All it takes is homework. But, as we all know, homework is a pain the posterior, so hardly anyone is doing it. The exceptions are companies like Electro-Voice, where the emphasis is on optimizing PA-type sound rather than producing state-of-the-art speakers for the audiophile.

***Editor's Note:*** In the accompanying article, our Consulting Engineer offers a qualitative explanation of the mathematical approach to woofer design. Being a basically gentle and scholarly person, he refrains from rubbing it in that nearly all of today's makers of \$2000 and \$3000 speaker systems are innocent of this discipline.

In view of the thoroughly documented, scientific information available on woofers and subwoofers (the two being conceptually the same except for the latter's relative freedom from restrictions on size), it depresses us greatly how the most vulgar, locker-room generalizations on the subject rule the minds of even advanced audio enthusiasts and of the manufacturers who cater to them. "Sealed enclosures are OK but they don't give you really low bass." Or "vented enclosures are more efficient but boomy." Or "if you want really tight bass you've got to use a transmission line." If there's one thing you get out of this report, we hope it's an understanding of how amateurish that kind of talk is. A speaker cone doesn't know about enclosure formats. All it knows is the combination of forces acting upon it. And that combination can be applied in a multitude of ways, none of them inherently good or bad. The important things are the damping (indicated by the  $Q$  of the total system), the 3-dB-down frequency, the linear excursion capability and other such purely performance-related data.

For example, if you ask about a sealed system what the  $Q$  is and the answer is 0.707, you already know that the frequency response is flat without a ripple, that the 3-dB-down point is the resonant frequency of the system, that an octave below that frequency the response is down 12 dB, and that the transient response is the best possible for these conditions. On the other hand, if you're told that the  $Q$  is 1, you already know that the response at the resonant frequency is now 3 dB better (0 dB down) but at the cost of a ripple just above that frequency and of slightly degraded transient response, which is nevertheless still quite adequate. For a vented system the numbers are again different. (See also the accompanying article.)

The point is that woofer design deals with the laws of nature, which in this case are completely known and will be the same in the year 2100 as they are today. Therefore, no one is going to come up with a triangular driver loaded by an elliptical slot in an L-shaped box that will give you a 115 dB level at 20 Hz with 10% efficiency in three cubic feet. Forget it. It's not going to happen. Whether the force that moves the driver is electrodynamic, electrostatic or copacetic. Nor can motional feedback accomplish anything that wasn't

damn close to the desired end result in the first place, before the feedback was applied. You can't fool Mother Nature.

### **Okay, but where does that leave us with subwoofers?**

What we must ask when evaluating a subwoofer, other than how good (i.e., accurate) it sounds, is whether the design is optimized for its particular size. Could the same size box, with different engineering, give you more cycles on the bottom? Or, if you're satisfied with its range, could it be more efficient (easier on the amplifier)? Or, if it's optimum on those counts, could it have lower distortion? The mathematical model referred to above provides the answer in each case. And, of course, one can push the inquiry a little further. Could a tolerable increase in size, at no additional cost, give you considerably better performance? In other words, has the designer explored all the available options in the light of present-day knowledge?

We can state without hesitation that no subwoofer known to us, whether it's separately available or part of a system, can stand up under this kind of cross-examination unscathed. We don't know of a single design about which a panel composed of Thiele, Small, Ashley, Keele and their peers could say: "This one incorporates everything we know."

Please note that this is not the same as submitting, say, a preamplifier to the same kind of scrutiny. No one knows exactly how good a preamp ought to be with a given number of transistors, resistors, capacitors, etc. The sky, or rather a straight wire with gain, is the limit. Not so with a subwoofer.

### **What about crossover networks?**

This is an extremely complex subject about which we'll have a lot more to say in the report on large, expensive speaker systems in our next issue. For the moment let's just summarize the basics.

Since subwoofers are intended to be crossed over to systems that presumably have decent upper-bass response, the crossover frequency is generally 100 Hz or lower. If the crossover is at low impedance, as in the typical passive network that goes between the power

amplifier and the drivers, the coils required at those frequencies must be rather large and unwieldy, especially if they are wound on air cores. What's more, the subwoofer may drain too much power from a single amplifier that handles the full audio power. Although there are some valid exceptions to this generalization, we ordinarily prefer to biamp the subwoofer through an electronic crossover. If nothing else, IM distortion will certainly be lower. Each of the subwoofers we tested comes with its own electronic crossover, although in principle others could also be used.

The main problem with electronic crossovers is the same as with preamps: they usually have a sound of their own. It's not easy to design a stage of gain that can be inserted between the preamp and the power amp without altering the sound at least to a slight degree.

If you're particular enough about preamps to use a Mark Levinson JC-2, for example, you may not want to plug it into just any old IC crossover thrown together by a speaker manufacturer. (You've probably noticed by now that we consider speaker people to be the least knowledgeable element in the audio industry, probably because it doesn't take a heavy technical background to put together a *bad* speaker.)

One alternative is a *passive* crossover *ahead* of the two power amplifiers; nothing can be more transparent than that, especially if you stick with a 6-dB-per-octave network, which can be made out of a dollar's worth of resistors and capacitors. That's what we've been using until recently; now we find the ingenious new Dahlquist half-electronic, half-passive crossover to be just as transparent and

## A Rational Approach to Low-Frequency Speaker Design

By Bruce Zayde

*Editor's Note: Engineers who have a thorough grasp of the mathematics of speaker system analysis can probably be counted on two hands and maybe a foot (which is how the others probably count them). The name of Bruce Zayde, our Consulting Engineer, generally comes up somewhere between the seventh and the ninth finger.*

Before we can understand why nearly all speaker systems miserably fail to reproduce the bottom octave of music, we must examine the very essence of a loudspeaker. We have to ask—and answer—what *is* a loudspeaker? How does it work? And we must ask whether our demands for the “perfect” loudspeaker are realizable.

All right, then, what is a loudspeaker? It is an *oscillator*. It has mass (voice coil and cone), it has a suspension (spider and surround), and it behaves exactly as a ball would when attached to the end of a spring suspended from the ceiling. The oscillator has resistance in the suspension, which tends to damp oscillations to a greater or lesser extent. This resistance is proportional to the velocity of motion.

This is wonderful news, since the mathematical form for the oscillator is a second-order ordinary differential

equation with constant coefficients. The solution for this kind of equation is straightforward and yields extremely useful results. They tie in and link the variations of mass and spring stiffness so that resonant frequency can be accurately predicted. The degree of resistance in the system can be analyzed to provide data on how this resistance will affect the resonant behavior of the oscillator. That is, will the system only respond by oscillating at its resonant frequency, or will it be able to oscillate at frequencies closely, or more distantly, neighboring its resonant point? The manner in which this resistance alters the oscillator's behavior is handled by the concept of the “Q” of the oscillator.

The Q, or quality factor, of the oscillator is inversely related to the resistance, or damping, of the system. I.e., the higher the relative resistance in our oscillator, the higher the damping and

the lower the Q.

It must be cautioned that in dealing with the Q of an oscillator one doesn't interpret “quality factor” as meaning relative goodness. That is, a high quality factor, or Q, does not suggest a good system, nor does a low quality factor (and high damping) imply a poor or not-so-good oscillator. The Q is merely a good way of illustrating the relative resonant behavior of an oscillator.

The solution of the differential equation, furthermore, gives us details regarding the excursion of the oscillator, the velocity of the oscillator, and the acceleration and deceleration of the system during excitation and after a driving force (whatever it may be) is removed.

Perhaps, at this point, we should modify our definition of a loudspeaker as a simple oscillator by considering the fact that it is driven by a linear

more practical.

The rule of thumb is: passive is more transparent than active; 6 dB per octave is better in transient response than either 12 dB or 18 dB per octave; 18 dB per octave louses up the phase response less than 12 dB per octave. Ultimately, however, the choice of network configuration depends on the acoustical characteristics of the speakers, not on electrical theory. For example, the only thing that would really help the Janis subwoofers in our opinion is a 36-dB-per-octave active network (see Janis W-1 review below).

#### To sum or not to sum.

Each of the subwoofers reviewed here can be used either singly or in pairs. Their networks have provisions for summed as well as left/right operation.

Summing the two stereo channels into a

single bass channel anywhere below 100 Hz will not result in any appreciable loss of *directional* information. There's virtually no such information in that frequency range. There is, however, *ambience* information. The sense of the hall, what some audiophiles call the airy or breathy quality of the bass, has some very low-frequency components, and these are not necessarily identical in each channel. In quadrasonic reproduction this information acquires even greater importance and should not be summed.

Another argument for using a separate subwoofer in each channel is that the kind of low-frequency "cheating" necessary to cut disc masters without insane amounts of groove modulation is based on the assumption that the listener has two complete bass channels. The phase cancellations resulting from summed

motor. The magnetic field with a voice coil seated within it comprises a motor whose power is determined by the strength of the field and the amount of voice-coil wire saturated within the field. This motor has control over the oscillator that has been described above.

The motor serves to accelerate and decelerate the oscillator, and, in general, keep the oscillator under control. But, we might ask, "what drives the motor that drives the oscillator?" Well, how about an electrical oscillator? A power amplifier connected to a loudspeaker provides current oscillations which, in turn, cause the motor to oscillate in accordance with the current commands, and this linear motor is then attached to the cone which oscillates the air in contact with it to follow the original electrical signal from the power amplifier. That's quite a lot of stuff going on. Our simple oscillator now becomes quite formidable, and must be entitled an electro-mechanico-acoustical oscillator.

Unlike the simple damping provided by the internal resistance of the original ball and spring model, there is damping provided by the power amplifier, which is brought about by the resistance ratio of the loudspeaker input to the power amplifier output. Especially where a goodly amount of negative feedback around the output stage of the amplifier is present, the output impedance of the stage can be extremely low (less than 0.5 ohm). The amplifier then greatly assists in the overall

damping and, in fact, in the ideal case, is largely responsible for it. (Low TIM amplifiers with reduced overall negative feedback have low output impedances, too, and provide ample loudspeaker damping.) So, for example, where the loudspeaker has an impedance of 8 ohms, and the amplifier has an output impedance of 0.5 ohm, the overall damping, neglecting all other (mechanical) damping, is 16.

Therefore, in a very real way, the output stage of a power amplifier must be considered as a part of the loudspeaker system. Now, what happens if the output impedance of the amplifier is not especially low with respect to the loudspeaker. Let's say, for example, that the output impedance of the amplifier is the same as that of the loudspeaker. Damping is greatly reduced, and as a result the Q of the loudspeaker plus amplifier is greatly increased. In this case, if the overall response with *high* damping between amplifier and loudspeaker is maximally flat, equal impedance between loudspeaker and amplifier will render a hump of 6 dB in the bass. (This is a Q of 2.) Note also that connecting a lot of wire between amplifier and loudspeaker will not only waste power (the lesser of the evils) but, more significantly, will spoil the damping relationship between loudspeaker and amplifier, and render a totally unsatisfactory response.

\* \* \*

So far, we've only concerned ourselves with a loudspeaker and power

amplifier. It should also be pointed out that the entire discussion restricts itself to the piston range of a loudspeaker (generated wavelength greater than the circumference of the cone). What happens when we put our electro-mechanico-acoustical oscillator in a box? Well, if the box is large enough to be an infinite baffle, essentially nothing. Except for restricting front-to-back cancellation due to dipole radiation, the infinite baffle does nothing to alter a loudspeaker's output. The variables already discussed (mass of moving system, suspension stiffness, mechanical resistance and resultant mechanical damping, power amplifier interaction and electrical damping) are all preserved. But what about a small box?

When a loudspeaker is placed in a box whose air volume is less than the equivalent air volume of the driver's suspension stiffness, the box then acts as an added stiffness, and raises the resonant frequency of the overall system. This is the principle behind the air or acoustic suspension system. It is essentially the same as substituting a stiffer spring in place of the original one in our ball and spring analogy. As a result, the overall mechanical damping in the system is reduced and the system Q is raised. This can be beneficial if the loudspeaker damping is too great to begin with, but if it results in insufficient damping, the response will be ruined. A logical remedy is a larger motor to increase electrical damping

*continued on next page*

operation could easily negate the little engineering tricks used to create at least a semblance of deep bass at high modulation levels. And, of course, two bass channels will give you 3 dB more power than one, which in marginal situations could also come in handy. For all these reasons, we used two subwoofers for stereo listening.

### The listening and laboratory tests.

We didn't find it necessary to A-B the subwoofers against one another. The differences were large enough to be retained even in the feeblest aural memory. Furthermore, we weren't really satisfied with any one of the subwoofers tested so far, and our reluctant choice among them was based on far more obvious considerations than subtle differences that only A-B-ing might have revealed.

The main speaker system above the

crossover frequency was in each case the Dahlquist DQ-10. For our rationale in sticking with this old standby, see our power amplifier survey in this issue. It might turn out to be a little repetitious to track through our reasons once again. Besides, the DQ-10 *needs* a subwoofer. Both the DQ-10 and the subwoofer under test were driven by the Quatre DG-250 Gain Cell power amp, a separate one on each. The rest of the reference system was the same as described in the power amp survey, except that the electronic crossover supplied with each subwoofer was used between the preamp output and the two power amps.

Measurement of each subwoofer was by means of the "nearfield" technique described by D. B. Keele, Jr. in the April 1974 *Journal of the Audio Engineering Society*. This method corresponds very closely to anechoic measure-

*continued from last page*

and restore correct frequency balance.

But what if the resulting resonant frequency is higher than desired? A reasonable solution is to increase the mass of the moving system, and establish a new resonant frequency lower than the previous one. However, this procedure will also diminish the damping in the system and raise the overall system Q. Again, remedial action could be to increase the motor even more (increased electrical damping), or to add some heat-absorbing material in the box (tuflex, kapok or fiberglass) and increase acoustical damping. The latter approach works by essentially changing a roughly adiabatic response to isothermal and results in increased damping in the area where needed. It should be understood that this approach works only where the required increase in damping is minimal.

We may also increase the box size, thereby reducing the air stiffness within the enclosed space, and thus lower the resonant frequency of the system, but this would increase the overall damping and could suppress bass response despite the lower system resonance.

Notice that when a box is introduced, the overall complexity increases rather sharply. But it looks like the worst is over, doesn't it? No, not by a long shot. We must contend with the vented design, now reaching new levels in audiophile interest, and rightly so.

The vented design format introduces a further level of complexity by adding a Helmholtz resonator to our

electro-mechanico-acoustical oscillator, with much further-reaching interactions. A vented system makes use of the rear radiation from a loudspeaker, and since this is the case, boasts greater efficiency than the sealed systems mentioned above. For a moment, let's examine the enclosure of a vented system.

It consists of the box itself and a hole, possibly with a tube behind it, to which nothing is mounted. The hole and tube define an air mass that is contained within them. This air mass reacts with the volume of the box to create a new oscillator. (The stiffness of the air contained within the box is the "spring" and the mass of the air within the tube or duct is the "ball.") The rear of the loudspeaker, or driver, drives the acoustical oscillator just described, and all driver parameters mentioned earlier now become interlocked with the box plus vent.

The loudspeaker now is responsible for not only its own damping, but it must damp the box plus vent too. This requires, as might be suspected, a higher damping than that required for an equivalent sealed system.

The case for the vented system approach is a good one, since higher efficiency for similar bass response is welcome. But there is an additional advantage. Lower distortion. This is true because the oscillator defined by the enclosure plus vent relieves the driver of considerable cone excursion that would occur near the box resonant frequency were it not for the venting.

In a sealed system, for equal output, driver cone excursion has to quadruple for every halving of frequency down to system resonance. This is also true for the vented system, except near the box resonant frequency. As the box resonance is approached, the excursion actually becomes less (and along with it the distortion) and at the box resonance the excursion is at a minimum because, at this point, the air mass contained within the vent reaches maximum excursion. This is actual motional energy transfer, in that the vent assumes a greater role in movement as the box resonance is approached. The energy is derived from the rear of the loudspeaker cone. In actual practice, the vented system is about 4 dB more efficient than a sealed system of the same size with the same 3-dB-down point in the bass.

It is of course essential in a vented system that the free-air resonance of the driver and the box resonance frequency be carefully related. The driver damping and box size are also closely tied together, as are the mass of the moving system of the driver and the 3-dB-down point of the system bass response.

\* \* \*

Somebody will probably have asked about transmission-line enclosures by now. Transmission lines (formerly called acoustical labyrinths) are nonoptimal designs that use excessive amounts of damping material to suppress resonances within the cavities that comprise



ment in the accuracy of the results obtained. The calibrated microphone used was the Bruel & Kjaer 4133, the measuring device the Hewlett-Packard 3580A spectrum analyzer.

Here are the results.

## Dahlquist DQ-1W with DQ-LP1

*Dahlquist, Inc., 27 Hanse Avenue, Freeport, NY 11520. DQ-1W Low Bass Module, \$275. Tested #0023 and #0024, owned by The Audio Critic. DQ-LP1 Variable Low-Pass Filter, \$250. Tested unnumbered sample, on loan from manufacturer.*

**Editor's Note:** The DQ-1W was reviewed in the last issue in conjunction with the DQ-10 speaker system. This is a follow-up report with new data and an evaluation of the new electronic crossover.

Last time we said that the DQ-1W wasn't really a subwoofer but simply a very high-quality woofer. Our measurements bear that out, in spades.

Guess what the lowest frequency is at which the DQ-1W is still *dead* flat. You're wrong. It's 78 Hz. It rolls off very gently below that and its 3-dB-down point (what Thiele calls its  $f_3$ ) is 42 or 43 Hz. From the response profile our guess would be that the system has a Q of just over 0.6 (not 0.707 as we reported last time), meaning that it's heavily damped. Nothing wrong with that; the curve is beautifully smooth, including the upper range. It's

the enclosure. Generally, a better approach to producing low bass response with minimal parasitic energy dissipation is to stick with the sealed or vented direct-radiator format. (Horns, of course, are another matter altogether, and their virtues and shortcomings require a separate analysis.)

\* \* \*

And now, what about how loud things get? All of the above discussion can be called "small-signal" considerations. We certainly are concerned with the amount of sound we desire to have a system reproduce. We cannot expect an 8-inch driver to produce a 32 Hz tone at 120 dB. It simply cannot move enough air to generate that sound pressure level. With a 15-inch or 18-inch unit, that capability may be within the realm of possibility, provided that the suspension has been carefully designed to permit gross linear movement, and that the voice coil is long enough to guarantee full electromagnetic coupling during this extreme movement.

The size of the vent in a vented system undergoes the same considerations. A small tube diameter can tune a box to a lower frequency than a larger tube diameter, but the air within the smaller tube must move farther than within the larger one for the same sound pressure to be generated. This introduces the very unpleasant rushing wind noises created by the smaller duct. In order to increase the diameter of the vent, the length of the duct must also be increased for correct tuning and this

could result in a tube of unrealistic length. One way around this is to introduce the vent substitute, whose sole function is to have sufficient mass to tune the box to the desired frequency, while at the same time not having any length associated with it. The most popular vent substitute is a cone with the appropriate mass, whose appearance resembles that of a conventional loudspeaker driver. Increasing the cone diameter requires an increase in mass in order to tune the box to a specific frequency. The larger the cone, the greater sound pressure level it can produce, but the greater mass it must have.

\* \* \*

All these variables have one extremely unpleasant aspect associated with them. They are all interrelated. More specifically, all the parameters introduced from the beginning of this article are tied together, and changing any one of them requires a prescribed alteration in the balance in order to maintain correct relation.

One method of dealing with this situation is to treat a loudspeaker system as a giant soup. The cook adds a little mass here, a little volume there. Oops, some more duct needed here. Oh, and we just must have some magnet over there. Ah, but now we reduce the volume just a smidge. Oh no, now we need a smack of wire just over there. Method you say—rubbish I say.

Gratefully, there is a splendid method of dealing with all these variables in a predictable and orderly

manner. As first realized by the Australian researcher, A. N. Thiele, and greatly expanded and elaborated upon by Dr. R. H. Small, also from Australia, a loudspeaker and a loudspeaker enclosure behave exactly as a high-pass filter, and all the glorious techniques of filter synthesis can be used to predict the performance of a proposed loudspeaker system accurately.

Through the use of dynamical analogies (comparing the mathematical form of electrical components and relating them to mechanical components with the identical form), a master circuit can be drawn up with all electrical, mechanical and acoustical elements accounted for, and then this circuit solved in the traditional manner (typically by the use of the Laplace transform) to yield all the critical interrelationships cited earlier. The solution is in the form of a high-pass filter (allowing all frequencies above a certain point to be passed, and all frequencies below that point to be increasingly attenuated), and accounts for all the linkages between the parameters of importance. This approach can be programmed into a minicomputer (or a large mainframe if so desired) and the correct design relationships can be almost immediately forthcoming.

In other words, achieving flat, boom-free, smooth bass response need not be a black art, but something derived from the thorough discipline of filter synthesis borrowed from the practices of electrical engineering.

the kind of curve that can be equalized just a touch at the bottom end without any ill effect (to pick up a few more Hz) and rolled off at the top without any great hurry for an inaudible crossover. And you can do both with the new DQ-LP1, as we shall see.

But a rip-roaring, subterranean, four-foot-bass-drum-in-the-solar-plexus monster it isn't. Instead, it's a very smooth, quick and accurate speaker for the *second* octave from the bottom. Ed Villchur's AR-1W of more than twenty years ago wasn't all that different. The DQ-1W (is the name an unintentional reminiscence?) is a little larger and probably somewhat more efficient. Since there's hardly ever any bottom-octave information on records and in FM broadcasts, the DQ-1W will in most cases give you an excellent replica of the signal going into it. And, as we pointed out in our first report, it sounds *right* with the DQ-10. But it most emphatically isn't the subwoofer for organ buffs and other bass addicts.

Room replacement can, of course, either beef up or cut down the response of the DQ-1W and also change its damping characteristics. That's true of any woofer; however, it's least critical with a completely sealed direct-radiator system such as the DQ-1W. By definition. Anyone who tells you that this woofer is *especially* sensitive to room placement doesn't know what he is talking about. Even so, you'll do well to experiment. And remember that the lower the crossover frequency, the less critical the distance of the woofer from the rest of the system.

Which brings us to the DQ-LP1 crossover network. What an elegant little box, both in visual styling and in engineering concept! Crossover design, like politics, is the art of the possible, and to our mind the DQ-LP1 represents the most intelligent trade-off to date between the conflicting requirements of frequency-response shaping and transient performance.

Above the crossover frequency, which is variable (by means of two neat little dials) from 40 to 400 Hz, the network is passive, so that it can't possibly introduce any electronic veiling. Once you've selected the crossover frequency, the input impedance of your *high* amplifier determines the adjustment that must be made inside the box (soldering in one or two little components per channel, to raised terminals available for this purpose). This

will create a 6-dB-per-octave roll-off below crossover in the passive section of the network. If your midrange or high-bass driver has to be stopped dead below the crossover point, this isn't the network for you. For the DQ-10, it's ideal.

Below the crossover frequency, the DQ-LP1 is an electronic low-pass filter, with a very clever response profile. The roll-off starts at 6 dB per octave, for the best possible transient characteristics in the crossover region. Then it accelerates to 12 dB per octave and finally ends up with an 18 dB per octave slope to kill the totally unwanted frequencies higher up. It makes you very nearly able to eat your cake (i.e., fast slope) and have it too (i.e., transient fidelity).

In addition to level controls for the low-pass section, the network also provides equalization controls (0 dB to +5 dB) for the bottom end. With an almost overdamped woofer like the DW-1W, that's very useful, making it possible to lower the  $f_3$  slightly, without hell to pay. But careful—with an underdamped woofer the Q just goes to pot. Woof, boom and slop.

The highest praise we can give the DQ-LP1 is that it introduces no more coloration than a purely passive, 6-dB-per-octave crossover, while being infinitely more versatile and effective in controlling the level and dumping the unwanted upper range of a woofer.

Our conclusion (only about the crossover, mind you, not the subwoofer): Every American family should own one.

## Janis W-1 with B4SL-C

*Janis Audio Associates, 2889 Roebing Avenue, Bronx, NY 10461. Model W-1 Subwoofer System, \$650. Model B4SL-C Electronic Crossover, \$240. Tested samples on loan from manufacturer.*

We have this fantasy that John Marovskis, the founder of Janis Audio and designer of the Janis woofer, made a pact with the devil.

"Do you *really* want ruler-flat bass all the way down to 30 Hz?" asked the Evil One. "Maybe 2 dB down at 25 Hz?"

"More than anything in the world," said John fervently.

"With *really* high efficiency?" teased the Devil. "Say an SPL of 85 dB with only about one watt going in?"

"Yeah, yeah!" cried John.

"From a moderate-sized commode, say 22 inches square and about a foot and a half high?" chuckled the Tempter of Mankind, moving in for the kill.

"That does it!" exclaimed John. "I'll do anything!"

"There's a price to pay," warned the Prince of Darkness.

"My soul?" asked John, well prepared for the demand.

"We'll talk about that later," smiled the Devil. "For the moment all you pay is a *rising* response above 100 Hz, about 6 dB per octave—and the biggest peak at 460 Hz you'll ever see in your life."

"How big?" asked John, knowing deep down it no longer made a difference.

"Fourteen dB up above your flat range," replied the Devil, himself amazed at the poor bargains struck by men.

"I'll take it, I'll take it!" cried John. "I'll get rid of the rise with an 18-dB-per-octave crossover. Tell me what to do, Satan."

The Devil held out his hand and John grasped it eagerly. A sulfurous puff of smoke exploded from their handshake. Then the Devil whispered in John's ear:

"Put a 15-inch driver in a sealed enclosure. Give it a system  $Q$  of 1. Then load the *front* of the cone with this magic slot I'm about to show you. And just ignore all the bad things you've heard about slot loading."

And that's the way it happened. John made the subwoofer, calling it the W-1. And he told everybody the truth about it. That it was dead flat below his chosen crossover point of 100 Hz, down to the system resonant frequency of 30 Hz, where the response was still 0 dB. We've verified that. That it had oh-point-something percent harmonic distortion at any frequency down to 30 Hz, never even as much as 1%, at an SPL of 85 dB. Also true. That it could shake the plaster off your walls with a 60-watt amplifier. You better believe it.

But there was one thing he didn't tell anyone. That even with the cute little 18-dB-per-octave electronic crossover he had signed for his subwoofer, the response at 200 Hz was

down less than 12 dB below the flat range on account of the inherently rising characteristic of the slot, and the peak at 460 Hz was only 22 dB below the crossover point. That's with the B4SL-C network *in*. Since the woofer is pluperfect in every other way we could determine, that has just got to be the reason why we didn't like the sound. Because we didn't like it at all. The upper bass and the mid-range, in combination with the Dahlquist DQ-10, were thick, opaque, incoherent and unpleasant. "No, no, it just doesn't sound *right!*" was the reaction of our staff members.

The lower bass is, of course, astonishing. The W-1 laughs at 32-foot organ stops, massed double basses and the Moog synthesizer. "Is that the hardest you can hit?" it seems to ask them. As a matter of fact, when the output of the woofer into our room was adjusted with the B4SL-C network's level controls for measured flat response above and below the crossover point, the bass was much too heavy and had to be turned down. Quite regardless of its overall fidelity, a 25-Hz woofer is another breed of audio component and requires very different feeding and care. You have to tame it before you can use it.

We weren't quite able to decide whether the *low* bass quality of the W-1 had anything to do with what we didn't like about it. The  $Q$ , as we said, is 1 and that's not the ideal damping characteristic for a sealed system, 0.707 being the classic trade-off between pressure amplitude and transient response. With the latter  $Q$ , the W-1 would measure -3 dB at 30 Hz instead of 0 dB. On the other hand it wouldn't be *up* almost 1.5 dB at 40 Hz, which is the characteristic ripple of a  $Q = 1$  system and the W-1's greatest deviation from absolutely flat response. Whether this makes the Janis sound less "fast" than the Dahlquist, for example, was difficult to judge on account of the more disturbing qualities that intruded.

John Marovskis has been going around saying that a  $Q$  of 1 makes his woofer "critically damped," which is simply an error. We managed to prove to him that critical damping in a sealed system means  $Q = 0.5$ , which of course no one is advocating as it would mean that the amplitude response had to be down 6 dB at resonance.

A friendly technical controversy then ensued, on which we have some correspondence

that would be much too unwieldy and confusing to reproduce here. Basically the position taken by Marovskis is that he considers 0 dB at 30 Hz to be nonnegotiable (i.e., that -3 dB at 30 Hz would not be acceptable to him) and that, given that unyielding condition,  $Q = 1$  provides still the best transient response. To us the whole thing seems less important in the case of the Janis woofer than the basic issue of slot loading and the resulting perturbations in response above the crossover point.

We understand that Janis also has a design for a 36-dB-per-octave electronic crossover, which hasn't been marketed so far. Although that type of network (sixth-order) has its own problems, it would be interesting to hear what it could do for the W-1 above 100 Hz, since 18 dB per octave just doesn't seem to be enough. Let's not forget that the very concept of a crossover network assumes reasonably flat and smooth response in both directions immediately above and below the crossover point.

Just to make sure we weren't listening to colorations in the B4SL-C, we also tried our purely passive network as well as the Dahlquist DQ-LP1 on the Janis, both set for crossover at 60 Hz. As you can guess, they didn't do any good, but you can't blame us for trying desperately. The Janis is much too tantalizing to turn your back on.

Somebody down there knew that all along.

## Janis W-2 with B4SL-C

*Janis Audio Associates, 2889 Roebling Avenue, Bronx, NY 10461. Model W-2 Subwoofer System, \$450. Model B4SL-C Electronic Crossover, \$240. Tested samples on loan from manufacturer.*

The W-2 is offered by Janis as virtually identical in performance to the W-1, at a \$200 saving. Like everything else these people say,

it's true—and that's just the problem.

The rising response of the W-2 is virtually identical to that of the W-1; if anything it's a little worse. Measured *through* the B4SL-C network, the W-2 at 200 Hz is down only 10 dB below its flat range. It doesn't have the Matterhorn peak of the W-1 at 460 Hz, but it has even more elevated average response just below that. Between 350 Hz and 420 Hz, the average level is only 21 dB below the crossover point. To our ears, the sound of the W-2 is also virtually identical to that of the W-1 in the upper bass and midrange.

The bottom end is slightly different. For one thing, the W-2 appears to have a slightly lower (and to our mind better)  $Q$ . The ripple just above the knee of the curve is much smaller. Does the W-2 *sound* better damped than the W-1? We aren't sure. Its entire bass quality is somewhat lighter, most probably on account of the 4 dB lower output at 30 Hz and 2 dB lower at 50 Hz (when the 100 Hz outputs are matched). If we call the W-1 a 25-Hz woofer, we can probably call the W-2 a 33-Hz woofer, as there appears to be a distance of about 8 Hz between the bottom-end slopes of their superimposed curves.

Would you pay \$50 per dB at 30 Hz for otherwise virtually identical sound? How about \$25 per hertz? We wouldn't, but then it isn't a Janis enthusiast who's talking.

## Recommendations

These have been slim pickings and certainly no occasion for definitive conclusions in boldface type. The Janis W-1 and W-2 are spectacular but faulty subwoofers, and the Dahlquist DQ-1W is no subwoofer, although excellent as far down as it goes and highly recommended if you don't expect too much of it. Only the little DQ-LP1 crossover is a jewel, but what would you do with it without a subwoofer?

# A Comparative Survey of Power Amplifiers

By the Staff of  
The Audio Critic

**Part I:** In which we compare the sound of 10 power amplifiers for openers, mostly in the 100 to 200-watt class, and just begin to warm up to serious electronic testing.

We'll handle this a little bit differently from our preamp survey. There we presented what we could, or couldn't, find out in the laboratory as an introduction to our reports of the listening tests. Here we propose to let a series of sonically correlatable electronic tests emerge from our total experience with all the power amps as we conclude the survey, either in Part II or (if there's a spillover) in Part III. The reason for this change of format is two-fold.

First, some of the most sophisticated units, with the greatest promise of providing new insights into electronic performance criteria, still remain to be tested as we go to press. For example, we're waiting for delivery of a Threshold 800A, which all sorts of experts assure us is The Ultimate. We've also been promised at least a brief exposure to a 100-watt-per-channel version of the Electro from Norway, of which the 25-watt version is as good as we've ever heard. Then there's the Bryston 4B, which we would have reviewed below if our sample hadn't come under suspicion for an elusive defect. (New sample coming; see also *The Admonitor* column in this issue.) We're also trying to get an Ampzilla II, and we've been promised a new pair of Futterman H-3aa mono units for more thorough examination. And so on.

Second, we have so far found that in the

case of power amplifiers there really *is* some sort of correspondence between measurable and audible characteristics, and we're really hoping that as we gather more evidence we'll be able to assert this with greater authority. We have a feeling that, in this case, time is on our side and all we need is more data. Our preamp tests appear to hold out no comparable promise of maturation.

## **What we measured and what we didn't.**

We had no reason to doubt the manufacturer's specifications in the case of any of the power amps we tested, so we didn't bother to verify them. They don't tell much about the sound of the amplifier in any case. The only exception worth noting at this juncture is the rise time, if at all specified, as it does seem to be related to listening quality (see under individual model headings, where applicable). We therefore routinely check every amplifier that crosses our lab bench with square waves, both with resistive and with capacitive loading. More about that at wrap-up time.

There are two offbeat tests, however, that we're very fond of and want to mention briefly even at this early stage of the game. One is a version of the CCIF intermodulation distortion test, with 14 kHz and 15 kHz mixed 1:1. It really separates the men from the boys. What's par-

ticularly interesting about it is that, in some amplifiers, it produces sidebands at 13 kHz and 16 kHz and in others a difference product at 1 kHz, but seldom *both* to any considerable degree. And each of these two kinds of IM *sounds* different. The other test is a measurement of what is formally known as network propagation delay and is more simply the time it takes for a signal to pass from input to output. It's performed on a dual-trace oscilloscope by subtracting the waveform of a pulse input from that of the output and examining the difference signal with delayed sweep. This is capable of yielding very useful information about the time-smear characteristics of the amplifier. We'll make brief reference to these and other simple tests under the individual reports while reserving judgment about their ultimate relevance until the conclusion of our survey.

### The listening tests.

Our approach to listening evaluations was discussed in detail in Part I of the preamp survey and receives further attention in this issue in Part II of that survey as well as in the editorial article. We can therefore restrict our comments here to the specifics of the power amp tests.

Each amplifier was listened to through a pair of Dahlquist DQ-10's, modified with mylar capacitors in the crossover as described in our first issue. To those who don't particularly like the DQ-10 we can only say that you don't have to like it to use it as a tool; the fact that it's a difficult speaker to please, being totally unforgiving of anything but the cleanest electronics behind it, makes it very convenient for eliminating amplifiers that *almost* sound right. We don't consider the Dahlquist to be the ultimate challenge to a power amplifier; the "finalists" in Part II will all be listened to through full-range electrostatics, inefficient subwoofers that eat amplifiers for breakfast and other monsters. As a first hurdle, however, we don't know of anything more revealing than the DQ-10.

The preamp plugged into each unit under test was the revised Mark Levinson JC-2 with Lemo connectors, our current choice as a reference preamplifier. Since, so far, the lab tests on power amps seem to confirm the listening tests, we have no evidence of subtle interface or compatibility problems when using this preamp with any of the power amps. The Rappa-

port PRE-1A with MC-1 head amp was also used in some of our tests to confirm the results. The program sources consisted of records played mainly with the EMT cartridge but occasionally also with the Denon DL-103S and Grado Signature, plus a few second-generation master tapes played on a Revox A700.

We didn't find it necessary to run controlled A-B listening tests on the power amps except in a very few, isolated cases. As will be apparent from the individual reports below, most of the units we tested had obvious shortcomings when listened to by themselves, and since we did find at least one excellent and relatively low-priced model, we didn't feel like investing additional time and effort into fine-tuning our preferences among the not-quite-satisfactory ones. We fervently hope that we'll have to A-B the bejeezus out of the few amplifiers that survive all of our test as we get into Part II. That will also be the time to analyze amplifier/speaker compatibilities—if indeed that's a realistic concept. (See the Quatre DG-250 review below on that subject.)

With that we're ready to begin the individual reports.

## Audio Research D-100

*Audio Research Corporation, 2843 26th Avenue South, Minneapolis, MN 55406. Model D-100 High Definition Power Amplifier, \$995. Three-year warranty; not clear whether customer pays all freight. Tested #36401134, on loan by courtesy of Lyric Hi-Fi, White Plains, NY.*

We have already made our comments anent Audio Research's venture into solid state; see the original SP-4 preamp review in our first issue and its follow-up in this issue. The D-100, a 100-watt-per-channel power amplifier, is the other vehicle in the incredible Analog Module promotion cooked up by ARC in an effort to beef up their State Of The Art image. In our opinion, the only thing unquestionably SOTA about the D-100 is that it comes from Minnesota.

In all fairness, it must be pointed out that we were able to borrow our sample only for a very short time. Our exposure to the D-100 wasn't nearly as long as to some of the other amplifiers reviewed here; however, we're quite confident in our judgment that it isn't the best of the lot, either for the money or on

an absolute basis. How high it rates as an also-ran is another matter; possibly quite high.

The first thing that struck us about the D-100 when we started to listen to it was its completely sweet, unstrained sound, combined with a nice open quality. We've got a winner here, we thought.

But wait a minute. There was something wrong. How come we couldn't hear the precise overtone structure of the cymbals and triangles? Wasn't there a lack of transient detail in general? There certainly was. What at first seemed sweet turned out to be merely blunted.

Then we also became aware of a lack of tightness and definition in the bass, all the way up to the lower midrange. This was no super amplifier, even if it was pleasant to listen to. The output just wasn't a complete replica of the input.

Quick to the laboratory before we had to return the amplifier. The only other unit we had lying around there for reference was the GAS Son of Ampzilla (not quite our favorite, either). We looked at square waves passed through the D-100 and then the Son. The latter had a much shorter rise time, about half that of the D-100, which appeared seriously bandwidth-limited by comparison. Eureka! Blunted square waves, blunted transient detail. It was almost too simple to be true, and we may yet decide that we jumped to a conclusion too quickly—but there it was. The lab appeared to confirm the ear.

We must add that the physical construction of the D-100 is every bit as impressive as the SP-4's. It's obviously built to last. Handsome, too, and very convenient to lift with those nice big handles.

Still, we prefer to cut our fingers on the sharp corners of the handleless, slippery Quatre DG-250. It has better bass, better transient detail, more power, at half the price.

## CM 912a

*Audio International, Inc., 3 Cole Place, Danbury, CT 06810. CM 912a Stereo Power Amplifier, \$899. Tested unnumbered sample, on loan from manufacturer.*

This is from the former C/M Laboratories, now operating under a new name and a new management. Again, our sample was under our roof for a very short time only, not even

long enough to be carefully looked at in the laboratory, but long enough to be listened to and ranked with considerable certainty in our sonic pecking order. It happens to rank quite high but not at the top. If none other, the Quatre DG-250 pecks it, and at a much lower price.

The CM 912a is a 150-watt-per-channel unit (225 at 4 ohms) with peak-reading meters and incorporates circuitry to drive the CM servo-feedback speaker, a feature on which we have no opinion. In conventional hookup, it sounds bright and detailed, some would say marginally (but not obnoxiously) overbright, others would say just right. We definitely prefer the slightly more reticent but somehow more transparent, more natural highs of the Quatre. The bass of the CM 912a is very acceptable when listened to by itself, but switching to the Quatre gives an immediate impression of greater tightness, detail and reserve power, despite the lower power rating.

An interesting and very elusive anomaly of the CM 912a is a kind of ping-pong or double-mono effect in stereo imaging. Plenty of left and right information, and strangely little fill-in in the middle. Whether this is some peculiar phase problem or merely an artifact of our equipment chain (or even just a figment of our imagination), we didn't have enough time to determine. We didn't hear it when we tested other amplifiers.

Overall, the CM 912a is a power amplifier we could probably live with quite happily if we didn't know what we know about others.

## Electrocompaniet

*Electrocompaniet, Toyengt. 14, Oslo 1, Norway. "The Two-Channel Audio Power Amplifier." price not available. Tested #86, on loan from private owner.*

Okay, audio freaks, eat your hearts out. Here's what we think is the world's best-sounding power amplifier and (a) you can't buy one in this country and (b) it's much too low-powered to be practical.

*Electrocompaniet* is simply the Norwegian form of The Electro Company, and we've been referring to this little marvel as the "Electro

from Norway" (not to be confused with the Electro Research from California, which we haven't tested yet). The power output of this unit is approximately 25 watts per channel (we believe it's rated at 28 watts but it doesn't quite seem to make it); there's also a 100-watt-per-channel version, we're told, but just try to get one. (We're trying. A friend who had personal dealings with the company in Oslo and ordered one directly from the factory many months ago is still waiting for it.)

The sound of the 25-watt Electro requires only a brief review. It's the best. Of course, you can't push the amplifier beyond its power capability. As long as you play it about 10 dB below window-rattling level, you'll hear definition and transparency a whole order of magnitude better than with the Quatre, which is our top choice among commercially available units so far. The Electro makes the bass cleaner and tighter on the naked Dahlquist DQ-10 than it is normally with a biamped subwoofer. The midrange is pellucid, and high-frequency transients are completely etched and focused, without the slightest ringing or fizziness. Of course, there comes the moment when you've just got to have more sock, and the Electro doesn't have it. Frustrating as hell.

We understand that the circuit has the blessing of Matti Ojala, the Finnish archenemy of TIM, although it's incorrect to refer to it as "the Ojala amplifier," as some people have, since Ojala isn't in the business of designing circuits for the audio industry.

Whatever its provenance, the circuit is certainly fast and has tremendous bandwidth. It just barely rounds the corners of 100 kHz square waves. We weren't allowed to have the 25-watt unit long enough to tell you more than that; if we ever get our hands on the 100-watt we'll certainly try to wring it out in the lab.

Meanwhile, we're just sitting here savoring the memory.

## Futterman H-3aa (preview)

*Futterman Electronics Lab, 200 West 72nd Street, New York, NY 10023. H-3aa vacuum-tube power amplifier (mono), \$260; stereo pair, \$520. Auditioned manufacturer's demo samples.*

**Editor's Note: This isn't really a test report, since the equipment was made available to us**

**only for a few hours. But we did have a chance to insert it into our reference system and form a rather firm opinion of its relative merit.**

The Futterman output-transformerless vacuum-tube power amplifier has been an audio cult item for the past twenty years or so, and it's getting better every year. We had lived with at least three versions of it before being exposed to this latest incarnation. An outfit in Michigan called Golden Ear now owns the patent to the circuit, but we haven't seen any amplifiers coming out of there; Julius Futterman, the original designer, is permitted under the patent-sale agreement to build a small number of hand-wired units per year, and it was a pair of these that we had the opportunity to audition.

The H-3aa is strictly a utility model but extremely well built; each mono chassis has six beam pentodes in its output circuit and can deliver 100 watts at 8 ohms (150 watts at 16 ohms—it increases the opposite way from transistor circuits). Coupling to the speaker is via 2500-microfarad capacitors, so that with an 8-ohm load the low-frequency response is down 3 dB at 8 Hz (by definition) and about 1 dB at 16 Hz. With the Dahlquist DQ-10, which has somewhat lower impedance than 8 ohms at the lower frequencies, these figures are a little bit less good, which still doesn't explain why we heard a slight looseness in the bass, since the damping factor of the Futterman is extremely high. In fact, this small deficiency (which, according to Julius Futterman, can be remedied with even larger output capacitors) was the only audible flaw of the H-3aa during our brief exposure to it. In every other way, it sounded magnificent.

We were especially impressed with the highs, which were truly sweet and free from strain, while still extremely detailed. Only the Electro from Norway was comparable (or superior?) in this respect; how we wish we could have had both of them available at the same time for A-B-ing! The midrange of the Futterman was also superb; it couldn't have been more transparent, or more accurate in depth perspective. Since the H-3aa has ample power for all but the most inefficient speaker systems, it would undoubtedly be our reference amplifier if the bass could be tightened up just a wee bit. We shall see; we've been promised a pair in time for Part II of this survey.



On top of everything else, the price is extremely reasonable; you should really order a pair and see how much further improved they'll be in 1984, which is approximately when you can expect delivery.

## **GAS Son of Ampzilla**

*The Great American Sound Co., Inc., 20940 Lassen Street, Chatsworth, CA 91311. Son of Ampzilla stereo power amplifier, \$434 (with rack-mount panel and handles). Five-year warranty; customer pays all freight. Tested #400845, owned by The Audio Critic.*

Even though we cringe every time we pronounce its embarrassing name, we consider the Son of Ampzilla to be an excellent little power amplifier—not even so little, since its 80-watt-per-channel rating at 8 ohms jumps to 150 watts at 4 ohms and even more at 2 ohms, making it especially useful for multiple-speaker and other low-impedance applications.

If the Quatre DG-250 didn't cost only a few dollars more, the Son would be a serious contender for best-sound-per-dollar rating in this survey. But we don't find the Son to be quite as accurate a reproducer as the Quatre, either audibly or measurably.

The sound of the Son is typically GAS-uous; highly listenable, never harsh or distressful, with a neat trade-off between transient detail and rounded pleasantness. It's neither ultratransparent nor veiled, just a little bit loose and whumpy in the lower part of the spectrum. Switching to the Yamaha B-2, for example (just to give you an idea), results in a spectacular improvement in openness and freedom from whomp, but considerably harder highs.

In the laboratory, the Son shows outstandingly good square waves with a resistive load but rings rather badly when an additional 1-microfarad capacitor is connected across it. This happens at frequencies as low as 2 kHz. At 20 kHz the ringing becomes disastrous; the square wave is barely recognizable. This augurs ill for driving electrostatics, despite the amplifier's unusual capability to handle low-impedance loads; indeed, a brief exposure to the sound of the Son through the latest Dayton Wright left us very unimpressed. Phase shift is quite high at 20 kHz and higher than that of the Quatre DG-250 even at 2 kHz; on the other hand, propagation delay is extremely low,

which just *may* be what keeps it all from sounding opaque and "electronic."

It's the CCIF test for IM distortion, however, that really nails this amplifier. With 14 kHz and 15 kHz going in (mixed 1:1), there's too much 13 kHz coming out: 0.2% at full power and more than 0.1% even at around 20 watts. The 16 kHz sideband is also there, but very little of it; more significant is the rarely seen 1 kHz difference product of almost 0.1% at full power and more than 0.06% at 20 watts, which may explain the whomping, since it indicates that fairly low-frequency garbage is being dumped by the more subtle high-frequency interactions. We can't really prove that any of this stuff is audible, but then how come the Quatre has so much less of it and sounds better?

In view of this company's advertising and our experience with their Thaedra/Thoebe preamp design, we come to more or less the same conclusion about the Son of Ampzilla: A very good piece of equipment but not good enough to make you go ape.

## **Luxman M-4000**

*Lux Audio of America, Ltd., 200 Aerial Way, Syosset, NY 11791. Model M-4000 Power Amplifier, \$1495. Three-year warranty; manufacturer pays all freight. Tested #16101103, owned by The Audio Critic.*

Like several other items in the Luxman line, the M-4000 is beautifully made, highly luxurious, very expensive and not quite good enough.

What we mean is best illustrated by one experience we had with it when driving the Duntech DL-15 speakers. As we reported in our first issue, we're quite impressed by these speakers (now apparently off the market), although they aren't our top choice. Our Associate Editor liked them, too, despite some flaws he pointed out the first time he heard them. The second time, several days later, he said, "You know, I was wrong about these speakers. I don't like them at all any more. They're harsh and nasal." Then we remembered. We disconnected the Luxman M-4000 from the Duntechs and substituted the GAS Son of Ampzilla, which was how he had originally heard them. "Ah," he said, "now I like them again."

Yes, the M-4000 has just a touch of tran-

sistory hardness, nasality and a not-quite-open quality. Nor is its deep bass the most detailed. It's still a lot better in all these respects than many amplifiers, but then we don't give consolation prizes. Its 180-watt-per-channel rating is quite conservative, however, giving it good reserve power on piano reproduction for example, which seems to be its forte. We also like its combination of VU meters and LED peak-reading display, which gives you the best of both worlds (like wearing suspenders along with your belt). Nicest of all are the input attenuators, calibrated in 1-dB clicks; what a gorgeous pair of controls and how we wish every good power amp had them! But, let's face it, sound comes first.

Again, it's the 14-plus-15-kHz IM test that sinks this luxury liner. At only 72 watts, the 13 kHz sideband alone amounted to 0.25% in one channel and 0.2% in the other. Taking the power down to 35 watts barely resulted in an improvement. The 16 kHz and 1 kHz IM products were more acceptable (especially the 1 kHz), but that much 13 kHz is almost certainly audible and probably accounts for the harshness. As they say in the commercials, CCIF sure works for us.

The M-4000 also showed some interesting anomalies with pulse testing, but before we could analyze the results, we had a chance to sell it (this one we owned). We grabbed the money and ran like a thief.

## Quad 405

*Acoustical Manufacturing Co. Ltd., Huntingdon, Combs. PE18 7DB, England. Quad 405 Current Dumping Power Amplifier, \$410. One-year warranty; customer pays all freight. Tested #2311, owned by The Audio Critic.*

"Current dumping" is one of the few thoroughly original amplifier design concepts to come on the scene since the dawn of the hi-fi era. Its circuit details are beyond the scope of this review, but the idea, simplistically stated, is that one part of the amplifier supplies the brute force and a separate part fills in the fine detail. This is supposed to make the fine detail more completely realizable and the entire operation of the amplifier more stable. There are no adjustments (bias, etc.) inside the box (which, incidentally, is small, handsome and beautifully finished); the amplifier is set for

life and replacement parts, if needed, are simply soldered in.

In all fairness, however, we must report that a very knowledgeable circuit designer we know has been heard referring to the 405 as "the Quad shit-dumping amplifier." This scares us because, as we said, he's very clever; maybe he knows something we don't. We happen to like the Quad 405 a lot; again, if the Quatre DG-250 weren't almost as reasonably priced, we might consider the 405 as a candidate for best value in our survey.

We especially like the bass; despite the low-frequency input filter (down 1 dB at 20 Hz and 12 dB at 7 Hz), the lows are firm, detailed and authoritative. The highs are, if anything, mildly subdued; at least there's not a trace of harshness or fizziness. The midrange is quite nice and open. Switching to the Quatre reveals, however, that there's a long way to go in all these departments; the DG-250 has tighter bass, a more transparent midrange, more crystalline highs. More power, too; the Quad 405 delivers only 100 watts into 8 ohms as against the Quatre's minimum of 125, and at 4 ohms the Quad is down considerably whereas the Quatre is up.

One must remember, of course, that the 405 was designed with the Quad electrostatic as reference speaker; in fact, it has provisions for a pair of plug-in limiter resistors to protect that speaker from an output voltage of more than 20 volts. We can't tell you at this point whether there are any amplifiers that drive the Quad electrostatic even better than the Quad 405; the two certainly make beautiful music together. (As you probably know, it's inadvisable to connect just any old amplifier to the Quad speaker.)

One more thing. If you hear hum and noise through the 405, it's probably your preamp. The amplifier has an input sensitivity of 0.5 volts for full output, and that's a lot of gain. The best thing is to use the low-gain Quad 33 preamp with it; as we've said before, the 33 plus the 405 are still quite a package for \$675, even if they don't beat everything in sight.

Besides, if you don't give Quad and the pound sterling your continued support, they'll never come out with the new full-range electrostatic they're supposed to have under wraps there in Huntingdon, which *does* beat everything in sight—or so we're told.

## Quatre DG-250

*Quatre, 8223 Remmet Avenue, Canoga Park, CA 91304. DG-250 Gain Cell power amplifier, \$495. No warranty information enclosed with original factory container. Tested #473, owned by The Audio Critic.*

Before anything else, let's make it clear that this is a *new* Quatre amplifier, called the DG-250 Gain Cell, available only as of late 1976 and not at all like the previous Quatre power amp. The DG-250 uses a highly original analog multiplier circuit (not to be confused with Audio Research's so-called Analog Module, which in our opinion is just a promotional name for IC's). The Quatre circuit is based on the philosophy of "if you can't lick 'em, join 'em." You can't lick the inherently nonlinear (logarithmic) output current characteristic of transistors, so you just accept it and put the signal through an oppositely nonlinear (antilogarithmic) process. The net result is linear—without feedback and hence without TIM. (They'll never teach it this way at EE school, but then the tuition there is more than \$28 a year.) Actually, the DG-250 does have some feedback around the output stage, but it's still quite different from the typical amplifier that relies heavily on feedback to keep it linear from input to output.

Whatever the reason, the Quatre Gain Cell sounds awfully good. Of the power amplifiers we have evaluated so far, only the Electro from Norway sounded decidedly better from top to bottom (but only within its very limited power capability), and the Futterman H-3aa on top and in the midrange but not in the bass. Overall, we hear very little that's wrong with the DG-250. The bass is extremely firm and tightly controlled, the midrange open and quite accurate in depth information, the highs clean and neither subdued nor exaggerated. What's more, the apparent reserve power is greater than you'd expect from the official 125-watts-per-channel rating. The available power is probably closer to 200 watts, especially at lower impedance. (Our Dahlquist DQ-10 is in the 6-to-7-ohm range at the lower frequencies.)

The measurements, lo and behold, bear out the sound. It's almost too neat to be true. Negligible IM distortion with the 14-plus-15-

kHz killer test. No propagation delay to speak of up to 50 kHz. Quite a bit of ringing on 20 kHz square waves into a load of 1 microfarad across 8 ohms, but the competition is even worse in that respect.

As a matter of fact, we're beginning to think that the Quatre and the Dahlquist don't form a synergistic combination, as we suggested in our first issue. Maybe the Quatre is simply a better amplifier, period. Maybe compatibility is just a name for our ignorance of the more subtle factors of electrical performance. How about that, golden-ear innocents?

By the way, the Quatre Gain Cell looks exactly as the name suggests. A big, black, anodized aluminum brick without anything sticking out of it. There's a tiny red LED in front and some heat sinks in the back. The edges and corners are sharp. Something like that monolith in *2001: A Space Odyssey*.

In fact, we can just see the apes from the GAS ads and posters crowding around it and reaching out in awe to touch it. For only \$61 more than the Son, the dawn of a new era. . . ?

## SAE 2400L

*Scientific Audio Electronics, Inc., PO Box 60271, Terminal Annex, Los Angeles, CA 90060. 2400L Solid State Stereo Power Amplifier, \$800. Five-year warranty; not clear who pays freight. Tested #24-03019, on loan from rep.*

This is a 200-watt-per-channel power amp with fully complementary circuitry from input to output (not every amplifier in the SAE line is as up-to-date in concept) and a very neat LED peak-reading power level display. The front panel is of the professional rack-mount type, with *big* handles. But the sound is merely good, not outstanding.

We liked the bass best; it's quite firm and authoritative. The highs are less hard and grainy than we've heard out of a lot of expensive amplifiers, but far from perfect. There's still a residual amount of aggression. The midrange is rather closed down; indeed, there's a dark, syrupy quality to the overall sound,

which at first passes for smoothness but is soon perceived as opacity and lack of detail. Listenable but not accurate.

The laboratory observations are revealing. There's no high-frequency harmonic distortion worth mentioning and rather low distortion with the CCIF test. But we measured considerable propagation delay, as well as phase shift, throughout the audio range. Both were quite evident even at frequencies as low as 2 kHz. Doesn't that suggest a correlation between measurable time smear and audible blurring of detail? Furthermore, with square waves from 5 kHz to 20 kHz there was appreciable ringing even into a purely resistive load. That's unusual and may account for the subtly uncomfortable sound at the higher frequencies.

All in all, the 2400L is just another amplifier. Neither its virtues nor its faults are interesting enough to make a fuss over. If at least they had apes in their advertising . . .

## Yamaha B-2

*Yamaha International Corp., PO Box 6600, Buena Park, CA 90620. NS Series B-2 Stereo Power Amplifier, \$850. No warranty information enclosed with original factory container. Tested #02834, owned by The Audio Critic.*

Several references to this 100-watt-per-channel vertical-FET power amp in our first issue (Part I of the preamp survey and elsewhere) indicated that we rate it quite high, almost as high as the Quatre DG-250. We're not so sure anymore.

The B-2 undoubtedly has a strikingly open sound, so open that switching to most other amplifiers creates the impression that something has closed down. This quality is hard to resist, but that isn't all that's hard. So are the highs of the amplifier; in fact they're downright brittle and unpleasant. The seduction of the openness is gradually replaced by irritation as one listens further. We're now inclined to believe that what we thought was special compatibility between the Mark Levinson JC-2 and the Yamaha B-2 is simply a case of reduced irritation, the explanation being that the JC-2 with its superclean highs makes no contribution to the total distortion, whereas other preamps do. (Slew-rate-related compatibilities are an-

other matter; the B-2 has an unusually high slew rate of 60 V/uS, which is a subject we won't go into until Part II of this survey.)

Since, obviously, a great deal of engineering sophistication has gone into the circuit design of this true DC amplifier, we don't want to be hasty in our dismissal of its sonic performance, but (again!) the audible problems at the higher frequencies are reflected in the results of the CCIF test.

At approximately half power (50 watts), 14 kHz and 15 kHz mixed 1:1 throw a fairly large sideband at 13 kHz (0.22%) and a smaller one at 16 kHz (0.06%)—about as bad as the Luxman M-4000 and worse than the GAS Son of Ampzilla. On the other hand, there's no 1 kHz product, so the net correlation is over-brightness but no whomping. (Too simple? Maybe, but it's plausible.) The openness and clarity seem to be borne out by very low propagation delay (almost as low as in the Quatre); what there is of it is constant at all frequencies. All very neatly accounted for, isn't it?

One can't conclude a review of the Yamaha B-2 without expressing admiration for the marvelous peak-reading meters and the two pairs of inputs, making it possible to A-B two preamps or other sources at the touch of a push button, with instant monitoring of levels. We'd love to make the B-2 our reference amplifier just for that reason, but we couldn't live with those highs in the long run.

Somebody who is very knowledgeable about these things told us recently that what seems to be bothering us is the typical East Coast sound. From the East Coast of Honshu.

## Recommendations

Since neither the Electro from Norway nor the Futterman H-3aa really "exists" from the consumer's point of view (just try and get one), it becomes a very simple task to designate our top choice—so far. Don't forget, though, that some very sophisticated units are still waiting to be tested.

**Best power amplifier so far, regardless of price: Quatre DG-250 Gain Cell.**

**Best sound per dollar: Quatre DG-250 Gain Cell.**

## Records and Recording



### The Ears Minus the Eyes

By Max Wilcox

*Editor's Note: This is the second of a series of articles exploring why records sound the way they do. You may or may not be aware that the author, who is also our Associate Editor and one of our regular listening panelists, recently won the top classical Grammy award for 1976 (Album of the Year) as the independent producer of the Rubinstein-Barenboim set of the Beethoven piano concertos. (But then what do those tin ears at the Academy know about good sound, right Max?) You may also be wondering whether we'll ever run record reviews in this column. The answer is yes, beginning with the next issue; there just hasn't been an avalanche of recent releases of irresistible sonic quality and we weren't particularly eager to rehash any widely reviewed favorites.*

Let us imagine you have just entered a concert hall. Going to your seat you are already beginning to participate in the atmosphere of a live performance. The hall is comfortable and beautiful, and you enjoy glancing around at other members of the audience while the orchestra members are making their way to the stage.

The house lights dim and the conductor enters. Your impression of his stage personality starts to form even as he approaches the podium. Then the music begins and you are flooded with a multitude of aural and visual impressions. You listen to the music, and you also become closely involved with the physical presence and actions of the performers. Both your ears and your eyes are sending you messages.

Your impression of the music, of the performers and of the general atmosphere of the event is made up of thousands of visual and aural impressions. At the moment they are happening it would be difficult for you to separate those impressions. And so it always is at concerts, operas or any live musical event. Whether

you are attending a solo guitar recital in an intimate room or hearing the Berlioz Requiem in a huge cathedral, your ears and eyes are fully involved.

I'd like to discuss what a subtly but significantly different experience any of these performances would become if you heard them on a recording in your listening room. Suddenly you would only respond to what your ears were telling you. Your mental energies would no longer be divided between visual and auditory impressions. There would only be the sound of the music to create the impact and emotional tone of the performance, and it has been my experience that the ears operate quite differently when they are solely responsible for your musical judgments.

\* \* \*

Let me give you a few examples. Many of you heard the recent premiere telecast of a live performance of Puccini's *La Boheme* direct from the stage of the Metropolitan Opera. Watching Luciano Pavarotti and Renata Scotto, you soon became involved in the lives

of Rodolfo and Mimi as you responded to the singing and acting skills of the principals, the skillful camera work and the colorful settings. If somewhere during the performance you had closed your eyes for a few minutes and just *listened*, you might have heard things that you had not consciously focused on before. Without the visual impact that is such an integral part of opera, you would have been more aware of vocal production, intonation, the acoustic surroundings of the opera house, the balance between the voices, and the quality of your TV audio. Opening your eyes again, these factors would still be important, but the visual involvement would again consume a fair portion of your attention, and your perception of the opera would come from the total of your various responses.

As another example let us say we are at a piano recital. The pianist is playing the elegiac slow movement of Beethoven's Sonata Op. 111. His face is transported with ecstatic agony as he plays and he gazes at some vision known only to him. His body is giving us one kind of musical message, but are his hands conveying the actual music with equal intensity? If we closed our eyes we might find the performance was less emotionally involved than the visual impression suggested.

In contrast, many great artists remain relatively motionless while giving performances of great emotional intensity. Rachmaninoff barely moved as he gave performances of volcanic impact. It is unfortunately true that a few listeners need physical evidence of emotions from their performers, and they perceive as "cold" a performance that is not "acted out." They are using their eyes, not their ears, to judge.

As the last example, how many of us could give a critical evaluation of the audio quality of the sound track of a fine dramatic film if someone asked us for a critique at the conclusion of the picture? Most of us would have to say we were caught up in the drama of the film and the performance of the stars. While we were sure the score contributed to the overall impact of the picture, we wouldn't have the slightest memory of the actual technical quality of the audio track. And this response could easily be from serious audiophiles who could give you a very good impression of the sound track's quality if someone asked them to close

their eyes and listen *during* the picture. Of course a movie sound track is not meant to be given close attention by the audience. Assuming it is of decent quality and is suffering from no serious distortion, it will serve the purpose for which it is designed and we will not be aware of it as a separate entity. But, it is *there* the whole time, and the same ears that would be discerning and demanding about the sonic characteristics of a record are probably not discerning at all about the sound track.

All of this is to show how the same listener will listen differently when varying demands are being made on his other senses. If during a film his involvement is almost totally visual, his ears and eyes are definitely equally at work during a concert, an opera or a Broadway musical. And when he listens to recordings *only* his ears are sending signals to his brain.

\* \* \*

Which finally brings me, in case you have been wondering, to the audiophile point of this rather philosophical treatise. Anyone who is reading this publication is certainly interested in sound. And I will even venture a guess that the readers can be divided into two or three groups: music lovers, sound lovers and an infinite variety of combinations of the two. Some of you are mainly interested in music, and have learned that you gain even more pleasure from musical experience when the sonorities are clean, clear, well-balanced and full-ranged. Some of you are quite straightforwardly excited by the sonorities themselves, and you have embarked upon a never-ending search for the most exciting and realistic reproduction of these sounds that you can manage to bring into your listening room. Sound itself is a very sensual experience and some musicians can make a case that composers like Ravel deal *mainly* in textures and sonorities. These textures and instrumental colors become the *substance* of their music, so addiction to sound is certainly not a second-class mode of pleasure.

Whatever your main interest in listening to reproduced music may be, you all share a desire and an appreciation for the best possible sound. I have tried to show you that we all use our ears with different degrees of concentration under different circumstances, and I feel that a person listening to a recording is more demanding about sonic qualities than any other listener. An acoustic environment that he would

accept and adapt to in a live listening situation would prove to be intolerable to him if it were the hall used for a recording.

The major recording companies are well aware that their productions should be made in the best possible acoustic settings, and they go to rather elaborate lengths to find and use such places, however offbeat they may be. A major truth in the art of recording is that if you don't have a good room you don't have a good recording. The best microphones and microphone techniques available will not make a bad room sound good. (If you work at it, you may be able to make a good room sound bad, but let's not talk about that.) So, we must give the listeners a good hall or studio.

If it's a hall with depth, richness and smoothness throughout the musical range, we will listen to a recording of a good performance with pleasure. The sonic pleasures will serve as a support and enhancement for the performance. However, give us that same fine performance recorded in a hall with shallow and dry acoustics, leaden or soggy bass, a dull or harsh midrange and high frequency range, and our pleasure in that performance is dramatically diminished. It doesn't *sound* good. Our eyes have no performer dramatics to distract our ears from the poor acoustics, and the artist's communication with the listener suffers.

If we had actually been part of a live audience for that same fine performance in that same bad hall, our eyes would have filled in some of the acoustical deficiencies, but with a recording our ears immediately and persistently tell us the tonal truth.

Let me hasten to add that, as a musician who has given many public performances as a pianist and a few as a conductor, I am not saying that recordings are superior to concerts for discerning listening. Long live the concert hall, for it has a dimension unattainable in any recorded form. As we listen to recordings it is simply that we are more finely tuned to the pure sound of the experience, and it is the goal of any recording production crew to give the performer and the listener the best possible sound stage for the musical experience that is being offered.

\* \* \*

Which brings us to the main question—how is the hall or studio chosen for a specific record-

ing? It would be ideal to say that each recording locale is chosen for its suitability to the music at hand and for the best possible projection of the tonal and dynamic qualities of the performance to be recorded.

Within practical limits that is always the desired goal, but no recording company has access to an unlimited variety of halls and studios. The practical hope is for one fine large studio for solo and instrumental recordings, and an equally fine and still larger hall for orchestral recordings. Well, all major companies can provide you with the large studio. EMI's Studio 1 on Abbey Road, London, has been the site of major recordings from the time of Schnabel and the early Budapest Quartet to the present day. It is very large, has warm natural acoustics, and fortunately it hasn't been ruined by the well-intentioned renovations that have recently marred such great halls as Orchestra Hall in Chicago. English Decca (London) has a fine studio in Studio 3, although they often prefer to record chamber and instrumental music in the many churches in London. Many years ago Columbia Records took just such a church on 30th Street in Manhattan and converted it into a fine studio. It is used for a wide variety of music, ranging from the Juilliard Quartet to Broadway musicals. Most of the non-orchestral classical Columbia records made in this country come from this studio.

RCA Records has an excellent large studio in Studio A in New York. Patterned after Studio A at RCA Italiana (where many RCA opera recordings were made), the New York studio has been my most frequent working ground since it was built eight years ago.

Philips and DGG have equally good studio facilities in Europe, although these "studios" are just as likely to be churches and small concert halls when it comes to solo and chamber group recordings.

\* \* \*

The qualities of the concert halls, churches or studios used for orchestral recordings are more variable. Often a recording company must choose between the home hall of the orchestra or an alternate site in the same city. Halls that have served for many years as concert sites for some of our major American orchestras are not used for the recordings made

by these orchestras.

Orchestra Hall, Chicago, was used for many great Chicago Symphony recordings dating from the days of Stock, Kubelik, Rodzinski, and, most particularly, Reiner. Reiner's recordings from Orchestra Hall in the 1950's and early '60's are still exceptional in their depth and dynamic range. In the middle '60's Orchestra Hall was rebuilt because it was rather uncomfortable for the audience and its acoustical response with a full house was uneven. Unfortunately, the hall that we came to know from the Reiner recordings was altered dramatically. Its acoustics had always been far superior when there was no audience, but now it was altered to sound the same whether empty or full, and the depth and resonance of the old hall were no more.

RCA, EMI, London and DGG moved to the Medinah Temple, a large church-like room with good acoustics, for the Chicago Symphony recordings. It is a very good hall, but it's still not old Orchestra Hall. Many voices have been heard urging the restoration of Orchestra Hall to its old glory and there is an increasing hope that this will occur. Keep your fingers crossed.

The Philadelphia Orchestra has long made its home in the historic and beautiful Academy of Music. The sound is warm, intimate and very clear. Its character can be heard in the early Stokowski recordings that were far ahead of their time in technical quality. Unfortunately, when stereo was developed the lack of depth and reverberation of the Academy became more apparent than it had been in monaural recordings.

Columbia began a search for more spacious-sounding acoustics. For a few years they recorded in the large ballroom of the Broadwood Hotel and then moved to the seventh-floor ballroom of what was then called Town Hall and is now the Scottish Rites Cathedral. Originally built as a Masonic Lodge and now again in the hands of its original owners, the ballroom is currently used by RCA for its Philadelphia Orchestra recordings.

During my four seasons as Ormandy's RCA producer, several improvements were made at the suggestion of engineer Paul Goodman and myself. Thirty-six large lead window coverings were installed to quiet the traffic sounds that had been all too audible in previous

years. More important, an industrial humidification system was installed to assure year-round resonance in the hall. Previously the hall had been warm and resonant-sounding in the months when the heating system was off, but dramatically drier and smaller-sounding as the steam radiators began to dry out the walls of the large room. In the fall and spring seasons the walls contained sufficient humidity to create reflections and consequent resonance, but the walls dried by winter heating were no longer reflective. They now absorbed high frequencies, cutting down on the sound reflections and reducing the resonance. The humidifier now maintains a relatively constant humidity in the room throughout the year, and the result is an acoustical environment that is much the same no matter what the season. (Columbia's 30th Street studio contains an even more sophisticated humidification system that they use to very good effect in controlling the acoustics of the room.)

The Boston Symphony is blessed with one of the great concert halls in the world in Symphony Hall. It ranks with Vienna's Musikvereinsaal and Amsterdam's Concertgebouw as a nearly perfect place to hear music. Boston Symphony recordings have varied in quality over the years, but that is a question of microphone techniques. Lewis Layton of RCA began the procedure of removing the first thirty or so rows of seats from the main floor of Symphony Hall and seating the orchestra on the floor. This gave an even more spacious sound to the orchestra, and it enabled the engineer to spread the orchestra out so he could have more individual control over the microphoning of the various sections. Charles Munch's still famous recording of the Saint-Saens Symphony No. 3 was the first recording made on the floor. The orchestra understandably prefers to sit on the stage because they can hear each other better in that position, but a well-made recording made from the floor position is always richer and more spacious.

The Cleveland Orchestra has a good hall in Severance Hall. It has a relatively short resonance, but the sound is clear and well-balanced. It only lacks the glow and warmth of the greatest halls. Until recently all of the Cleveland Orchestra's recordings were made in Severance Hall, including all of their recordings with the late George Szell. When English Decca (Lon-



don) began to record the orchestra with Lorin Maazel, they moved to Cleveland's Masonic Auditorium, a room of quite spectacular acoustic properties, and some very beautiful sounding recordings have resulted (particularly the Prokofiev "Romeo and Juliet").

The Los Angeles Philharmonic plays in the Dorothy Chandler Pavilion at the Los Angeles Music Center. It is a very comfortable auditorium with a superb stage facility for ballet, opera and such events as the Oscar presentation, which takes place there each year. It was unfortunately designed more for audience comfort than for optimum acoustics. It is heavily carpeted throughout and the sound is clear but lacking in resonance and depth. English Decca moves the orchestra to Royce Hall at UCLA for their recording sessions, and the sound has more of the desired spaciousness and warmth.

The New York Philharmonic has recorded in many locales around New York during the last fifty years. As early as 1928 Mengelberg recorded Strauss's "Ein Heldenleben" in Carnegie Hall, and the great Toscanini/New York Philharmonic recordings were all made in Carnegie Hall, which was the home of the orchestra. When Columbia signed the orchestra they moved the recordings to Liederkrantz Hall, then to the Columbia 30th Street studio, then to Brooklyn's St. George Hotel ballroom, and then back to Carnegie.

When Lincoln Center was built, the orchestra moved to its new home, Philharmonic Hall (renamed Avery Fisher Hall a few years ago). I will not go into the very sad story of the hall's plagued acoustics, but after a few attempts the orchestra's recordings were moved to the ballroom of the Manhattan Center. Man-

hattan Center had become the prime New York orchestral recording location in the 1950's. The RCA recordings of Stokowski and his orchestra were all made at Manhattan Center, as were most of Artur Schnabel's concerto recordings with Krips and Wallenstein. Morton Gould recorded there, and I produced several Rubinstein solo and concerto recordings there in the early 1960's. This large and very resonant ballroom has been the recording hall of the Philharmonic for many seasons. It has produced some excellent recordings, particularly those produced by Andrew Kazdin in recent years.

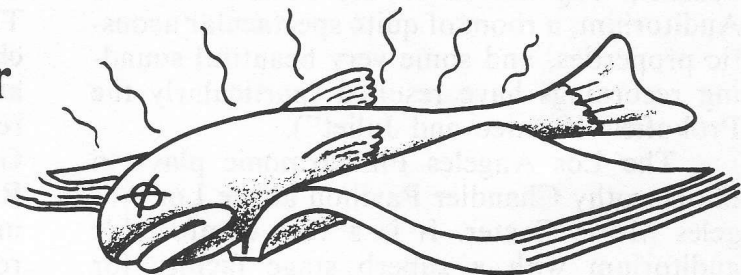
I am not aware if Columbia is planning to record in the completely rebuilt Avery Fisher Hall which replaced the previous interior this season, but I am sure they are investigating the possibility.

\* \* \*

As you can see, American orchestras have not had an easy time finding suitable recording locations and it serves to prove the point I am making. Many of their home halls are adequate but hardly sensational in acoustical terms, but with the notable exception of Avery Fisher Hall, the patrons have not been clamoring for new halls. The old halls are comfortable, they exist, and everyone is used to them. If the concerts are exciting and well played, the audience can fill in with their eyes the absence of acoustical glories they have come to expect (or at least hope for) from recordings played in their living rooms.

In the recording industry no one makes such accommodations for the acoustics in our productions. For our audience, it's the ears minus the eyes at all times. For them, the best is none too good.

## The Admonitor



*In our first issue, we admonished some heavy advertisers like Pioneer, prompting a few of our readers to remark that we were preaching to the converted, since they had long ago learned to discount the credibility of these big-budget ad campaigns. Well, this time we'll look into the smaller ads of a couple of strictly audiophile-oriented specialist companies. Surely they're the good guys in the white hats. . . ?*

### **Bryston 3B and 4B**

This small Canadian manufacturer of amplifiers made what we consider an inauspicious advertising debut in the March issue of *Audio*. Although the ad is only about a quarter of a page, the claim is far too big to swallow.

"We build the two best power amplifiers in the world," says the copy; "the 3B with 100 watts per channel, and the 4B with 200 watts per channel. Each will distort a musical signal less than any other amplifier we know of."

Now the only reason this can have even a semblance of credibility is that the name of Bryston is unknown to most audio enthusiasts, some of whom may therefore take a who-knows-maybe-it's-true attitude. If Sansui, for example, made a similar claim, it would be mercilessly hooted down by the same crowd or, more likely, ignored. So, for openers, Bryston is capitalizing on the virginity of its product line to get away with two of the most dangerous advertising phrases: "best in the world" and "less than any other."

Just *how* dangerous is revealed by our own tests on a borrowed Bryston 4B, which appear to indicate rather high audible and measurable distortion of several types. Luckily, we had a chance to talk to Bryston's chief engineer and were left with a reasonable degree of doubt as to the condition of the unit we had tested. It may have been subtly defective. For that reason we excised (with considerable editorial difficulty) the Bryston 4B review from our power amp survey in this issue and will report in Part II of the survey on a brand-new sample promised to us. The point is, though, that the ad

allowed no margin for error.

We also wonder what other low-distortion amplifiers the Bryston people "know of." It might be to the advantage of their formal veracity to have no knowledge of the Threshold, the Electro Research, the Electro from Norway, the latest Futterman and several others we plan to test at about the same time as the Bryston 4B. May the one that "distorts a musical signal less than any other" be exalted.

### **Grace G-707**

Right below the Bryston ad is an ad of similar size for "the largest-selling tone arm in America," the G-707 by Grace (imported by Sumiko). The ad attracted our attention because it perpetuates an irritating simplism about tone arm design, one that has just about carved a permanent niche for itself in audio freaklore.

"Its ultra-low mass enables cartridges to *sound* better," proclaims the ad. "Even our own!" Does that mean *all* cartridges? If it does (and that's certainly the implication), then it's dead wrong.

Substituting a tone arm of lower mass for the one previously used with a specific cartridge will raise the resonant frequency of the arm-cartridge combination. If that resonant frequency was originally too low, then the change will make the combination sound better. If the resonant frequency was just about right in the first place, then the change will make the combination sound worse. (Exact numbers belong in a future tone arm report, not here.) Although

other factors also enter into the picture (such as the damping, or Q, of the system), it should never, never be a rule of thumb that "the lower the mass of the tone arm the better." Life isn't that simple.

For example, we have used the G-707 with the Denon DL-103S cartridge and found the arm to be too low in mass. And remember, that's not the same as "bad." Grace makes very good tone arms. Only their advertising is bad.

### SME 3009

While we're on the subject of tone arms, let's have a good laugh. In the same issue of *Audio* as the Bryston and Grace ads, a one-column SME ad pays off the headline "Amati, Batista, Bechstein . . ." with the following copy:

". . . SME: a worthy companion for the world's best instrument makers. The best reproduction of music, either by electronic or acoustic means, requires a combination of sensitivity and strength: sensitivity to the delicate vibrations which make up the sound, but strength enough to ensure that only the *right* vibrations are heard.

"The SME arm achieves this delicate balance by precision engineering, setting a standard that others have tried to equal."

We're thinking of writing to SME asking for their exact specifications on (a) the *sensitivity* and (b) the *strength* of the 3009. We're especially interested in the strength, as we have a very stubborn piece of hardwood here to drive some nails into.

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## Classified Advertising

**Rates:** For 25 cents per word, you reach everybody who is crazy enough (about accurate sound reproduction) to subscribe to *The Audio Critic*. Abbreviations, prices, phone numbers, etc., count as one word. Zip codes are free (just to make sure you won't omit yours to save a quarter). Only subscribers may advertise, and no ad for a commercially sold product or service will be accepted.

**Closing Date:** Ad copy must be in our hands by the 15th of the month preceding the publication month. That means by April 15th for the May/June issue, by June 15th for the July/August issue, and so forth. (Note that the publication months are the odd-numbered months.) Should the current issue be slightly behind schedule, a reasonable extension of the closing date will be granted on request.

### For Sale

JBL L-300's, pair, \$1500 or best offer. McIntosh C-28 preamp, \$525 or best offer. Luxman M-4000 power amp, \$1250 or best offer. Will sell separately at above prices or as a system for \$3000. All in mint condition. Contact Henry Hunter (no collect calls please), after 5 PM weekdays. (318) 996-7230.

OHM F (IMPROVED) speakers, \$550 for a like-new pair used little more than a year (new units now sold at \$1000). Seller will not take responsibility for shipment. For details, call (312) 248-3111 after 7 PM, or write Mike Riley, 2440 Lake View, Chicago, IL 60614.

AUDIO RESEARCH SP-3A-4 preamp, perfect, \$550. 4-track 4-channel tape recorder, Sony TC-654-4, \$530. SME Series II improved arm, \$70. Denon 103S cartridge, \$90. Janszen I-30 electrostatic speaker, utility black, \$80. Sony 777S-2 stereo 2-track record 4-track play recorder, remote control, \$400. J.A. Mitchell, (615) 245-5370 after 6 PM.

AMPZILLA, \$500. Janszen Z-412 HP, pair, \$350. Audio Research EC-4, \$200. SME 3009 S/2 detachable and non-detachable versions, \$75 each. Teac 3340S/dust cover/remote control, \$800. Audio Research ST-70-C3 (rebuilt Dyna ST-70), best offer over \$250. Sony TTS-3000, \$150. All equipment in excellent or better condition. (912) 746-1414 days or (912) 746-0037 evenings (Georgia).

MARANTZ 10-B with cabinet, excellent condition, \$600. Thorens TD-125 with SME-3009 Improved with detachable shell, ADC XLM, \$325. Koss ESP-9 headphones with 10-foot extension, excellent condition, \$90. (312) 336-2896.

STACKED QUADS, subwoofers, crossover, SAE 31B, Phase Linear 400, Thorens 160C, Crown IC-150. DC-300A. Want to buy used Son of Ampzilla, Audio Research D-100. M. Pence, 223 Fairfield Drive, Dyersburg, TN 38024. (901) 286-1998.

HEATHKIT LAD-1013 Audio Scope, 2 and 4-channel function, oscillator, triggered sweep, multipath. Less than 8 hours use. \$130. Call (419) 991-1163 or write T. Painter, 201 Seriff Drive, Lima, OH 45807.

CROWN SX-724 tape recorder with counter in standing console. Cost \$1500, sacrifice \$625. Infinity Servo-Static I electrostatic speaker system, rosewood, transferable warranty, custom stand and wiring. Cost \$2500, sell \$1400. Both units mint! Contact John Clancy, Apt. 2011, Lafayette Pavillion, One Lafayette Plaisance, Detroit, MI 48207. (313) 393-0564.

AUDIO RESEARCH D-150, best offer over \$2000. ESS-504 amp with fan, \$520. Jensen Stereo, Dyna preamp FGT-5 MK-II, \$325. Radford ZD-22 preamp, \$375. J.P. Sammut, 432 Chestnut Avenue, San Bruno, CA 94066.

LEVINSON JC-1 AC adjustable head amp, \$150. Audiocraft variable damped unipivot tonearm, \$100. Audio Research SP-3A-1 (3.2), \$475, and D-76A, \$700. Dayton-Wright XG-8 MK-III series 2, \$1900. Dunlap-Clark 1000, \$1200. Quintessence power amp II, \$800. B&W DM-6, \$900. Dave, (313) 285-8186 after 5 PM.

CITATION 11A Equalizer/Preamplifier, Marantz 240 amplifier, Technics SL-1500 turntable, B.I.C. 960 turntable, Grado F3E+ cartridge, Kenwood KT-6007 tuner, Dynaco Quadaptor, Phase Linear 400 amplifier, pair Fairfax FX-300's, pair Dynaco A-35's. Original cartons and warranty. No reasonable offer refused. R. Harding, 13312 Sunset Canyon N.E., Albuquerque, NM 87111. (505) 296-1063.

B&O 3000 turntable, arm and cartridge. 18 months old. Stylus 2 months old. Immaculate. \$150 or best offer. Gerald F. Conlon, 446 Wilson Avenue, Beaver, PA 15009.

SOMETHING SPECIAL. Luxman turntable fitted with Stax tonearm and Win Labs cartridge. Used 1 month and with warranty cards. Also reconditioned Revox A-77 and slightly used Pioneer tuner. Call (305) 689-0400 or (305) 832-9142, or write Kenneth Wagner, c/o Roxy's Bar, 841 South Dixie, West Palm Beach, FL 33401.

SME non-detachable arm, latest type, like new, \$85. Levinson JC-1, \$100. Thorens MK-II turntable with dust cover and SME mounting plate, \$250. Brillig, 57 West 56th Street, New York, NY 10019. (212) 541-6161.

MARK LEVINSON JC-2, D system; Audio Research D-100; EMT; Grace 940; Linn Sondek; Stax SRX-III and SRD-7. Perfect condition, 2 months old, 5 years parts and labor. Best reasonable offer. (312) 947-0356, nights.

ADVENT 101 Dolby noise reduction unit, hardly used, \$90 postpaid. Ron Kindel, Box 9, DeWitt, MI 48820.

SENNHEISER HD 424 headphones, pair, used approximately 2 hours, \$50. Edward Ellis, 28 Parrish Street, FLW, MO 65473. (314) 368-5802.

RF SIGNAL GENERATOR (B&K), \$150. Also, Magneplanar Tympani 3-A, ARC SP-3A-1, D51, D75 and EC3. David Gordon, 943 19th Street, Des Moines, IA 50314. (515) 288-8573.

DBX 119, \$130. Sony SQD 2020, \$150. B&O MMC 6000, \$50. Koss 2+2 headphones with case, \$45. Realistic DVM, \$75. Heath IO-17 3-inch scope, \$60. Texas Instruments calculators, SR-50, \$25. SR 51A, \$45. Everything in good to excellent condition complete with manuals. All prices include shipping. J.J. Thompson, 281 Warren Avenue, Kenmore, NY 14217.

TORONTO AREA AUDIOPHILES! Used Ampzilla, Dayton Wright SPS-III preamp, Phase Linear 4000 preamp, Thorens TD-160, all A-1 at fair prices. If serious call Steve, (416) 699-1547. Also, CM Labs 912 amp wanted.

AMPZILLA with meters, factory wired, 3½ years of transferable warranty left, mint condition, \$575. Technics SL-110A with SME (latest version, non-detachable), mint, \$260 (will sell SL-110A for \$200 and SME for \$75 separately). Tim Britt, Route 7, Box 96, Chapel Hill, NC 27514. (919) 933-7460.

AUDIO RESEARCH SP-3A-1 preamp, \$450; D-76A amp, \$675. Both mint, all modifications. Together, \$1100. Also Fidelity Research FR-1 MK-II cartridge, unused, \$65; Denon AU-320 transformer, \$75 (together, \$130). Modified Dyna Stereo 70, \$150; Dyna FM3 tuner, \$50. Call or write: Larry Cassidy, 1033 Golf Lane, Wheaton, IL 60187. (312) 668-7966.

IMF SUPER COMPACT, \$285. KMAL arm (new), \$80. ADC XLM new stylus, \$45. Sony tuner, \$45. Dyna Stereo 70, \$100. H-K Citation II preamp, \$195. IMF TLS-80, \$1050. Denon AU-320, \$90. Terry Duffy, 5232 Sagamore Drive, Swartz Creek, MI 48473.

ESS AMT 1 Tower speaker system, with transmission line bass and Heil driver. Excellent condition, \$390. SAE 30 and 31 pre- and power amps, \$240 the pair. Pioneer PL-12D turntable and Grado FTR+1 cartridge, \$65. Harry Britt, 341 Palmer Hill Road, Riverside, CT 06878. (203) 327-6513.

PHILLIPS speakers RH532, pair, \$400. Fisher 202-R AM-FM tuner and MPX 100 multiplex adaptor, variable bandwidth AM, six i.f. stage FM, the tuners completely independent, \$100. (415) 444-4856.

DENON AU-320 moving coil cartridge transformer, \$75. Supex SDT-180 cartridge transformer, \$65. Dave Magnan, 2585 North Spinnaker, Port Hueneme, CA 93041. (805) 985-6593.

RTR ESR-15 electrostatic tweeter panels, \$200 each side. Hartley subwoofer with enclosure, \$400. SME non-detachable, \$85. Supex 900E moving coil cartridge with transformer, \$150. Crown VFX crossover, \$200. Pioneer SX-850 electronic crossover, \$140. Trevor Lees preamplifier kit. And much more. Call (415) 386-7227 or write Kevin Lee, 109 16th Avenue, San Francisco, CA 94118.

TYMPANI IIIA speaker system, treble/midrange/bass panels, plus bi-amp crossover, \$1500. Thaedra preamp with latest sonic modification, \$725. Ampzilla power amp, 200 watts per channel, \$625. Contact Oscar Henderson, (313) 862-7516.

DUAL 1219 changer, with base and dust cover, switching to tapes/cassettes, needs minor repairs, reasonable. Call evenings after 6:30 PM (212) 767-9499.

MAGNEPLANAR Tympani I-C's, two Ampzillas, Audio Research SP-3A-1 and Phase Linear 4000 preamps, ERA turntable, Transcriptors Vestigal and SME 3009S2/Improved non-detachable tonearms, Sonus Blue Label cartridge with new stylus, never used. Write Alan Grier, 711 16th Avenue South, Birmingham, AL 35205 or call (205) 324-0170 or (205) 836-6059 anytime.

AUDIO RESEARCH SP-3A preamp, \$450. Crown DC-300A amp, \$450. Both in perfect condition. Write Dr. Drummond, 4508 St. Andrews Road, Columbia, SC 29210 or call (803) 781-0401 evenings.

QUINTESSENCE preamp, latest mods, \$325. Phase Linear 1000, case, warranty cards, \$275. Technics SP-10, black base, dust cover, Grace 707 and new Sonus Blue, warranty cards, \$600. All mint. John Fermin, 77 Fairmount, #120, Oakland, CA 94611. (415) 832-3299.

L.W.E. MOTION FEEDBACK speakers, pair, specially modified by C/M Labs to be virtually flat from 24 cps to 20,000 cps. Special feedback hookup is included. First \$450 takes all including guarantee. Steve, (212) 796-6647.

SHURE/SME 3009 tonearm (improved, detachable) complete with two extra plug-in shells, original box and all accessories. New condition at 1/2 price. \$85 complete. Randy Tomlinson, 180 Midway Road, Decatur, GA 30030. (404) 288-6875.

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LEVINSON JC-2 (System A and D, serial 1374). Luxman P-121 turntable (sealed carton). SAE III CM power amp (fan and cabinet). Yamaha CA-1000 integrated and CT-800 tuner. SME 3009/S2 improved (detachable). (518) 783-6890 evenings, Albany, NY area.

PATEK PHILIPPE wrist watch, 18 carat gold, case and strap. New, has lain in safe deposit box since received. Lists for \$2950. Will trade for new Nakamichi 1000. F. Floriani, 529 Eighth Avenue, Bethlehem, PA 18018.

NAKAMICHI 1000, flawless. Sony's \$900 Wunckerkind, the PS-8750, 3 months old. \$1400 the pair! (914) 968-7678.

DUNLAP CLARKE 1000 power amplifier, perfect condition, completely checked out by factory and tweaked 25% beyond specs, \$1000. Call (203) 966-5333.

FUTTERMAN model H3 output-transformerless stereo power amplifier, 60 W per channel. Little used, perfect condition, original tubes (but factory-replaced power transformer). \$300 or best offer (within two weeks of publication). Philip Bridges, 17910 Pond Road, Ashton, MD 20702.

QUADRAPHONIC EQUIPMENT. Sansui QRX-6500 4-channel receiver, \$250. Panasonic SE-405 CD-4 demodulator, \$250. Pickering 4500-Q quad cartridge (like new), \$250. Four Bose 501 speakers, \$80 each. OR all above, \$495. Teac 3340S (less than 50 hours use), \$650. DBX 124 (less than 10 hours use), \$300. Call David after 6 PM, (305) 856-9087.

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RABCO straight-line tonearm, old model, plus information about how to obtain European music magazines, preferably classical music. Send information to J.D. Williams, 303 East Rix, Tyler, TX 75701.

ANY NEW or old spec sheets, test reports, reviews and owner's manuals on audio equipment. Am trying to create extensive reference file for personal use. Quad is of particular interest to me. Please send nothing for which you expect payment. Timothy Steck, 218 Foch, Ellwood City, PA 16117.

KING CRIMSON, Genesis, Gentle Giant concert tapes and bootlegs. Send information to J. Fella, 75 Crest Road, New Providence, NJ 07974.

PIONEER SD-1100 stereo display scope. Also, what have you in 4-channel amps (non-integrated)? Need two in 25 to 50 watt range for part of a tri-amp system. Write or call if local to Philadelphia. Bill Tyrell, 7335 Chestnut Avenue, Melrose Park, PA 19126. (215) 635-3084.

MCINTOSH, C-8 and MC-60. Robert Klein, 217 King Street, Alexandria, VA 22314. (703) 836-9242.

MARANTZ MODEL 7 8B and 2 No. 9 amps. McIntosh models MC225, MC240, MC275. Harman-Kardon or Scott tube units. Will purchase outright or trade new equipment for same. Bob Miller, PO Box 416, Babson Park, FL 33827. (813) 638-1673.

STEREOPHILE Summer (2) 1971 issue. Must be intact, excellent condition, reasonable price. Drop card stating price and condition to John Sullivan, 12 Grove Street, South River, NJ 08882.

ANY Stereo/Quad, Phillips Cassette or L-Cassette, Stereo/Quad/Multitrack Open Reel machines, chassis, transports, electronics. Teac TCA-42, 3340 series. Sony TC-160. Any tonearms, phono/regular (Audio), pre-preamps, Astrocom Marlux equipment, 4-channel demodulators/decoders/encoders/equipment/circuits. Noise suppressor units/boards (Dolby A, Dolby B, dbx, Phillips, etc.). Equalizers and other studio equipment, raw speakers, speaker systems/components. In any condition. Write or phone Rick Smith, PO Box 244, Arlington Heights, IL 60006. (312) 394-3513.

MAGNEPLANAR Tympani 1-C. (415) 383-6418.

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# The Audio Critic

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## In the next issue:

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We devote most of our space to the comparative survey you've been waiting for: large, expensive speaker systems with state-of-the-art pretensions. Swelled heads roll; clever, cool heads are patted; audiophile sensibilities are outraged and delighted.

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We continue our in-depth power amplifier survey, possibly even concluding it. Special attention is paid to sonically correlatable laboratory tests.

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We go more deeply into phono cartridges, tone arms and turntables. (Three subjects that should hardly ever be discussed separately.)

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And lots more, as always.

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