

The Audio Critic®

Retail price: \$7

In this issue:

We bring you Part I of the transcript of our "Seminar 1989," a morning-to-midnight bull session featuring the uncensored opinions of Bob Carver, Dave Clark, John Eargle, Stanley Lipshitz, Peter McGrath, and your Ed.

In an article comparable in importance to our classic tonearm geometry series of 1977-78, a new contributor to our publication establishes a mathematical basis for a method of speaker placement enabling you to obtain the best possible bass response in your listening room.

We identify and expose certain endemic asininities on the subject of CD's in our second "Hip Boots" column.

Plus our other regular columns and features, including reviews of some remarkable new organ recordings.



Issue No. 13

Winter/Spring/Midyear 1989

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

The Audio Critic® is an advisory service and technical review for consumers of sophisticated audio equipment. Barring unforeseen delays, it is published at approximately quarterly intervals by The Audio Critic, Inc. Any conclusion, rating, recommendation, criticism, or caveat published by **The Audio Critic** represents the personal findings and judgments of the Editor and the Staff, based only on the equipment available to their scrutiny and on their knowledge of the subject, and is therefore not offered to the reader as an infallible truth nor as an irreversible opinion applying to all extant and forthcoming samples of a particular product. Address all editorial correspondence to The Editor, The Audio Critic, P.O. Box 978, Quakertown, PA 18951. (New address since December 1988.)

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For subscription information and rates, see inside back cover.

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In the last issue, in this very space, we confidently projected “a regular quarterly schedule in 1989,” and now here we are, late again. And again the reasons for it are “singular and nonrecurrent” (honestly!), but at this point we are a bit reluctant to subject you to the boring details. Let us merely call your attention to the more general and quite self-evident truth that it requires the same amount of purely editorial effort to produce a magazine for a few thousand readers as it does for a million. A page of camera-ready editorial copy represents the same amount of work no matter how few or how many people end up reading it. The question is: how many people are doing the work? In our case the answer is one—your Editor—plus an occasional contributor such as Bill Rasnake in this issue. (We are referring to his landmark article on speaker placement.) On the other hand, there are magazines that have more staff members than they have editorial pages per issue.

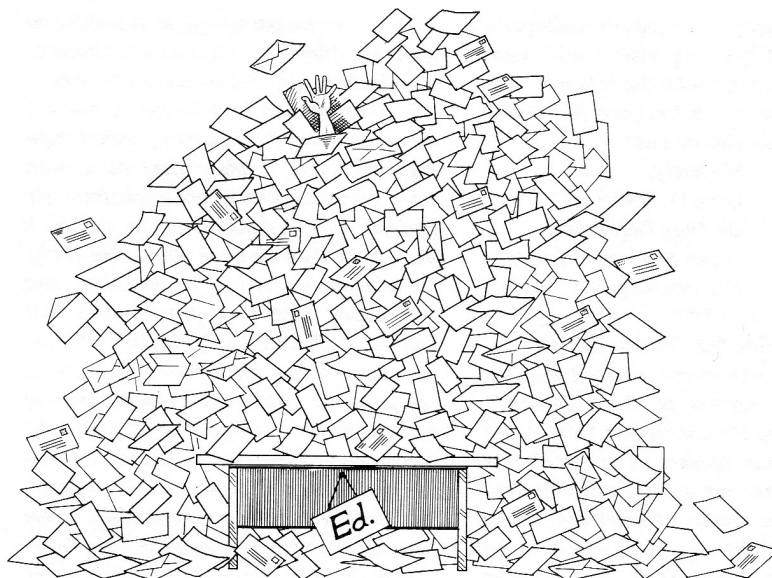
If we could double our editorial staff to a total of two, we could halve the time between issues. Simple arithmetic. With an editorial staff of six or seven, we could be a monthly magazine and publish on time. (Note that we are not even talking about the many hours of laboratory work; we are writing that off under unreimbursed entertainment.) All that would depend, of course, on a considerably larger gross income from a larger circulation and a larger number of advertising pages. The time will come, we are certain, but meanwhile we want you to understand very clearly where we are coming from.

Regardless of our not very impressive publishing schedule and regardless of what you may have heard from 19-year old audio salesmen who started their job three months ago, we are very much alive and definitely here to stay. We are gradually regaining our former circulation base and have established a new and viable advertising base. Our credibility in the eyes of the best and smartest people in the industry is at an all-time high, as witnessed by the cast of the seminar in this and the next issue.

So, when you look at the publication you are holding in your hand, please realize and remember that it is more of a blueprint for technical competence, literate journalism, and editorial integrity in an audio review, more of a promise of things to come, than it is an example of a thriving publisher’s scheduled output. That will be the next phase, and of course it cannot happen without the support of the thinking audiophile and the advertisers who want to talk to him. We have every reason to believe that, to a limited but highly critical and still sufficiently large clientele, we are emerging as probably the only game in town worth playing, and that our special niche in audio publishing is carved out and beginning to be filled.

Box 978

Letters to the Editor



This is the second time we are using our new box number and Pennsylvania address; in our last issue we were still so unaccustomed to Box 978 that in the article on digital equipment we parenthetically referred the reader to the "Box 392" column. Sorry about that. Of course, we could have asked for our old box number at our new post office; it might have been available but would probably have created misunderstandings about our new location. Just remember the change if and when you write. Letters in this column may or may not be excerpted, at the discretion of the Editor. Ellipsis (...) indicates omission. Address your letter to The Editor, The Audio Critic, P.O. Box 978, Quakertown, PA 18951.

The Audio Critic:

What a pleasure it was to receive the two latest issues of *The Audio Critic*, my long-lost favorite audio publication. I certainly appreciate that these issues were credited to my original subscription, and I enclose payment for a new subscription to show my enthusiasm and support.

I once heard that one of the difficulties in preparing the original publication was the pressure of finding for each issue some new, significantly better component that could "blow away" the competition—sort of an audio scoop. After 40 years as a serious audio hobbyist I have concluded that these breakthroughs do not occur with that frequency, in spite of much of the high-end audio press's desire to convince us otherwise. Many dependable audio products have proved their long-term excellence. In the category of speakers alone I could mention the original Quads, the Pyramid ribbon tweeter (one of your scoops) and the Janis subwoofer system.

I suspect there are enough interesting and worthwhile audio topics ripe for illumination by your unique approach, without too much emphasis on convincing the hapless audiophile that he should be discouraged with equipment that, as Stan Freeberg put it, "has been obsolete for at least a

week."

My personal view of the scene is that the future is in the integration of audio and video. I believe there is so much to be done to improve video and TV sound that a lot of tweaking and breakthroughs are needed and seem to be slowly forthcoming. The two technologies seem to be growing together in the new generation of multiple-purpose digital players, stereo TV's and recorded movies with decodable 4-channel sound. Golden eyes are not required to judge the current crop of commercially available video products.

Sincerely,
Lohr H. Gonzalez
San Juan, Puerto Rico

What a pleasure it is, if we may echo your own words, to agree with everything a subscriber writes. The component-of-the-month approach to audio journalism tends to serve small-time marketing interests, not the cause of good sound. A new issue of an audio journal should bring the reader new knowledge, not a new yuppie shopping list. As for the marriage of high-end audio and video, our views were expressed in the Harman/Kardon VPM 600 review in Issue No. 12 and are fully in accord with yours.

—Ed.

The Audio Critic:

...Good luck. We really need fresh air and new, uncommon views. Go ahead, but take care: the Japanese with their big and strong artillery, the Europeans with their unique combination of art and technology, are both fully active.

The Yankees are under big pressure, but they have the potential and the experience—who will be Napoleon?

Very kind regards,
Lily Rendon
Lima, Peru

Napoleon? Forget that wimp! To an audio journal with a Hungarian editor, the role model is Attila the Hun, who was known as "the Scourge of God."

—Ed.

The Audio Critic:

I thought you might like to see a copy of the letter I wrote to *The Absolute Sound*. It goes along with your idea of trying to correct misinformation that appears in the audiophile press. I thought the comments concerning *The Audio Critic* and the Carver speaker were quite unfair. One thing I cannot understand about the various audiophile publications is why they are so hostile to Carver equipment. Is it because the

equipment really isn't up to audiophile standards but the very visible ads claim that it is? Or could it be the opposite, that the equipment sounds too good for what it costs? Any thoughts on this?

Sincerely,
Gene D. Robinson
Geology Department
James Madison University
Harrisonburg, VA
* * *

To the Editor [of *The Absolute Sound*]:

I would like to comment on the portion of your answer to Gene Steinberg (Letters, Issue 56) concerning Peter Aczel and the Carver speaker. You stated that Aczel "became very unclear when discussing the power needs of Carver's Amazing Loudspeaker." He says in his report on the speaker (*The Audio Critic* No. 11) that "Sensitivity is quite low: 82 dB SPL at 1 meter with 2.83 volts input..." and a bit later, "You need 200 watts but you could use 1000." What's unclear about these statements?

You also say that the Carver speaker has an "amazing" (what a nice play on words) rise in its low-frequency response and that this was "documented by none other than Julian Hirsch." Once I regained consciousness after the shock of seeing you refer to anything Julian Hirsch would write, I looked up his report on the speaker. In his close-miked measurement of the woofer response, he did document a rise in frequency response of "6 dB per octave from above 100 Hz down to its maximum at about 26 Hz..." But in the very next sentence, which you perhaps missed, he says that this rise "exactly compensates for the normal low-frequency loss of a planar speaker, making the system's actual bass response flat down to the maximum point, 26 Hz..." From reading the technical description of the speaker, it appears to me that this is exactly what the system was designed to do. Why do you ignore this part of Julian Hirsch's report? I would not accuse you of selectively referring only to material that supports your position, but one wonders.

Sincerely,
Gene D. Robinson
Geology Department
James Madison University
Harrisonburg, VA

Thank you, Gene; you have kindly spared us the trouble of writing an item in our "Hip Boots" column about this. No one ever accused Harry Pearson of fair-

ness. The entire paragraph from which you quote the "unclear" bit is an irresponsible exercise in snide, undocumented innuendo.

For reasons best known to himself, we make Harry feel insecure, even though his publication is older than ours, with more subscribers and more advertisers. He appears to be thinking about us much more often than we think about him. (Does he imagine we strive for technical and journalistic excellence just to make him and his staff look bad?) At any rate, you give him far too much credit by allowing the possibility that he overlooked part of Julian Hirsch's review. First of all, you can safely assume that he did not look up the review before making his comments; that kind of accountability is alien to his nature. Secondly, we doubt he would recognize the principle of the Carver speaker design if it bumped into him at high noon on the Long Island Expressway. We are willing to concede his love and understanding of music; we do not deny his past role in the furtherance of high-end audio; we even consider him a better than average writer; but he is untutored in science and engineering and knows nothing about cause and effect in electroacoustics. His credibility is close to zero in the academic and professional circles of audio. Memories of his Infinity-IRS-in-a-telephone-booth reference setup still elicit giggles in the trade; only the tweako interests continue to fear him and court him. Let them.

As for the anti-Carver bias of the "alternative" audio press, we offered our thoughts on the subject in Issue No. 10 (see page 32, right-hand column) and have little else to say at this point. The best example of a Carver product that sounds a lot better than the price would lead you to believe is the "Amazing Loudspeaker."

—Ed.

The Audio Critic:

As you know, McIntosh stereo components are highly popular, and old McIntosh components are greatly in demand. And yet, I have never, ever, seen McIntosh equipment reviewed, either favorably or unfavorably, nor have I ever seen McIntosh on a list of recommended components. Can you enlighten me, and us, on what in the world goes on here?

Sincerely yours,
Lester F. Keene
Fredericksburg, TX

There is absolutely nothing sinister going on. You have obviously missed sev-

eral fairly recent McIntosh reviews. After a very superficial three-minute search of our magazine shelves, we found a review (quite favorable) of the MC 2002 stereo power amplifier by Larry Greenhill and Dave Clark in the April 1985 issue of Audio—and we know there are others. It is true that McIntosh keeps its distance from the "undergrounds" and does not solicit reviews by them, probably figuring that the fickleness of the subjective reviewers is likely to do more harm than good in the long run to an already prestigious product.

—Ed.

The Audio Critic:

...Regarding digital audio:

A brief remark in Issue No. 11, "Those whose hearing is so exquisite as to require better figures are out of luck," doesn't seem to do justice to a topic (audio bandwidth requirements) that has occupied your letters column and editorial comments as much as it has.

I recall favorable comments directed toward Mitch Cotter's NF-1 filter whose upper corner was substantially above the 20-odd kHz that CD and DAT provide. Ditto the built-in filter(s) provided on the NAD 3020 and a number of others. Julius Futterman sent a letter endorsing those in the limited bandwidth camp, and numerous other statements in the older issues indicate that bandwidth-limited systems are the way to go, a conclusion I don't disagree with.

What does concern me is that I've seen nothing indicating that anyone really knows what the upper limit ought to be. Am I unjustly suspicious, or are there reasons beyond foiling D/D copies of CD's that caused the DAT folks to go to 48 kHz? Why did Mitch Cotter and other designers choose frequencies near 35 kHz for their upper corner? Should I and others conclude from your CD experiences that there really is nothing worth pursuing above 22 kHz and that the controversy has finally been laid to rest?

I'm confident that with improvements in the IC fabrication processes, LSB, MSM and all SB errors will become a quickly forgotten part of audio history, but I can't help but feel a bit shortchanged with a brick-wall upper frequency limit not so far from what I could hear a few years ago. A bit more insight on this would be appreciated by at least one reader.

...[Regarding] the "alternative" press:

Over the last few weeks I have had the experience of reading several recent

issues of the slick *Stereophile* and feel compelled to let you know how much it increased my already substantial appreciation of your publication. When I originally subscribed (shortly after the first issue), I had no way of knowing just how different you were.

Your periodic, semiside comments on the state of alternative audio reviewing don't even come close to describing just how terrible a job the others (well, at least *Stereophile*) are doing.

The crowning touch of my *Stereophile* experience was a single line from JA on page 27 of the October [1988] issue regarding DO's cable test. It said that those who feel that single- or double-blind testing of the cables would have been the only valid way to do the test should not be reading *Stereophile*. I've taken them at their word.

My personal belief is that your old report on the state of wires and cables is the model of a scientific approach to semi-popular reviewing and informing. I understand that not all technical aspects of the audio business are quite so easily nailed down, but you are doing the best possible job, again in the opinion of one reader whose background is in related fields. Thanks.

Barry Janiss
Ben Lomond, CA

Any discussion of the audible effects of bandwidth limiting inevitably separates into two discussions. One has to do with the limits of hearing, the other with the time-domain characteristics of analog low-pass filters. Keeping that upper corner of the filter well above the highest frequency to be accurately reproduced has always been considered good engineering practice, especially with high-order filters, and old-timers like Futterman and Cotter were certainly of that school. The digital filters used in the latest D/A converter circuits do not raise that issue, although they have their own problems, and the computer-optimized (we hope) analog filters on the recording end of the digital chain are getting better and more forgiving all the time. We have no evidence whatsoever, not even the slightest, that the CD/DAT standards are skimpy with regard to bandwidth. We are willing to concede the slim possibility, however, that the difference between the 22.05 kHz and 24 kHz cutoffs of CD and DAT, respectively, is audible on cymbals, snares, triangles, etc., to an occasional youngster of freakishly keen hearing.

Our perspective as regards the alternative audio press is that we represent normal competence and accountability, such as you always had the right to expect, and they are the new breed of intellectual and moral lightweight currently accepted in so many formerly demanding sectors of our culture. What they purvey is trendy consumer chitchat, not knowledge.

—Ed.

The Audio Critic:

I was delighted to discover... that your publication has returned. I've missed your lucid, thoughtful and well-written (always) commentary and frank perspective.

You steered me wrong a few times (DCM "Time Windows"?!), but not to worry, you're human, and those few stray paths are a minor deviation from what is regularly a very clear and penetrating voice in the abrasive static that has become audiophile journalism.

I still have and delight in my Quad ESL's and Futtermans to which you introduced me years ago. (They even survived a 3-year hiatus with Quad ESL-63's)...

Sincerely,
Gary E. Martoni
Weehawken, NJ

Corrections: It is strictly a matter of opinion that we are human; some would disagree. The DCM Time Windows of 1977-79 were far from a bum steer; they were probably the best medium-priced speakers in the world; what happened later is another matter.

DCM is a totally different operation today; we still have a lot of respect for one of the partners, Steve Eberbach, both as a person and as a speaker designer, but we have absolutely no confidence in any company that hires Bob Park as president. The man is a walking credibility gap in our opinion; our schlock warning light goes on the moment he enters the picture.

And yes, the original Quad ESL had more delicately etched highs than the 63 and is still preferred by some audiophiles for that reason.

—Ed.

The Audio Critic:

...In your continuing quest to debunk humbug in the business, I wonder if you could better explain the implications of your new and loftier editorial standard, of "accountability."

Perchance this implies that if products fail to satisfactorily live up to your praise,

you'll personally guarantee a refund?

Sorry, but I just couldn't resist it. Aside from some signs of strain versus your last issue, the latest continues to doggedly reflect the same idiosyncratic and iconoclastic style, and stylish flair for words and ideas, that always made TAC one of the most readably delightful pubs in the business.

Cordially,
Michael D. Riley
Santa Monica, CA

The kind of refund you talk about has to do with the accountability of the dealer who sold the equipment, not the reviewer who praised it. The reviewer must be accountable for his praise or any other opinion he publishes. That means (1) laboratory measurements to back up his listening tests, (2) listening tests to verify, or at least relate to, his measurements, and (3) reasonably plausible scientific/engineering explanations for (1) and (2).

As for our doggedness, what else would you expect of a breeder and exhibitor of Bullmastiffs, but how can you call us stylish? Of course, it is possible that in Southern California analytical thinking and a literate use of English are considered an optional choice of style, like expensive sunglasses or cowboy boots. (Sorry, but you gave us little motivation to resist that one.)

—Ed.

The Audio Critic:

...I still believe that we are dealing with a number of distortions and subtractions and additions which are quite audible and yet defy our current standards of measurement. Equipment simply does not behave as well as it measures—so something is still missing from the data bank. It is my opinion that we have an *idea* how good or poor a piece of equipment is by our current measurements; however, there is far more to be done before we can say that we can measure and quantify all audible performance variables.

Presuming, for the sake of further discussion, such a premise to be valid, the implications extending from it become obvious: when the "measurement" school of reviewers can only be certain of incomplete and flawed data, we must rely on what our ears tell us. And then the whole nebulous area of "subjective" analysis so well lampooned by you comes into play. Despite our desire to be accurate in some absolute sense, we find ourselves once more at the mercy of subjective reviewing

as a valid tool for judging equipment. And opinion takes on exaggerated importance, as if it were scientific data. So, where [am I] headed with all this? Please bear with me.

I think your Issue No. 12 presents the problem very clearly. On the one hand you discuss ABX testing; on the other, it is hard to deny the "anecdotal" evidence, however scientifically shoddy, presented by Christopher W. Russell! I had intended to take this point up with you previously, anyhow; however, Issue No. 12 just handed me the ideal opportunity to discuss it in terms of views already expressed by others, a much easier task, to be sure!

First of all, I believe Mr. Russell, and I feel that his observations are absolutely valid, even without the anecdotal evidence! What he recounts is close to what my own senses have told me for years, and the results of ABX testing, apologetics notwithstanding, do not quite square with my experience. And therein lies the problem. Am I asserting that my hearing is "superior" to that of ABX subjects? Certainly not! Am I validating the "snake-oil" views held forth as "gospel" by others without concrete evidence beyond their own subjective reactions? Possibly so.

I believe that ABX testing often gets less than conclusive results because it fails to attack the comparison as directly as it first might appear to! If you have a continuously running piece of music, and you interrupt it with switches from one component to another as it plays, you are not comparing apples with apples, even though it would seem that you would be! Because, at each switch, you are listening to the section *which follows* what you just heard—and any difference might have to be quite pronounced to reliably show up on a test like that. However, if it could be arranged, even with the fallacy of relying on memory, to hear instead a repeat of *what you had heard* from the other component, you might get far more dramatically conclusive results. Those who hear "dramatic" differences between components *do hear them*, and not entirely for emotional or subjective reasons. There is a *real* difference—it is just that the ABX test often fails to pick it up because the listener is asked to compare ABCDEF with GHIJKL! No two moments in music are so close in sound as to make such comparisons valid for any but dramatic variances; hence, the equivocal ABX results differing from the opinionated results of "subjective" reviewing.

I would also qualify this observation

by saying that comparing A on Tuesday with B next week Friday, as some reviewers attempt to do, is a fraud. The components must be compared at the same time, and through the same system. But, if one repeats a section of music just heard on another piece of equipment seconds before, assuming the volume level is the same, I feel that a great deal can be revealed, and even to the casual listener...

Best wishes,
Harrison Pierce Reed III
Gloversville, NY

Out of the 37 single-spaced, narrow-margined pages you have written us so far (very hard for an editor to ignore!), the above excerpt is probably closest in subject to what currently occupies our mind.

Regrettably, your elaborate exegesis is of a point of view we have by now put behind us, although we were thinking much along the same lines some years ago. In fact, your ABCDEF vs. GHIJKL argument appears, somewhat differently worded, in our Vol. 1, No. 1 (early 1977), of which we believe you have one of the few surviving copies. The argument still has the same validity as ever—as recently as in Issue No. 11, we brought up the idea of programming a CD player to recycle the same 20 seconds of music for really critical ABX testing—but our experience is that the more we try to outmaneuver the ABX box, the more stubbornly it keeps presenting the same results.

Your problem is that you are a True Believer and would rather write 37 pages of audio philosophy or argue for 37 hours than actually perform the one simple experiment that might destroy your belief system. That experiment has only two essential requirements: (1) the two amplifiers or preamps or CD players, or whatever you are comparing, must be matched in output level within 0.1 dB (by meter, not by ear!), and (2) you must not have the slightest clue as to which is which, only that this is sound A and this is sound B. No ABX switching system is necessary; just listen. You will be frightened out of your wits because your cherished beliefs will be crumbling—even if you shakily manage in the end to tell the two apart. No audiophile is willing to believe just how much a Pioneer or a Radio Shack Realistic sounds like, say, a Krell or a Mark Levinson before actually trying this without cheating. It appears to us from your letters that you never did try it—not all the way.

—Ed.

The Audio Critic:

Glad you're still with us and hope you get bigger. I've enjoyed all three issues [Nos. 10, 11, and 12]. One hope: please keep witty but not catty. All are entitled to their opinion, even if it's proven wrong.

Joe C. Palladino
Lander, WY

Your admonition typifies the Middle American aversion to intellectual confrontation, an attitude we understand, even respect to some degree, but totally disagree with.

Erroneous opinions advanced modestly and in good faith should be corrected patiently and without rancor, that much we admit. But anyone who loudly, aggressively and/or pompously proclaims that $2 + 2 = 5$ should be instantly and publicly humiliated—in our modest opinion. Otherwise the loudmouthed ignoramuses will get bolder and bolder and eventually demand to correct those of us who know that $2 + 2 = 4$. That has already happened in some sectors of audio.

—Ed.

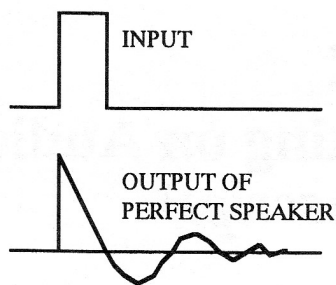
The Audio Critic:

With respect to your criticism of my technical competence on p. 38 of Issue No. 12 of *The Audio Critic*, note that I said "pulse," not "square wave," in the *Stereophile* review from which you quoted. The two are not equivalent.

A few minutes' reflection concerning the difference in the spectral nature of the two and a better understanding of the nature of the Fourier transform should lead you to agree with me: A loudspeaker must indeed have both flat frequency [response] and the ability to produce whatever is the acoustic equivalent of a DC voltage step (as well having a minimum-phase characteristic) in order to reproduce a single rectangular pulse without modifying its shape. It only need have a flat frequency response and a minimum-phase characteristic to reproduce a square wave (which is, of course, symmetrical about the time axis).

Despite the undoubted design talents of Bob Waterstripe (*Huh? Not Steve Eberbach? See below.—Ed.*), the convincing nature of DCM's literature, or even the florid nature of your prose, neither the DCM Time Window nor the Time Frame TF-1000 can do anything other than simulate a high-pass filter when confronted by a unidirectional pulse.

A clue:



(Totally wrong. See below.—Ed.)

“Rankest nonsense”? Hard to be right all the time, isn’t it? If you are going to continue in your self-appointed role to watch the watchers, it would be a good idea for you to put on your hip boots when you read your own writings in *The Audio Critic*.

Yours sincerely,
John Atkinson
Editor
Stereophile
Santa Fe, NM

P.S. For your information, I am told that Larry Archibald was regarded as a damn fine “automobile repairman.” Perhaps you should take a critical look at your social attitudes after you have brushed up on your engineering theory.

Oh, boy! You certainly know how to snatch defeat from the jaws of victory. You had the perfect opening because we had been so sloppy as to accept your insufficiently specific reference to an “input pulse” at face value, failing to ask whether it was a Dirac impulse, a step function, the usual function-generator-type positive or negative pulse (merely an offset square wave), or what have you. You could have pretended, for example, that you had really meant a step function (a step from 0 to a + or - plateau and no return to 0), and we would undoubtedly have lost the argument then and there.

But no! You draw a little sketch for everyone to see that your input is the common, garden-variety positive-going square pulse, and then you totally blow it by showing a high-pass-filtered step function as your output—and through an underdamped, ringing high-pass filter at that. Some “perfect speaker,” man! You obviously receive coaching from the sidelines in these matters but seem to be unable to keep your signals from getting mixed up.

Now, what we had in mind as the input was naturally also the square pulse you show, since that had been what Steve Eberbach used as his test signal at DCM (not Bob Waterstripe, for crying out

loud—he was the marketing man) and what we, too, use routinely in our speaker testing. That is the pulse you meant; that is the pulse we meant; and that is the pulse which passes through a “perfect speaker” exactly as shown below, in a simple computer simulation, confirming what we wrote in “Hip Boots” and leaving you with egg on your face. (You and Dick Olsher ought to join some kind of breakfast club.)

The perfect speaker we hypothesized for the simulation was modeled by a 2nd-order Butterworth high-pass filter (i.e., a slope of 12 dB per octave, $Q = 0.71$) with a passband frequency of 16 Hz. That is about as perfect as one can get, you will have to agree. The computer program is not the most refined and actually exaggerates the graphics of the input/output relationship, but that works to your advantage. Despite the peculiar labeling of the time axis, the grid represents 0.2 msec per division. The pulse duration chosen is typical for speaker testing. The important point is

that the output is a virtually perfect replica of the input, without the slightest ringing, leaving your explanations very close indeed to the “rankest nonsense.”

We are flattered by your implication that we are right all the time, except—at last!—in this case, and we are not stung by your opinion of our prose, since you are obviously of a very different literary persuasion as witnessed by the sharpness of your repartee. One would have to go to a school playground to hear the equal of your so’s-your-mother style of punch line about “Hip Boots.”

As for Larry Archibald, we brought up his previous business to indicate that he did not come to the magazine from the world of audio, not because we think an automobile repairman is socially déclassé. That was your dirty little thought, not ours. “By George, sir, the poor beggar was in trade. Pity, what?” Once an Englishman, always an Englishman...

—Ed.

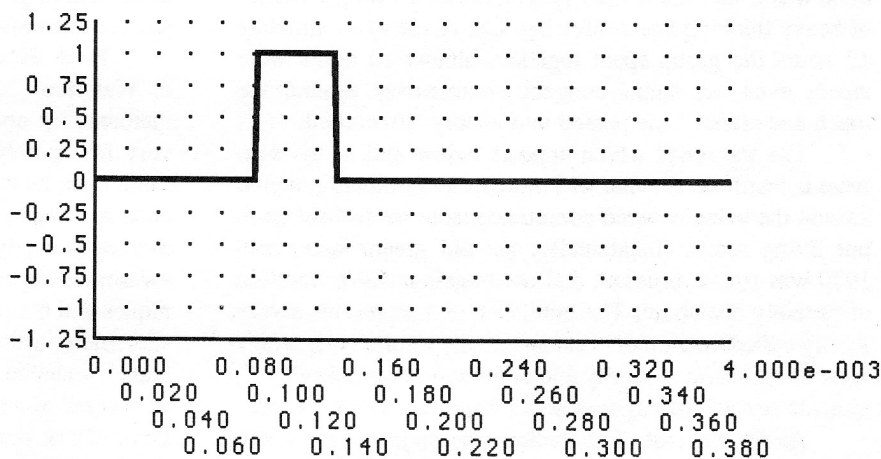


Figure 1: Input pulse to the speaker. Amplitude, unity; duration, 0.5 msec.

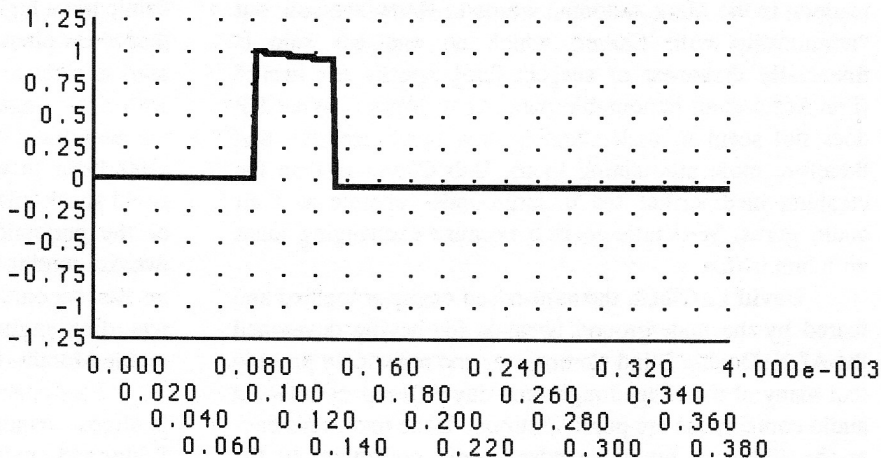


Figure 2: Computer-simulated output of the hypothesized “perfect speaker.”

Seminar 1989:

Exploring the Current Best Thinking on Audio (Part I of the Two-Part Transcript)

Many of our readers still talk about our 1979 seminar. This is a “son of,” as it were, but unlike most sequels actually better (sort of like De Niro as *The Godfather*). It is a good example of the fare *The Audio Critic* tries to offer as an alternative to the “alternative” audio press.

Your Editor had been in his new house in Bucks County, Pennsylvania, barely long enough to unpack when the distinguished participants in this seminar gathered there on a mild winter day. It was the best possible housewarming event from an audio journalist’s point of view, although there was little time for partying between the long stretches of heavy thinking and conferring. Out of the approximately 15 hours the group spent together, almost 10 hours were taped; even so, some pungent commentary around the lunch and dinner table passed into history unrecorded.

The transcript which appears below and in the next issue is restricted to what was more or less officially uttered around the baize-covered conference table we had set up in our living room. (Incidentally, the old green baize from 1979 was found, brushed, and used again—call it tradition or possibly nostalgia.) The published text represents a very lightly edited version of what is actually on the tape, with a view to maintaining clarity and continuity. Asterisks (* * *) indicate omitted passages of small importance or relevance.

As for our cast of characters, the major-league audio professionals who honored us by donating a weekend to our publication, they were, in alphabetical order:

Robert W. Carver, who needs no introduction to our readers; in the Mark Antonian words of Harry Pearson, our “relationship with Carver, which no one has said is financially dishonest or suspect [sic], speaks for itself.” (For Aczel is an honourable man, right, Harry?) What HP does not seem to understand is how much smarter, and therefore more stimulating to us, Bob Carver is than the crashing mediocrities the undergrounds venerate as their audio gurus. We cultivate Bob because exchanging ideas with him is fun.

David L. Clark, the hard-nosed engineer loathed and feared by the underground tweakos for having developed the ABX Double Blind Comparator and repeatedly proving that many of the alleged night-and-day differences between audio components are purely fictional. Dave makes his day-to-day living as an independent audio consultant to the Detroit auto industry.

John M. Eargle, world-class recording engineer, former president of the AES, speaker designer, textbook author, teacher, musician, etc., in other words the complete audio expert, to whom we devoted an entire “Records & Recording” column in Issue No. 11, where you can read about him at greater length. John flew in from Los Angeles just for this seminar—what a compliment!

Prof. Stanley P. Lipshitz, Ph.D., of the University of Waterloo (Ontario, Canada), where he teaches applied mathematics and is also in charge of one of the world’s very few purely academic audio research groups. At the same time, he is the current president of the AES. If there is such a thing as an intellectual superstar in audio today, Stanley is surely it. His knowledge of theory in all areas is awesome; his practical expertise extends to recording techniques and a multitude of other nitty-gritty disciplines; he is supremely articulate as well as iconoclastic; charlatans blanch when he appears on the scene; yet he is very tolerant of sincere middleweight practitioners like your Editor. As Dave Clark remarked, “the audio world doesn’t deserve Stanley.” Well, we are at least trying to...

Peter McGrath, the odd man out in the context of our seminar, since he is neither a technologist nor an academic but a high-end audio retailer, in which category he is that rarest phenomenon, a genuine class act. (Avery Fisher used to refer to the rank and file of his dealers as “people with dirty fingernails and stinking armpits.” Our view of the retail trade is a little less jaundiced, but even so we consider Peter to be most untypical.) We felt that if anyone could speak intelligently, credibly, and agreeably on behalf of the perfectionist audiophile, up to and including the tweako contingent, it would have to be Peter. On top of it he has become, over the past 9 or 10 years, a part-time recording engineer of outstanding repute (Audiofon, Harmonia Mundi). Call him the thinking man’s audio tweak.

Lastly, and not alphabetically (out of modesty, which is almost mandatory in such company), **Peter Aczel**, your Editor and moderator of the seminar.

Let us proceed, then, to the transcript.

EDITOR: Good morning, gentlemen. As they say in those English mystery stories and mystery films, you must all be wondering why I called you together here today. (*Polite laughter.*) Seriously, though, let me welcome you to this informal seminar, or symposium if you want to call it that, of *The Audio Critic*. Its purpose, as you know, is to explore the best current thinking on audio, on various aspects of audio, and to provide the readers of *The Audio Critic* with the best possible guidance on a broad range of subjects. And I will have to remind you as we go along here that no matter how technical or abstruse the conversation becomes, we always have to get back to some sort of practical takeout or take-home information for our readers, because there may be subjects that we around this table are terribly interested in but that may be either too technical or not particularly relevant to the needs of our readers. So I'm going to be asking you from time to time, all right, this is fine, but where does this leave the typical audiophile, what should he think or do differently, or what should he conclude from all this? Don't let this inhibit you; we'll discuss anything you like, but when we get to a certain point I may say, all right, let's sum up the practical significance of this to a typical reader of *The Audio Critic*. I would like to go briefly through some introductions; there are thumbnail biographies of all of you printed in the preface to the transcript here, but I would just like to put into my own words why each one of you is here, what you represent to me, starting in alphabetical order: Bob Carver, I've always considered you to be more than a technologist in the audio field, rather one of the few inventors, genuine inventors that I'm aware of; you represent the manufacturing industry around this table, and I think it's well represented.

* * *

Dave Clark, representing I suppose the independent audio engineering community, or the free-lance audio engineering community; you are best known to me, perhaps not to your various clients but to me, for your work, for your very important work, on listening tests and your reviews that are informed by your particular approach to listening tests, which I think has been probably the most carefully considered and the most scientific in the industry. (*Amused sounds of modesty from Dave Clark.*) John Eargle, I have for many years been in awe of you as the compleat audio technologist; I really don't think there is any aspect of the audio discipline that you are not familiar with, but I've been particularly aware of you recently as a recording engineer and I've become an admirer of your orchestral recordings. Stanley Lipshitz, I think if a vote had to be taken among audio practitioners as to who is the keenest intellect in the audio field, you might very well win the vote. You represent the academic community and the pure research aspects of the discipline in this gathering. Peter McGrath, you have been my favorite high-end dealer for so many years; as I've often said, if you had your store just around the corner, I

would probably spend half of my time there and not get any work done. I expect you to represent at this table, and to explain to our readers, the point of view of the high-end dealer community, at least as you see it. I don't want to go very much more deeply into these introductions because everybody's personality and point of view will emerge in the course of these discussions, but I would like to poll you very briefly as to what I've just said, if you have anything to add or edit or revise.

CARVER: The recording involvements of three of the panel members; you forgot that.

EDITOR: Yes. I have to add that *three* of the members of this panel are very heavily involved in recording. John Eargle, of course, as I've already said; Stanley Lipshitz, who apparently has been doing a great deal of digital recording at the university (I wasn't even aware of that until very recently); and, of course, Peter McGrath, who has done some very fine work in the recording field, most recently for Harmonia Mundi, right?

McGRATH: Correct.

EDITOR: It's interesting... Although I think, John, you're probably the only one around this table who is a day-to-day and week-to-week professional in recording, interestingly enough there are two others

Introductory formalities, pleasantries, musings, and disclaimers.

"...some of these views may come through as sounding hard-nosed..."

who are very much involved in that discipline. But I'd like to poll you at this point, whether you have any additions to make to what I've said. Bob Carver?

CARVER: Ask me a leading question.

(*Mild laughter.*)

EDITOR: Would you say you represent the manufacturing industry?

CARVER: Well, I'm certainly the only manufacturer here, but I really feel that I represent myself, because in my own imagination I find myself so removed and so different, as far as I can tell, from all of the other manufacturers, or most of the other manufacturers, that I feel uncomfortable *representing* manufacturers; we're all individuals, and each of us would probably represent ourselves in a different way. That's all I have to say about that.

EDITOR: Dave Clark?

CLARK: Well, I'm supposed to represent engineering, or the independent engineer or consultant. I guess I would take that on, and I'd say further I'd like to think that I represented engineering in general, which is important to audio, and most products, most *good* products, I think are engineered by engineers, not disgruntled space scientists. More credit should be given to good engineering I think, so I'm happy to try and represent that.

EDITOR: Very well. John Eargle?

EARGLE: I think your intro was pretty fair and thorough to the extent that we would expect it at this point. I certainly don't represent recording engineers as a lot; Lord knows they're all over the map. I place myself sort of in the middle zone between minimalists, whatever that may mean, and multimiking—and I know what that means. I think I represent the point of view of people in this business who let the music dictate what the demands are and the room that you're working in. It's not necessarily a documentary approach that I take but rather the approach that this record is going to have to play back in many locations and convey some pretty honest musical values in the process. I don't want to get too involved in a philosophy at this point but I would say that in my own personal view—what I feel is important to me today and for the rest of my creative time in this business—the recording side of it is far more rewarding than any other side of it, and I've been involved curiously in the very beginning of the audio chain and the very output of the audio chain, where there are hundreds of degrees of freedom. When it comes to the in-between part of the audio chain, where there are fewer degrees of freedom, I've generally not worried that much about those points; I've assumed that people like Bob Carver are building amplifiers that have an input pair of terminals, an output pair of terminals, and a relatively simple transfer characteristic—we know that's not really the case in the fine structure—but when you look at the variables in a recording studio and the variables in a playback room where you have loudspeakers, you're faced with an infinity of variables, and I spend most of my time wrestling with those. That's all I better say at this point.

EDITOR: All right. Stanley Lipshitz, I should probably announce that, even though you're the current president of the Audio Engineering Society, your presence here has absolutely nothing to do with the Society.

LIPSHITZ: Yes. I can't have them blamed for my personal opinions, which is what I'll be expressing here.

EDITOR: So I think that's quite clear, that this session here has absolutely nothing to do with the Society, but would you like to add something about the academic community and pure research and so forth?

LIPSHITZ: Well, I think, yes. Just one point—that we as a group I think have a benefit, and that is that if we make fools of ourselves it has no dire consequences. We're not constrained by commercial or other pressures. So the opinions I'll express will be my best views of the matters, based on personal experience, and what I believe I understand, and experiments that I and other people have done. Although some of these views may come through as sounding hard-nosed, they are generally based on an informed opinion—at least that's what I will claim. One of the aspects that frustrates me quite greatly in audio is how frequently one will be hypothesized wrong on the basis of nothing more than claims and hypotheses from people who ei-

ther haven't done the experiments, don't want to do the experiments, or don't really want to know what the experiments might result in, but have a very definite belief in what is right and what is wrong.

CLARK: What do you mean by an experiment, can I ask?

LIPSHITZ: An experiment could be an objective experiment looking at a meter; it can be a subjective experiment as long as the subjects or the variables are controlled in some scientifically reproducible way. I think an experiment is not an experiment if it is something that cannot be replicated. By replicated I mean somebody else has to be able to do the same as you did—what I mean is *you* have to be able to do the same as you did, then to show *me* that you can do it when I can check to see which other things might be the causes of what you did or did not hear or perceive. That's what I mean—that might sound rather harsh but it's based on a lot of experience—that you can waste an enormous amount of your time if you take some people at face value. They make a claim that sounds a little bit outlandish; you get interested; yes, you've got to try and check it—and so many obvious things are wrong with it. An hour later you know what the answer to the problem was, and it wasn't what the person had concluded; it was due to something else entirely. Well, we'll be getting into all of that. The views I'll represent will be what I hope is a considered objectivist's type of approach, even to subjective questions; they can be objectivized.

EDITOR: Very good. Peter McGrath, how do you feel about your niche?

McGRATH: In the disclaimer department, I do not represent retailers, high end or otherwise. In a way I guess I never really have. Also, I am the kind of person who is wearing two hats: that of the person who does run a retail operation and also of someone who is intimately involved in the recording process. I was kind of envious of what John was articulating because I have the same kind of frustration; I have such wonderful freedom and joy and pleasure in the activities involved in recording and have to sort of keep pinching myself to go back to the other world that I derive my living from and hopefully put my four children through college with. One thing that I would like to point out about the retail aspect of what I may or may not bring to this table is that our primary role as retailers is a role that I think we have yet to define clearly. We have failed to do that as retailers; we've really not been able to make people for whom this equipment was originally designed and conceived understand it and enjoy it. And that I think is for me the greatest frustration, and I think perhaps the greatest challenge that lies ahead. It is something that I hope we touch on later.

EDITOR: Oh, absolutely. We'll get into all that. What I would like to explore here before we get into the meat of the subject is something that has always bothered me. It's something unfortunate, but it's very real: that a good many audiophiles—I would call them a significant minority rather than a majority, but they're certainly not

a negligible group—have what I call the conspiracy theory of audio, namely that whenever audio professionals say something, present a point of view, there is behind it some kind of hidden agenda, some kind of ax to grind, some kind of personal advantage to be gained or a personal hobbyhorse to be ridden. I believe that the group around this table is as free of that kind of limitation as any such group can be, but I would like to put the question to all of you: do you have such an agenda? Do you have a particular subject on which things *have* to come out a certain way, otherwise you'll be very, very unhappy? Who would like to comment on that first?

CARVER: Well, I will. I've often been accused of having an agenda—some greedy, grubby agenda—but it's really not true.

EDITOR: I got a hate postcard a few weeks ago. After saying all kinds of nasty things to me, the man wrote on it—in a slightly different ink, indicating that it was not written at the same time as the postcard—“Carver skills!” (*General laughter.*)

CARVER: Well, you know, that perception has to go back to the way I design my products. Earlier, you asked about manufacturing, and I stated what I didn't represent. What I do represent is a circuit-design approach that is not strictly mathematical and textbook, but it's not crazy,

“...the conspiracy theory of audio, namely that whenever audio professionals say something...there is behind it some kind of hidden agenda, some kind of ax to grind...”

it's not, you know, out in... What?

EARGLE: Don't point at me!

CARVER: No, I was gesturing...

(*Laughter.*)

LIPSHITZ: That was a generalized point.

CARVER: Yes. I design my circuits as a result of a series of converging experiments that teaches me the way. I mean I know how people get the idea that it's a “shill” operation or something—and it maybe has to do with the way I name my things—but...

EDITOR: I'm sure it does.

CARVER: ...but since I invent it I get to name it anything I want. And it's only a name.

EDITOR... You mean like the Digital Time Lens?

CARVER: The Digital Time Lens, the Asymmetrical Charge-Coupled FM Detector, the Magnetic Field Amplifier...

LIPSHITZ: That was your best one, the asymmetrical charge-coupled one—that's *really* good, but the asymmetry sounds bad, not good; it has sort of... (*Laughter.*)

CARVER: Asymmetry is even, so it's got to be good...

EDITOR: But you're willing to live with any kind of truth as long as it's reasonably well established?

CARVER: Actually, I find it frustrating—so often frustrating—that the audio com-

munity really isn't interested in or doesn't want to hear the truth. And that hurts; it makes it tough. We'll get into that...

EDITOR: Yes, we'll get into that.

CARVER: But I don't know if that's the audio community or if it's human nature at work.

LIPSHITZ: I think it must be partly both. I think we all like to believe that we're impartial and unbiased and neutral, and have no ax to grind. I certainly hope that I have no ax to grind. Certainly, as you develop more and more experience in a particular area, your views normally become more and more fixed, in the sense that if your experience continually confirms and reinforces what you believe, you get more and more confident that what you believe is correct. I certainly believe that certain things that I claim are correct. I'm willing to be proved wrong—I may be wrong—and if so, I wouldn't say I'll be pleased or happy to be proved wrong, because of course we have some kind of vested interests, but I'm certainly the sort of person who can be convinced by evidence. What I find frustrating is something I've already referred to, and that is being hypothesized wrong on the basis of simple claims with no substantiation whatsoever, and especially from people who will turn the onus of proof back on to you, which is something that is ridiculous. You know, this individual A will say to you: that's not correct, I can hear such and such a thing, now you go off and listen to it yourself and verify that you can hear it. And I say, absolutely no; if you claim that you can hear it, demonstrate to me that you can hear it. That will convince me. You may be right, I may be wrong, but just claiming that you can indeed perceive this thing and then putting the onus on me to convince myself that this is the case is ridiculous.

EDITOR: Absolutely.

CARVER: You know, I really have found that, tragically, only a very small minority of people are willing to change a belief system when faced with evidence, scientific or any other. And it also seems that those people who are willing to accept being wrong have to go through a training period. It seems that if you're trained to be a scientist, an engineer, or a physicist, it comes naturally. It's easy to be wrong, and being wrong doesn't matter all that much to your sense of self. But most people aren't like that. I think it's a skill that can be acquired with training, and it seems to come from, you know, just going to school for a while. David was talking about this last night, and he has a heartfelt knowledge of it as opposed to just mind-felt.

LIPSHITZ: Well, I think it is very cruel, it can be extremely hurtful, to take a topic where you really believe on the basis of a lot of work that you understand something and to be told just outright—you're wrong! To be told to accept that fact on the basis of nothing more than the claim that you're wrong.

EDITOR: Well, people like that don't understand the principle of the burden of proof. As I've pointed out a number of times, if I say that there's a six-hundred-

pound gorilla sitting in that chair over there...

LIPSHITZ: I say you're wrong; you're clearly wrong!

EDITOR: ...then I'm the one who has to prove it. Stanley, you say there isn't one, then I can't say, prove it! *You* have to say, prove it! This is very simple; I think lawyers understand this, and scientists understand this, but audiophiles don't.

EDITOR: I just want to ask Dave Clark very briefly whether he represents unalterably the point of view that everything sounds alike, as you have been accused of.

CLARK: Yes, I've been accused of being part of that conspiracy. One of the most shallow speculations—I guess I can understand where you're coming from on this, Bob—is about the ABX Company and who owns it and who profits from these thousands of ABX Comparators that are being sold. *(Carver laughs uproariously.)*

EDITOR: Everybody knows it's a million-dollar scam.

LIPSHITZ: To show you the differences can't be heard. It would be weird to sell a component to prove that people can't hear a difference.

CLARK: So I'm thought of as constantly promoting this end because I make money from selling ABX Comparators.

EDITOR: That's right!

CLARK: In fact, a group of us from the hi-fi club in Detroit, essentially friends, got together and started the company because we wanted to find out what was going on. We got some stuff published, and they said, of course they found *that* because they're trying to sell those bloody comparators. Well, I feel a great sense of relief having sold the ABX Company, and I'm not a part of it, and if any comparators are sold I don't make a nickel. I still think it's a great thing.

EDITOR: And, lo and behold, A and B still sound the same.

LIPSHITZ: They're wired internally, Peter, to be identical. *(That cracks up Carver totally.)*

CLARK: You shouldn't have to sell your company in order to be able to make a statement. People should look at the value of the statement itself, rather than instantly seeking a motivation behind it.

EDITOR: I just want to goad you into assuring us that on the rare occasions when A and B sound different, you're willing to admit it.

CLARK: You know, I...

LIPSHITZ: You're making him defensive.

CLARK: ...I want to say something, as long as you brought that up.

EDITOR: We'll get into the meat of that when we get to the ABX test.

CLARK: I'd still like to bring it up because you brought it up. I use the comparator all the time in my work. I do testing for people as part of my consulting, and I design tests, and well over 50% of the tests that I run come out with hearing a difference. So, that's not something new to me. What's new to me is hearing a difference between two 100-watt amplifiers that are conservatively and properly operated.

EDITOR: Very good. Peter McGrath, do you have an ax to grind with respect to the superiority of expensive equipment to inexpensive equipment? Would it hurt you beyond endurance to admit that a \$600 amplifier may be as good as a \$6000 amplifier, if it were the case?

McGRATH: No, it would not, because that construct of expensive-and-not-expensive is all part of the same artifacts that define this elusive line that supposedly separates high end from mid-fi and all of these other arbitrary kinds of distinctions that cease to have much value to me at this point. If it could be demonstrably proven that a \$600 amp is as good as a \$6000 amp or a \$5000 amp, all I'd want to know is, do I have good access to selling it in my marketplace, and it would be a great pleasure to be able to offer it to that many more people. My big gripe is not so much that. A lot of my gripe has to do with the integrity of manufacturers, the integrity of the other dealers that they appoint, my own integrity which is constantly tried and put into question. It really does not follow the lines of expensive vs. cheap. It follows the lines of what's good and what's bad, how long does it last, what really, truly in the long run represents good value. There are a lot of things, though, that justify an expensive product. Sound is of course generally con-

"I do testing for people as part of my consulting, and I design tests, and well over 50% of the tests that I run come out with hearing a difference."

sidered to be the most important. But I think that if a manufacturer feels that it's important for a customer to have something that has engraved front panels and has a real tactile feel of jewelry to it, there's nothing wrong with that. And if the customer is willing to pay dearly for it and the manufacturer has to charge for it, I don't think there's anything fundamentally wrong with that, either. Those are the things that fall into the category of private ownership and private excellence. I mean, no one criticizes the fact that a Ferrari is not that much faster than a BMW, yet it costs three times as much. Well, there's an awful lot more that separates those two cars, other than mere performance.

EDITOR: But, as you know, in the typical high-end audio salon, the statement is constantly made that this amplifier A at \$5000 "blows away"—that's usually the term, blows away—this other amplifier B that's only \$900. And I have been told—a lot of people in your field have told me and also some high-end manufacturers—that if it could really be proven that the \$600 amplifier sounds every bit as good—and never mind the luxuriousness of its feel or the tactile impression or the cosmetic impression—if it could be proven that the actual sound of the \$600 amplifier is every bit as good as the actual sound of the \$6000

amplifier, we in the audio business shouldn't be talking about it because it's bad for business, it's bad for the industry, you're rocking the boat. Do you gentlemen feel that the unvarnished truth is bad for business?

CARVER: Well, it seems to be. That's what we've said, that somehow it seems that truth is bad for business, people often don't want the truth—and it's sad.

McGRATH: But, you know, there is another component here, too—and maybe this is a corollary to truth and fiction and fantasy and so forth—but indeed the very premise of the whole concept of high fidelity is one of illusion, sleight of hand. We are in fact dealing with fantasy, we are dealing with illusion, we are dealing with replication. As I say, the premise of all of this *is* fantasy, and maybe as an adjunct and an extension of that, we don't want to get meddled with by cold, hard reality. That's why, for example, a lot of the subjectivists are deeply troubled by what you represent, Stanley, and we don't want our alchemy messed with by cold, hard, scientific reality because we are involved in a romance, so to speak.

CLARK: I don't understand that.

McGRATH: We don't want people analyzing jokes; comedians are made uncomfortable by people analyzing the essence of humor.

EDITOR: Harvey Rosenberg used to say, you think we are in the sound business? No, we are in the toy business.

CLARK: But, Peter, I don't understand this fantasy thing that you're talking about.

McGRATH: Well, what I'm talking about is the idea of making music happen in the room—it's fantasy.

LIPSHITZ: It's illusion.

McGRATH: It's illusion—well, it's fantasy as well.

CLARK: It's illusion. Okay. I think there's an important distinction there. I think all of us are interested in producing the illusion, but it's not a fantasy.

EDITOR: Illusions are repeatable.

CLARK: Thinking that certain specifications have an effect on this illusion is fantasy.

McGRATH: No, I'm carrying it on to the next level—because, after all, you are creating the illusion of a musical event, for which then fantasy occurs in your mind. As to what that means...

LIPSHITZ: Let me say what I think you're saying. What Dave is saying is that the illusion is essentially a physical, objective quantity. And I think what you're talking about is a perception. That's a subjective quantity. The illusions can be quantified; even perceptions, in fact, can be quantified and investigated. But people buy components—or get involved in audio, become audiophiles—I suppose for a number of reasons, one of which is higher-quality objective sound reproduction, which may or may not give them improved subjective impression or feeling. And another one is perceptions, or satisfaction—various other emotional aspects which have nothing to do with the engineering side, and in many ways have nothing to do with the record-

ing side, which is more artistic.

McGRATH: Precisely right.

LIPSHITZ: Now, there's nothing wrong with somebody getting pleasure out of owning a beautifully built load of junk—I mean with superb quality of craftsmanship and physical construction and “weighs a ton” and “glows in the dark” and all those things—if that gives them satisfaction, that's fine. But I do believe that people discussing the qualities of such a product should discuss its objective qualities and its subjective, emotional aspects as well, and separate those, and say we have here a load of junk that may give you pleasure if you like A, B, or C.

EDITOR: Bottom line, though, Stanley and Peter: if everyone who owns or is about to buy a home audio system had your perceptions, Stanley; if everybody knew what you know—fat chance, but if everybody did—would the “gross national audio product” become lower? Would there be less money in the business?

LIPSHITZ: No, I think not. You see—people perceive partly what they want to perceive. The topic you've raised is the question of whether it is somehow wrong to tell people: this product is not very good on technical grounds, there are things it clearly does which are wrong—these are demonstrable, you can hear them, or may be able to hear them—but it has these other nonaudio aspects which may mean something to you. There's nothing wrong with buying a Rolls-Royce because you love the aura of the car. That doesn't mean it gives you better transportation. However, it would be fraudulent to claim that it had a twelve-cylinder engine if it were only an eight or a six. What we have, I think, is certain groups with vested interests in maintaining the belief that there are unquantifiable, not understood technical differences which are responsible for a lot of the perceptions. Many of us at this table do not believe that's the case.

EDITOR: That's true, and we'll get into that. But what I'm trying to explore here is this: Peter, could Dave and Stanley ruin a \$15,000 sale for you in your store if the customer listened to them? That's really what I'm trying to find out.

McGRATH: I don't think so. I really don't believe that. If the customer actually followed the full extent of what it is that they're saying, I don't really believe that would happen. Maybe I'm naive in maintaining that position. I guess part of it is that I have the fundamental belief that if we followed what they're advocating to the fullest extent, a lot of the things that are expensive will ultimately be justified. And the things that are expensive and not worth it should ultimately be flushed out for what they are. I believe that some of these things are very good, and as a professional at high-end audio retailing I have tried in my own way, as best I can, to flush out many of the things that I believe are fraudulent, which does not mean that I have to go and summarily throw out everything that's expensive nor that everything that's cheap is good. You understand what I am saying, Peter? With the means that I

have at my disposal, i.e. making master tapes, and listening very very carefully, and working with people that I have an intrinsic trust and belief in, and with my rather limited technical means, I have tried to evaluate and make judgments. And I have the faith that, if subjected to a much higher level of technical scrutiny, some of the things that I advocate—if not all of them—would be proven good, and many of the things that my competitors recommend would be proven bad—I hope.

CLARK: That's a disagreement with our idea—well, I'm lumping Stanley and me together, which isn't correct—with the idea that a lot of things sound the same that are purported to be different. It's really a disagreement with it; it's not answering the question. If the customers were convinced that the \$5000 amplifier didn't sound different from the \$600 one, I think it would be bad for business. I think that business would go down; you cannot sell a \$1000 washing machine to a person because the \$500 ones wash the clothes just fine. And high-end audio right now is based on fantasy, not a creation of the illusion.

McGRATH: Well, I think that's a misleading statement; I don't think that's a valid statement at all. I'm willing to concede that there are differences that can be prov-

“What we have, I think, is certain groups with vested interests in maintaining the belief that there are unquantifiable, not understood technical differences...”

en and that there are differences that can be denied through thorough scrutiny, but I don't necessarily jump from that and say that the high-end audio industry is based on fantasy; I don't find that to be absolutely true. I guess maybe I misspoke when I used the term fantasy and maybe what I really meant to say was illusion, but this industry is based on illusion, and I guess what I'm saying is...

EDITOR: But illusion is repeatable. The magician can make the elephant disappear on Tuesday and Wednesday.

CLARK: I agree with the illusion part.

LIPSHITZ: Deception. I think you mean deception. People's beliefs...

CARVER: Everything that you sell in the store—or almost everything you sell in the store—I believe is manufactured with integrity and is certainly worth the value; the money that people pay is represented in the quality of the workmanship, the parts, and the labor. And for somebody to spend \$5000 for something like that is okay if the lie isn't hooked on to it—and the lie is that it has a magical quality, and you must buy it for the magical quality.

McGRATH: Well, that I do not market. And that does prevail in my industry, and I do take exception to that, and I've lost a lot of my audiophile customers...

CARVER: You've lost a lot of your audio-

phile customers because of that?

McGRATH: You bet I have, because I've alienated them. Since I started recording, I've lost those people—because I, too, was involved in that, and for me the recording process was a very rude awakening.

CARVER: So you stuck to your own beliefs?

McGRATH: Yes, I made a change.

EARGLE: I wanted to make a remark a while ago. One of the best things that a high-end manufacturer can do, and that a high-end manufacturer normally does if he wants to maintain that position, is to pick his dealers very, very carefully. The reason that the \$600 amplifier is rarely pitted against the \$6000 amplifier is that they're never on the same sales floor at the same time. They may be in Stanley's laboratory at the same time, but just look how one is demonstrated relative to the other. You go into a really good high-end store, and you find that great care normally has been taken in setting up a listening room; there's a variety of loudspeakers that have been gone through and checked off and some rejected because they don't really work well in that room. This is why when you wend your way through the Riviera Hotel during the Las Vegas CES, or a hi-fi salon that purports to be high end, you find that people have brought a hundred CD's with them but they're only playing five—the five that really sound good in that room. In other words, part of the mystique, the aura of the salon is really catering to a different set of sensibilities and taste on the part of a consumer. And the consumer at some point will probably say, hey, I don't really give a damn whether this \$600 amplifier is as good or not; it isn't associated in my mind with the other things that I have in my house, with my Rolex watch, my Leica camera, my fine *cave* down in the basement with all of these French wines and such. A great deal of this is a matter of what really turns you on. Now, if it happens to work well in the process, which it should, that's fine. This is what we've all agreed on—that there's nothing wrong with a man paying ten times as much for a house, for a car, or an amplifier.

EDITOR: Yes, but he shouldn't feel totally crushed by the information that the Timex keeps as good time as the Rolex.

EARGLE: Well, it's at least possible to measure the thing, but the point is that the measurement becomes purely secondary. You expect all these watches to keep good time; you expect all these cameras to take good pictures—but the feel, the heft, the fact that somebody sees the name Nikon or Leica hanging around your neck really becomes as much a part of the experience as looking at the photograph. And I maintain that a great deal of high-end identification in any field, including the neighborhood that you live in, is based upon these factors that go way, way beyond the mere service or the mere utility of the structure or the device or whatever.

CARVER: The flip side of that, the tragedy side of that, is somebody who doesn't have the means, doesn't have the money to buy the \$5000 amplifier but scrimps and

saves and deprives himself of a million other things that he could use to buy the \$5000 amplifier because he wants his audio nirvana. That's the sadness.

CLARK: That happens.

CARVER: That's what I would like to see done away with.

LIPSHITZ: Yes, that is the point I wanted to make, too. There's no harm, there's no evil in somebody spending more money for a perceived belief or benefit or whatever. I do believe, however, that a person should not be misled, should not be told if it cannot in actual fact be substantiated, that something is audibly superior. There's no harm in saying it's built better, it has other aspects, it matches his Rolex, or—you know—if you can afford it you may be happier with this thing...

EARGLE: But, Stanley, no one necessarily tells the man that. The man tells himself that the \$600 amplifier doesn't sound as good—because he goes to the store where that amplifier is being sold, and he finds it being marketed along with 10,000 other low-cost, mid-fi devices, and that amplifier is never really properly put through its paces. And I would hardly expect the dealer of the \$6000 amplifier to dissuade the customer from buying one, any more than I would expect a Rolls-Royce dealer to say, look, if all you want to do is go to the store and back, that little car from Yugoslavia is going to work just fine...

LIPSHITZ: Yes, you can save yourself a lot of money by going next door... But getting back to Peter's question, Peter McGrath doesn't think he would be likely to lose a sale. I'm not sure. I disagree with you. If you had the other amplifier there, and if you had an argumentative person like me in the store while Mr. X was discussing with you which amplifier he should buy, you might lose a sale because I might intervene...

McGRATH: But again, though, what John has described is very much, classically, the case, and that is that the customer is not necessarily buying strictly on the basis of sound quality. He is buying on the basis of a variety of other factors that enter into it. Although I have to admit—and maybe this is really what it comes down to—that we do not use ABX testing in our store. I have to admit that when I do make a comparison between some fine quality products, well-engineered products, such as let's say a **Bryston 4B** and a **Mark Levinson No. 23**, both of which are comparable in power, and both of which are connected to a speaker—let's say, as a typical case, a quality speaker like a **Thiel**—and both of which are being fed a master tape, and we're not driving either one into any kind of distress, we find—and maybe we're wrong, but this is typically what we do every day, and maybe I'm deriving my living from a falsehood—but the fact is that when we make that comparison there is a perceived sonic difference, and that difference is purchased. It does not suggest that the 4B is a bad sound—indeed it isn't at all; it's a very, very good sound—but the 23, which is three times the price, represents an incremental improvement, and

then the customer is faced with the dilemma in his own mind—does he want to spend the difference or not? And this is in the context of how we sell; maybe that's wrong and maybe it should be more tightly controlled, etcetera, etcetera...

LIPSHITZ: No, there's nothing *wrong* with that. Those things are what people have perceived. But I don't know whether there's an audible difference between the two amplifiers you mentioned when driving...

EDITOR: We'll get into these listening comparisons later. I just wanted to explore the business aspect...

McGRATH: That is the business aspect. That is what goes on.

EARGLE: Look, it's not up to Peter to make the comparison for the prospective customer. It's up to the manufacturer of the \$600 amplifier to pick his dealers as well as Mark Levinson has picked his dealers, so that *that* amplifier, that class of product, can be given a fair shake in the marketplace by the people who sell it. For the most part, those amps are being sold by people who are in competition with Joe Blow and his hi-fi store across town, whereas I would suggest that Peter's operation is basically one of a kind in a major metropolitan area.

LIPSHITZ: Yes, and it was because of that

“...I believe that the untruths that are told aren't really told at the dealer level...floor salesmen want to do good... but their knowledge comes from the editorial press.”

that I visited Peter's store when I was down in the Florida area. But Peter (*addressing the Editor*), let me just try and say something. I'm not taking it off into A/B comparisons at this point. But just that question. Suppose I were in the store—and we're not talking \$600 and \$6000; we're talking \$6000 and \$4000; we're talking the two amplifiers you mentioned (*actually \$4700 and \$1595—Ed.*)—and suppose I wasn't thrown out of the store when I started interjecting, and I said, Peter, you've just told this customer here that these two amplifiers sound different. You let him listen to the one and the other...

McGRATH: Let us say that I haven't told him. Let us say that I connected them, and he perceived the difference.

LIPSHITZ: You can say that afterwards. Let me give you my scenario. I interject there and say, Peter, let's do the test a little bit differently. I'll stand here in front of the preamplifier, so that the customer can't see whether the button is in position one or position two—one or the other orientation. And now let him listen. I'll say, this is one of the two amplifiers. And half an hour later he'll say, all right, I'd like to hear the other one now, please. So I'll say, all right, this is the other one. Now that's not a blind test, for the simple reason that as long as I always call the one amplifier the first and

the other one the second, I could from Toronto ask you, Peter, is the button in position one? Yes, the button is in position one—yes, that's the first amplifier—I can tell it over the phone. That's a totally non-blind test. But I'm willing to hypothesize that—the great likelihood is—the customer would either say, I don't think I can hear any difference, or I don't really know which is which, I'm not sure which is better—which is another way of saying, if there's a difference there it's very subtle, more subtle than I heard when you told me which was which! That's the point. A lot of these perceived differences are perceived nondifferences.

McGRATH: Well, I dispute that, obviously. We do blind listening, not double blind; in fact, part of the blind listening is something that I go through on a routine basis when I'm evaluating, because a lot of my time is spent listening. What we have in a store like mine—and I think this is typical of a lot of high-end stores, not the very big ones that try to have everything, but ours is limited in our market and therefore we have to be very limited in terms of what we offer—what I have is only the tip of the iceberg of what is generally available. We're considered, I guess, the plum in our market; everyone wants his product in my store, so I have to do some pretty careful hairsplitting—and I do a lot of blind listening to the components.

EDITOR: At matched levels within 0.1 dB?

McGRATH: Yes, I do. Well, within the resolution of my Sound Tech 1600A; it's got 0.1 dB resolution.

LIPSHITZ: When measured across the speaker terminals?

McGRATH: Across the speaker terminals, without a microphone. It's a voltage right at the speaker terminals, right across the **Quad ESL-63**.

LIPSHITZ: Which is the only sensible place to measure it.

EDITOR: Well, that's very interesting. But I would like you to bring up your experiences when we really get into this ABX testing situation.

CARVER: I have a comment on politics again, regarding this.

EDITOR: Okay. Yes.

CARVER: I believe that the marketplace has emerged very naturally and that, in the distribution system, the expensive and high-end equipment more or less is in one physical location in a high-end store, the mid-fi is in another, and so on.

McGRATH: That's all changing radically right now as we speak, by the way, and that's another real concern that I have. It's a terrible political thing that's emerging now.

CARVER: I know it is, I know. But at least at the present, and in my area, that's the way it's merchandised. And I believe that the untruths that are told aren't really told at the dealer level. I believe that the dealer floor salesmen want to do good by their customers and want to be a powerful force for good and do their very best. But their knowledge comes from the editorial press.

McGRATH: Absolutely correct.

CARVER: And that's a far greater flaw—and this is the prime example, you know, Exhibit A here—and they get it wrong. They get it wrong!

McGRATH: No question; most of these salespeople just parrot the same crap that they've read the day before in the magazine that came in the mail, and they have the advantage of having gotten that issue in the mail before it arrived by UPS to their consumers, so they're that much more informed.

CARVER: It's much easier for a young, 19, 20, 21-year old salesman to believe in magic than to be disciplined about what he is going to tell the customer, to deeply dig into it and understand it so he can be really informed. It's much easier to believe in "amplifier A blows away B" or "this golden wire is going to make you happier, sir." It's easy to believe in magic and it's a lot more fun. And that brings us back to: is truth bad for business?

EDITOR: I think the consensus seems to be that it is bad for business.

LIPSHITZ: Possibly, possibly. Look, you're in the business, Peter, of—dare I say it—an underground audio magazine.

EDITOR: Hm, pretty much above ground.

LIPSHITZ: Poking above ground! I mean, it's not a pejorative epithet...

EDITOR: Let's just call it a small audio magazine. The only thing that makes it underground is that it's small.

LIPSHITZ: And of course some of these magazines are extremely influential and have the power over many small audio companies to put them out of business or to make them very prosperous—and that is fine if that power is exercised responsibly.

EDITOR: That used to be truer, Stanley, than it is today. It was certainly true in the heyday of high-end audio—late 60's, early 70's—that if one magazine said that this particular amplifier is the living end, and it was a small company, some kind of basement constructor, he then could emerge from the basement and actually rent a factory and make some profit. But today there are so many products, and there are so many opinions...

McGRATH: That's it, divergent opinions.

EDITOR: ...that it no longer works as simply as it used to.

CARVER: I think it does. I think it's even more powerful than it used to be because the power of the publications has sort of been focused into a very small, powerful group—about three, really. We're talking about the underground publications.

EDITOR: You're talking about the high-end journals.

CARVER: Yes, *Stereophile* and *The Absolute Sound*. And *The Audio Critic* is emerging as a powerful force in the field. They can be very destructive to a manufacturer, or they can be very, very helpful and make a company very prosperous. It's not diluted the way you think it is. It really isn't; I think it's been more focused.

LIPSHITZ: Just a personal comment. I used to subscribe to many of the early undergrounds; I used to get great pleasure out

of reading that. Look, there's another manufacturer that bites the dust! It's wonderful! The bloody idiot—look, those fools!

CARVER: Aw!

LIPSHITZ: And the first A/B test I participated in was when a friend built with post office relays an A/B box. Why did he build it? We believed all these differences were there. We got great pleasure out of reading these things; we just wanted to test something. We had two power amplifiers, and we hooked them up. And we switched, and, oh yes, the difference was there. The difference was audible. Then it suddenly occurred to me that—wait a second—one of those two power amplifiers is polarity inverting, the other one isn't. Ah, a bit of rewiring to get the box to correct for that—the difference was gone! That was the beginning of it. I think a lot of us so-called rationalists probably started with the belief that many of these things that we now believe are nonexistent and/or imagined or so small as to be essentially imperceptible if not actually imperceptible—we believed they were there. But we've allowed the evidence to change our beliefs. That's where the difficulty arises. People have big egos, especially in this area. It's emasculating to be told that you're wrong. And it's probably also very cruel to demonstrate to somebody that he is wrong. And that can be

“...the best that exists isn't even perceived to be as good as it is by the vast majority of the people for whom it was originally created. They don't even know about it.”

done. So it would not be in the interest of a dealer, I think, to take somebody who believes that product X is better and demonstrate to him that he can't tell the difference between product X and product Y, or demonstrate to him that product X is actually wrong, that product Y is the more accurate.

EDITOR: Maybe a fair statement would be that there is a profitable market for fantasy, but there may also be a profitable market for truth.

LIPSHITZ: Well, truth must out in the long run.

EDITOR: Could we agree on that?

EARGLE: Well, we haven't even started on loudspeakers yet. (*General laughter.*)

EDITOR: Underlying all this is, I think, a sort of basic polarization. I perceive this in your various comments—that audio equipment is a product that produces sound, yes, presumably music, but audio components are also an extension, an expression of your lifestyle, and this may be the basic polarization—that those of us who only care about music may have a totally different approach from those of us who want to invite the boys from the office to our place and say, *voilà*, that's my stereo system. Those are two totally different approaches, and maybe that's the governing principle. But this gets me right into a subject that

really is sort of the overture, the curtain raiser to our more technical or at least more subject-oriented discussion. What is the ultimate goal, what is the ultimate meaning of audio technology? What would we like to see happening? Is there a point where we would say, ah, we've done it, this is what audio technology is all about, here it is. What are our goals?

McGRATH: Well, you're sort of projecting an image and a goal to be achieved in audio, in terms of a technological realization that is yet to be met, and again my frustration, really, is that nobody knows what we've got. That's what bothers me more than anything else. From a marketing point of view, and I guess as a retailer, it's in my best interest to pursue the subject, but rather than look ahead, for me the major problem is that we've got some wonderful things the vast majority of the population doesn't give a damn about. That is really frustrating. Why continue to refine it further—and that gets back to the issue we just left. It's because of the politics, it's because of the confusion in the marketplace, subjectivists versus objectivists, and so forth, and it's the kind of thing that intelligent people, particularly people who go to concert halls, don't want to be bothered with because it's confusing to them.

CARVER: So you're saying that we've scared away some people who could really...

McGRATH: I think we have done a major disservice, and again it became really apparent as I got involved in the musical community that I now serve, in my community; I'm trying somehow gently to make those people feel comfortable with this black art, black science, or even pure technology that I'm involved with.

EDITOR: You're saying the best that exists is good enough; we are close to nirvana.

McGRATH: No, no, Peter, that's not what I'm saying at all. What I'm saying is that the best that exists isn't even perceived to be as good as it is by the vast majority of the people for whom it was originally created.

CARVER: Or they don't even know about it.

McGRATH: They don't even know about it.

LIPSHITZ: Well, they don't care.

CLARK: What do you suggest doing?

EDITOR: Let me approach this from a slightly different angle. Suppose an extraterrestrial expedition arrived to observe our occidental society here. I have a feeling that they would report to headquarters that western man, in the second half of their 20th century, had an obsession with replication—accurate replication of sound, accurate replication of images, and so forth. We are almost more interested in replicas than in the actual experience. Is this really a valid pursuit? I would really like to explore this on that level.

LIPSHITZ: You mean should we encourage people to go to more concerts rather than buy more stereos?

EDITOR: Well, for example, for example.

How important is it that it's 99% accurate rather than 97.5% accurate?

EARGLE: In the first place, if you have an electronics chain that's 100% accurate or very, very close to it, or let's say has a combined transfer characteristic that shows that any departures in this trip from input to output are really negligible, and let's say you're setting up as a goal the recreation of something that might have taken place in a concert hall or in some idealized concert space, which may be a hall without people where you have a better reverberant signature, the fact is that you're still left with the burden of recording on two channels and playing back over two channels over a pair of loudspeakers in a room—that becomes a real burden. The 99.9% may exist in the two-wire part of the chain, the whole electronics side, but when you look at what your options were at the beginning and what your options are at the playback end, the loudspeaker/listening-room end, you find that the 99% has gone down to 39%. If your chief joy is music, then a lot of that is written off as being inconsequential, and you simply hear through all of this nonsense, hear through all of the eigentones of the listening room and the rattiness of the microphones—those all disappear, and you can enjoy the music. But anything that you think you're hearing in the way of images generally is the result of some decision making on the part of an engineer, who hopefully knew what the music was and was working in concert with a producer and a conductor who had similar ideas, and pulled the whole thing together and made something that's not only musically satisfactory but also will satisfy them under a given reference of listening conditions. And if you can strike that happy balance once, it will probably sound good in most places. That becomes a real burden as far as I'm concerned; the real onus on us as masters of our trade, hopefully—or people who are trying to master a trade—is that we can spend an awful lot of time on the heft and weight and mass of electronics, but we should realize that the real burden in this whole process lies elsewhere. It's harder to test. My God, how do you double-blind test a recording? How many people have recorded the same music with two or three different setups? It's been done, but not very often. And how the hell do you ABX test loudspeakers?

EDITOR: What I hear from what you're saying is that we're trying to take home the musical experience and, once we have taken it home, it's far from good enough.

LIPSHITZ: For some people—and too good for others. I think perhaps one of the frustrations of people who have an interest in accurate sound reproduction is that some people couldn't care less. They may be musicians; maybe they're not musicians. Some people could listen to your system and say, that's very good, much better than mine—I wouldn't spend that much money just for sound playback.

McGRATH: Thank you very much—exactly.

LIPSHITZ: I think most people would agree, yes, that's better than mine, but their

priorities are different. That's one thing. I don't think many would say, that's worse, assuming that we're talking about a good reproduction system. It is better. But are they willing to pay for it? Maybe not.

EDITOR: But I say, why take home the experience? It's good enough that I have the experience from time to time, and when I take it home it's just a souvenir, it's not really complete, it's not as accurate...

LIPSHITZ: I'm not saying that. I was coming to that. No, what I'm saying is, given the same record, yes, your playback system is better than my playback system. I can appreciate that, but neither of them is like the real thing; the differences that John was mentioning are far greater distortions than the differences between the two playback systems we're talking about. If major improvements or changes are to be made in sound reproduction in the home, it will be in improved recording/reproduction systems, meaning the two ends, not the middle, which is the amplification, the electronics, and the storage. We can do those things very well now; the illusion is essentially created by the way you capture the sound and the way you put it back into the room for the listener to perceive—and neither of those can replicate the original live experience. I think if we had a better, say, surround-sound capability that people

“...how do you double-blind test a recording? How many people have recorded the same music with two or three different setups?...how...do you ABX test loudspeakers?”

could listen to, that might impress them more, but whether they would be willing to pay substantially more for that—I don't know.

EARGLE: Or manufacturers or record people to make product for that...

EDITOR: All right. So, bottom line, is the left/right stereo format here to stay, or will we, or should we, eventually graduate to a more lifelike format? If indeed you believe that a more lifelike format...

CLARK: That's the bottom line from where you were, to the previous discussion, to jump to left/right stereo?

EDITOR: I don't quite follow your question, Dave.

CLARK: I'm wondering how it relates to what we were talking about just before.

EDITOR: Well, Stanley was talking about surround sound, and making the experience more real, more lifelike, and I think that the basic limitation right now is that the universal format for sound reproduction, for home music systems, is left/right stereo.

CLARK: John indicated, and I go along with this from what I've observed, that if you're really into the music it's conveyed perfectly adequately on a less than state-of-the-art system.

McGRATH: Perfectly adequately? What does that mean? By whose definition?

CLARK: For the enjoyment of music.

EARGLE: If it's music only that you want. Most people who are interested, who are really into the notes and into the performance, can hear through the vagaries of the system.

EDITOR: A kitchen radio, for that matter.

McGRATH: Well, that thing on the wall there (*pointing to an intercom unit*) would suffice.

EARGLE: Well, mono. Not even left/right stereo but mono.

LIPSHITZ: A constant frustration when people are doing recordings and making cassette copies for the musicians is that they ask, would you like Dolby B or Dolby C? And they say, I don't know, what's that, what's the difference? And if the lack of knowledge is so great, the differences we're talking about here are not important to those people.

McGRATH: That was the point that I was trying to make, Peter, earlier—that those are people that I want to have an interest in all this. Why are we talking about where we can take this technology if we haven't even engaged their interest at the level we're at now? I guess that's kind of what frustrates me.

EARGLE: You may have difficulty ever engaging their interest on the level that you're talking about.

* * *

McGRATH: Let me put it another way. I'm involved with three orchestras, and I record them all. And I see five, ten percent maximum of the people that I see in the halls come through my door—or maybe even, for that matter, my competitors' doors, whether it be a high-end store or a chain. They're simply not interested in making those commitments to buying the equipment that would help extend the joy of that experience in a continual, meaningful way in their home. They simply don't buy it.

LIPSHITZ: But most of them have stereo systems.

McGRATH: I would say most of them don't. Well, most of them have a radio.

LIPSHITZ: And have records?

McGRATH: And television. But very little in the way of stereo. It's interesting. Very few—in Miami. Now, I don't know about other communities, but very few of them really do. It's amazing. They may have something they bought in college 25 years ago that probably doesn't work, and they have no real interest in renewing it—most of them.

LIPSHITZ: So they go to live concerts rather than buy recorded music.

EARGLE: They don't go to concerts to listen, they go to concerts to play, and you can only...

LIPSHITZ: No, no, no, he's talking about the audience.

McGRATH: I'm talking about the audience.

EARGLE: I thought you were talking about the stage situation.

McGRATH: No, not necessarily the musicians. I'm talking about the people who are in the hall, who have not followed through on “my agenda” and don't seem to want to

carry that experience home.

EDITOR: John, you said that a more or less adequate but not very great stereo system is perfectly acceptable to a musician or a serious music lover who is interested in the notes and the performance.

EARGLE: To most of them.

EDITOR: And that is certainly true; I know this to be a fact. But at the other end of the spectrum, about this ultimate audio experience that you, Peter, feel is a closed door to a lot of people, that people should be exposed to, and if they were exposed to it they would appreciate it, is it possible—and I'm not trying to come to a conclusion, I'm really asking a question—is it possible that this ultimate audio experience is still so far short of the concert-hall experience, so far short of the true musical experience, that it's not exciting to a large number of people? That it's not as exciting to them as it is to you? And maybe that's the reason why they stay away from it?

McGRATH: That's a very good question, I think.

EDITOR: You think it's absolutely thrilling that it's so good, and this other person might say, well, it still doesn't sound like Orchestra Hall in Chicago, or whatever.

McGRATH: What you allude to is an interesting question, and I've thought about it. For example, what if you put together an \$80,000 "ultimate" audio system in terms of today's technology, subjected that concertgoer to such a system, and then to what might be around the corner in terms of a properly done 4-channel or 6-channel surround-sound system that cost \$3000? He might well be more impressed by that. He might well be more involved with that. It's a very strong possibility. Then, of course, my role would be to take that \$80,000 system and expand it at that level to the surround-sound setup. There is a possibility that that is what it might take. It might take that technological leap to engage him. There is that possibility, but I have the real feeling—you see, that's what my experience has been—that that customer has simply not been exposed to what we have now. And when properly introduced to it, and if you can strip away all of the conflicting garbage that currently surrounds it, political and black science and all of that, if you simply take him into a room, sit him down in front of the **Quad ESL-63's**—I keep referring to them because for me they are magic, but take any other *good* speaker, you name it—you sit him down, and you connect some good electronics to it, and play a good CD or a good LP on it—that's an experience that the vast majority of music-loving people have never even been exposed to. They really haven't been. They've been exposed maybe, at best, to some lunatic's idea of a high-end system that hums and buzzes and squawks, or they've gone into a chain store and have seen garbage—and presented by some pimply-faced kid who has absolutely no idea what music is. And this is the experience that most music lovers have when they go to buy a hi-fi.

CLARK: Well, I think this fits in with what you're saying even though it may not

sound like it at first. I decided a long time ago to unabashedly separate the thrill of achieving close reproduction of sound from the enjoyment of music. Most people, from what I read, say the opposite—that the whole point is the reproduction of the music. I certainly listen to a lot of music, enjoy it, and perhaps that's what got me into it in the first place, but the technology of it is fun because it's a real challenge. It's a great deal of psychoacoustics—perhaps more psychoacoustics than engineering. It's relatively low-tech—audio is low-tech, basically—but the psychoacoustic aspect is high. And I think what some of your customers may be missing is the fun-technology aspect of setting this up, and the thrill of going to a concert and then coming home and putting on a disc and playing it and saying, my gosh, that sounds really close. I think that's available.

EDITOR: You're assuming that everybody is a hobbyist. Most people are not hobbyists.

CLARK: That does make that assumption. We've got the other reasons for buying it—it fits in with your Rolex and your Porsche and everything else—which I consider valid reasons, but I think that this hobbyist aspect does apply to the readers of audio magazines. I think they are all hobbyists.

“...if we had a good surround sound system...[musicians] would unequivocally agree that it was superior because they would be able to hear more of the performance.”

EDITOR: You're saying in effect that music is just an excuse for a fascinating hobby.

CLARK: Well, it's nice that the two of them are there...

CARVER: Pretty nice marriage.

CLARK: ...but, yes, I am saying that. As a separate item, I am saying that *that* exists. It sure cleans up my thinking, *exactly*.

EDITOR: If you're right, I think it's rather sad.

McGRATH: That's my problem, David. That's my frustration. I guess what I'm saying is that as a retailer I've dealt with hobbyists for many, many years, and I guess I'm tired. And I see a mission, and that mission is to try and get the people who love music to employ this stuff as simple tools. If they enjoy playing with it, that's great. But I guess I want them use this as an access tool to a higher art form.

CLARK: The musicians don't need it.

McGRATH: No, no, I'm not talking about musicians, I'm talking about concertgoers.

CARVER: I'm interrupting because I'm excited. You could easily capture those people with a little bit of promotion.

McGRATH: Well, that's what I'm trying. I'm going after them, and I'm trying.

CARVER: You could set up a blow-your-socks-off demonstration and invite people through newspaper ads, flyers at the sym-

phony orchestra, to come in and listen, and offer something that will get them there. Hear a million-dollar system, or something. You can capture those people.

McGRATH: We're trying.

LIPSHITZ: I'd like to disagree with you. My experience is that, for a lot of people, it's the technological aspect of audio that puts them off.

McGRATH: Absolutely correct. "I'm not a hi-fi nut like you."

LIPSHITZ: There are too many knobs, too many buttons; it's the people who don't know the difference between Dolby B and Dolby C who don't want to learn about these new things, don't want to have all those choices and difficulties and so on. They would like the sound; I believe that if they heard your system, they would agree it's better. The musicians would agree it's better even if they don't consider those qualities to be necessary qualities. It has the aura of being a tinkerer's gadget-oriented, complicated, technological area, and many people don't want to get into it. And I think the high-end people could probably sell expensive systems to many people if they didn't have the knobs and buttons but gave just as good sound. So the aura needs to be changed. And another point I wanted to make is: the musicians may not value some of the criteria that we consider important in sound reproduction; it's not the most important thing to them; but stereo *is* better than mono, and I think they would agree with us on that. And if we had a good surround sound system, I believe that those people would unequivocally agree that it was superior because they would be able to hear more of the performance. Without contradictions!

EDITOR: But do you think that's the coming thing? That's really what I was trying to find out from you.

LIPSHITZ: Yes, it could be. Now, surround video, which is an abortion of a surround sound system, has again interested people in it—after this enormous fiasco of quadraphonics, which is ill-conceived.

McGRATH: That's correct.

LIPSHITZ: Yes, it will happen eventually. I think it's a great pity that there is this enormous opposition still. It will be expensive initially, but again, if it can be technologically demystified and become part of an accepted system for sound reproduction, it has the capabilities of being a very significant thing.

EDITOR: Now, which system do you have in mind?

LIPSHITZ: Well... Ambisonics.

EDITOR: Ambisonics? Four channels?

LIPSHITZ: It doesn't have to be Ambisonics, but it has to be a properly conceived system along the same lines as that.

EDITOR: But four channels from the start?

LIPSHITZ: Well, horizontal surround is three channels—as many speakers as you want, three independent channels. Four channels for full sphere, including vertical component.

EDITOR: But, ideally, the recording session would have to be set up with that end result in mind.

LIPSHITZ: Yes.

EDITOR: Do you think it can happen?

LIPSHITZ: Yes. But I don't think it's around the corner.

EARGLE: I think it's certainly a possibility, and I think that all of us would agree that a properly mounted Ambisonics recording would convey more tactile, spatial texture than simple two-channel stereo might at the same time, in the same room. However, I'm not giving it much of a shot for the future because it's going to require more information-handling capability than the hardware industry—the big guns in that industry—are going to want to do, I think. And another point: most of the surround activity, let's face it, that's going to be occupying people in the future is going to be derived from video experiences in the living room because it's more appreciable—in the sense of, my God, I heard that airplane fly over, it really came over my room, and everybody in my room can hear the dialogue in the center speaker up here, and things like that. And another point: in the purely direct ambient—nature—I think that we have at our disposal now relatively low-cost hardware generating perfectly acceptable reverberant-field information. It isn't what would have been recorded in the room, but there are not that many good rooms to work in, believe me. I know; I've seen some of the places where orchestras do concerts, and you wouldn't want to make an Ambisonic recording in them. And you can't do everything in St. Paul's cathedral, where there's a substantial signature.

EDITOR: You're saying in most cases derived ambience is as good as recorded ambience.

LIPSHITZ: Well, you cannot reproduce a realistic ambience from two loudspeakers in front of you, whether it's real or derived.

EARGLE: That's right, you must have more loudspeakers to do it, but the carrier that comes into the home may be limited to two channels for very practical reasons. I think that we would all agree to that.

LIPSHITZ: John, would you agree with the following, then? There is a real possibility of home systems with more than two loudspeakers.

EARGLE: Oh, Lord, yes.

LIPSHITZ: You're saying in the near future you don't see a real possibility of more than two channels coming into the home in terms of information.

EARGLE: Yes, I would say that.

CARVER: That's right. And that leads to the next question. Is there enough information available in two channels to somehow construct a believable sense of acoustic space and to replicate a convincing experience? And I believe there is. Do you think so?

LIPSHITZ: Oh, absolutely, absolutely. I have two pressure sensors on my head. I only have two channels of acoustic information coming into my brain—if I exclude body vibration, etc. Two channels are all that is required if you will...

CARVER: Do it right.

LIPSHITZ: ...make it binaural.

CLARK: Yes, if it's binaural.

CARVER: So, if it's done right, then the two channels we have today with existing technology are enough. There is at least enough information available.

LIPSHITZ: Yes, and you're talking hologram and...

CARVER: And so that's okay? Whew, I'm glad.

LIPSHITZ: No, no, no. What I was saying is this. In principle, we have two pressure sensors on our heads; two channels of information should be able to do everything aurally. Now that's not enough. We perceive visually; we perceive other things, too; so we'll never reproduce the complete experience, only the aural experience. But if you want to recreate the original sound field in the room, so that no matter where you are in the room you can walk around and you hear exactly as you would have heard in the original location—in other words, something like the aural equivalent of a hologram with light, where the original wave fronts are recreated, and then you can see the different perspectives as you move your head around—that is not conceivably achievable. It requires such an infinity of information to do that, we cannot do it. So four channels are not enough to do the latter. Four channels are better than two channels if you want to do a sur-

“...if you want to recreate the original sound field in the room... like the aural equivalent of a hologram with light...we cannot do it...four channels are not enough...”

round sound through loudspeakers; I think you're talking a minimum of three; four will be better, but four is not infinity. Binaural, at that point, whether it's through headphones or with some processing through loudspeakers...

CARVER: Sonic holography. *Sonic holography!* (*Spoken mock-disruptively.*)

LIPSHITZ: ...becomes, as an engineering-psychoacoustic question now, a situation you have to reevaluate entirely. Should we be talking about n channels where n is large, or should we be talking about two and doing it binaurally?

EDITOR: In June of last year, Duane Cooper had a little informal demonstration in his hotel room, where I heard surround sound out of two loudspeakers. But my head had to be clamped in a vise, figuratively speaking.

EARGLE: Yes, that's true.

LIPSHITZ: Well, Duane is doing it in a slightly different way. Duane has a clever idea, which he described in the paper that accompanied the talk he gave. But of course experiments were done 40 years ago in anechoic chambers, where with the listener's head held in a very specific position in relation to the loudspeakers, images could be produced in any direction—above, below, behind, in front. Yes, because all you have to do is to know ex-

actly where the listener's head is, get the pressures right at his ears, and he will perceive what he would have perceived from the source, being in the desired location. That is loudspeaker-binaural. But fixed-head loudspeaker-binaural; that is not a practical proposition.

CARVER: It's not a practical proposition. When I first developed the sonic hologram ten years ago—boy, it's almost ten years ago—our requirement was that your head be locked in a fixed position in space. And over the ten years, I worked on it and worked on it because that was totally unacceptable to my customers, and I've developed it to the point where it has a degree of freedom that you would enjoy sitting in a concert-hall seat. You can move, you can do this, you can do this, you can do this, you can change your position, and it stays together—up there, out in space. I believe that two channels are enough to completely replicate a believable sense of it-could-have-happened. Maybe not facsimile reproduction, but a reproduction such that you could believe that it happened in the past and that you're really reexperiencing it. The approach that I take is to combine sonic holography with surround speakers. Sonic holography takes care of the frontal hemisphere—one of the limitations that the head freedom implied in the system was that it can't do the back, or it really can't do 180° and 180°, but it can do sort of like this, a nice large three-dimensional proscenium of sound—and the surround speakers do the back hemisphere and the side components. And it works out really well, or at least I think it could be made to work out really well because the ambient component of the sound field, the random phases and all the things that give the concert hall the loveliness and the patina of bigness, come from the randomized sound field components, and the imaging stuff comes from what Stanley's loudspeaker-binaural system or real binaural system would deliver. Combining those two with only two channels of hardware information I think can do it. I think that we have the technology to create the experience that we've been looking for. I think we're really close.

LIPSHITZ: We can do very sophisticated digital signal processing; that's coming more rapidly than we think, I believe.

McGRATH: There's a company that's working on that now. I've heard it.

CARVER: It doesn't matter whether it's digital or analog. It's irrelevant whether it's digital or not; it's psychoacoustics.

LIPSHITZ: It's psychoacoustic; that's true.

EDITOR: Let's talk about hardware that a reader of *The Audio Critic* could go out and purchase and have the experience that we're discussing here. Any comments on that?

EARGLE: Yes. I think that the greatest likelihood for that listener right now is to go out and waste money. Because if he goes out and buys one of these things, like the Yamaha room synthesizer or whatever it is [**Digital Soundfield Processor—Ed.**] or any of a number of other things that

have built-in...

EDITOR: Lexicon?

EARGLE: Yes, the Lexicon at least will double as a decoder for a Dolby stereo-optical experience with your TV set. But my feeling and my experience is that the haphazard application of these things in most living rooms is just sheer disaster, that it's absolute garbage, and not a soul in this room would want to give it more than ten seconds' worth of listening. Properly implemented it can do some very nice things, but it is so hard in the present state of implementation.

LIPSHITZ: Is it bad, John, because people turn the reverb volume too high?

CARVER: Insufficient echo density.

LIPSHITZ: Is it like people's TV sets where they have the color intensity turned up too high?

EARGLE: It's some of that, and a lot of it is an insufficient number of "insignificant" sources. The thing is that they have two loudspeakers back here in the wrong place; what you really need—it's like specifying a surround channel in a motion picture theater. The idea is that—and I've done quite a bit of this lately—the way I perceive it is to have an ensemble of no less than 12 loudspeakers, each one running at a fairly low level and distributed in such a way that the ear can't really lock onto any one of them.

LIPSHITZ: That's an interesting point.

EARGLE: If you're going to give yourself the freedom of moving your head around, that freedom is given more leeway by having more sources playing at a lower level.

EDITOR: But that is immensely complicated and unlikely to happen.

EARGLE: Well, the cost of it... It could be done.

CLARK: I think that's very practical.

CARVER: Actually, I'm working on it right now. I'll have a thing like that out soon.

EDITOR: For 12 loudspeakers?

CARVER: Well, nine.

EDITOR: Nine? And you expect people to buy nine speakers?

LIPSHITZ: An odd number. That's interesting.

CLARK: When I was installing Dolby theater systems ten years ago, I always went for 12 or 14 small surround speakers, rather than a couple.

EDITOR: Well, theater sound—yes.

LIPSHITZ: Let me just give a reason, possibly, for the idea that many loudspeakers are better. We investigated recently the stereo errors in surround reproduction from the same signal sources through different numbers of loudspeakers. Let us suppose you're talking about the best surround sound system that we know of at the moment, which is Ambisonics; horizontal surround, for example, so you have three channels of information—the forward, sideways sound velocity components, and the pressure—and you can get those exactly right at the center of the loudspeaker array. It doesn't matter whether you use 4, 6, 8, 12, however many loudspeakers in the horizontal array, the pressure velocity will be right at the center, which you can

never get in stereo—you have to have speakers all around the listener. However, the error in the *neighborhood* of the center will reduce as you use more and more loudspeakers to reproduce that field, each being fed with the appropriate signal for its position from those same three channels. So what you're saying, John, is that the listener's ability to tell that he's got discrete loudspeakers scattered around him decreases as you use more speakers. That doesn't require more channels of information coming from the recording.

EARGLE: Sure. That's right.

CARVER: That's right.

CLARK: Why do you always say that Ambisonics is the best? I've been exposed to Ambisonics and I didn't think it was very good at all. I've heard others...

LIPSHITZ: On pure theoretical grounds it's got to be the best.

CLARK: On pure theoretical grounds?

LIPSHITZ: I get ten percent. (*General laughter.*)

CLARK: I'm glad that you said that because I don't think...

EARGLE: He was billed as our theorist, you see, in the introduction.

LIPSHITZ: No, no, no. I've done a little bit of Ambisonic experimentation, and we want to do a lot more. We have a four-channel digital recording capability now,

"...what's wrong with headphones? We have millions of people walking around with Walkman cassette players, using headphones. Isn't there a possibility for binaural?"

and we have a Soundfield microphone; we want to set up an eight- or ten-loudspeaker reproduction system with adjustable decoding and do some synthesizing and listening.

CLARK: How about two or three people listening at once? When I heard Ambisonics, I specifically moved off center because I know that it's easy to do these things where you create pressures at a person's ears—not easy, but it's doable—and I insist on moving off center because I can't view stereo listening as a single-person experience.

LIPSHITZ: Well, I agree with that...

CLARK: You should be able to sit where you want, within a range, and with friends, and listen to something. And you can't do that with Ambisonics.

LIPSHITZ: With stacked chairs, one above the other. (*Laughter.*) But, look, just briefly, regarding Bob's comment that what you're looking for maybe is not facsimile reproduction but credible reproduction—we've only done some experiments, a lot more needs to be done. But the thing that did impress me with the six-loudspeaker horizontal surround as compared with four is the extent to which it was much better when you were away from the center.

CARVER: Where were the speakers?

LIPSHITZ: They were well away from the

walls, which required a large room—to have a hexagon well away from the walls and a reasonable space inside. However, when I stood then on the boundary of that hexagon looking inwards and listening, I was aware that there was indeed a sound field; the image wasn't right, but it was pleasant, it was...

CARVER: Believable.

LIPSHITZ: ...almost believable. It was certainly not as good as it was at the center, but it was better than it was with fewer loudspeakers.

EARGLE: And certainly, you could have a sofa on which three people could sit side by side and really be almost in the eye of this storm, so to speak.

CLARK: To me, that's the goal, rather than precision reproduction of something.

CARVER: You know, even if you look at two rainbows, the rainbows are different. But if you look at a rainbow today and look at a rainbow tomorrow, it would seem to you to be exactly the same. But it's not because the rainbow is a little different. And that's what I mean by the difference from a facsimile—not as a negative. Facsimile reproduction doesn't mean it's bad...

LIPSHITZ: We can never get facsimile reproduction.

CARVER: That's right.

LIPSHITZ: So there are trade-offs. And they are engineering, they are psycho-acoustic, they are aesthetic, they are practical, but there are always trade-offs.

EARGLE: Over loudspeakers, you mean. It's possible... over headphones...

LIPSHITZ: Yes, and we have to make, I think, considered judgments if we want to really, significantly improve perceptions. I think we have to make considered judgments about which trade-offs to make. We're making the wrong trade-offs, I think. We can do better trade-offs now than we could in the past. But I want to ask you one thing. Given that loudspeaker reproduction raises a lot of problems and they're all room-related things, too—and the loudspeaker/room relationship is being investigated by some groups; it needs a lot more work done on it—what's wrong with headphones? We have millions of people walking around with Walkman cassette players, using headphones. Isn't there a possibility for binaural? We can transcode between true dummy-head binaural and loudspeaker stereo, and vice versa, approximately—not exactly but approximately. Is it inconceivable that people could sit in their living room with lightweight, unobtrusive headphones, listening?

CARVER: I tried to make a set of headphones once, and it's very difficult to make headphones work properly binaurally because of the small reflections associated with your eardrum and the ear cup on the headphones. Even one reflection—your brain thinks there is more than one arrival, and you can no longer make sense, real sense; you have to begin imagining again.

EARGLE: Well that's a problem that I think can be solved by proper designing of the phones.

LIPSHITZ: Technical problem.

CARVER: Yes, it's a technical problem. I ended up—it was hard—with a phone that was this big. It was this big, and I had this much sound-absorbing stuff, with the transducers at the end; I was blasting through sound-absorbing stuff, and you can imagine the equalization and the power that it took just to prevent the first reflection off whatever it was inside of my ear from interfering with the binaural effect. I stopped at that point—but it's not easy, it's not an easy job.

EARGLE: Well, you know, even plain-Jane binaural at this point, with a good dummy head, with some attention to the equalization problems, and not compounding any equalization errors, and having good headphones—I mean just normally good headphones—and measuring them, and tweaking the overall EQ to tear out that last little bit of error: it's amazing how accurate the whole thing can be and how palpable images up here are as opposed to images around you. I mean the Zuccarelli demonstration...

LIPSHITZ: I didn't hear that, unfortunately.

EARGLE: Really, it was amazing. The thing is that his attempts to play these things over loudspeakers—they don't work at all. They just don't work. But what he is doing is simply using a normal dummy head and paying very, very close attention to all the subsequent equalization in the process. It can work extremely well. The only problem that I have, and I think that a lot of people would have, is being locked into a frame of reference that has no inertia to it; you move your head up around like this, and that whole sound...

LIPSHITZ: Does that worry you? I've never found it to worry me.

EARGLE: It bothers me.

CARVER: It doesn't bother me, either.

EARGLE: What I would love to have would be almost a stationary pair of things out here that created a field.

LIPSHITZ: Jens Blauert did that with binaural. Yes, he had a mirror business—as he rotated his head, it changed the signals to the headphones.

EARGLE: Ben Bauer did something similar. He had a pair of induction coils on top, 90° apart, and it was just an amplitude change, which doesn't quite do it all, but...

LIPSHITZ: Yes, a little bit of matrixing of the field.

EARGLE: That's right, that's right—and you could move around like this, and the orchestra stayed *there*.

CARVER: Wasn't there a stereo chair once—that you sat in, and you could move your head?

EARGLE: Well, there still is. I saw one at the show with a subwoofer that shook the bottom of the chair!

CARVER: Oh, that's wonderful.

CLARK: I can give you a prescription of something that somebody might do to enjoy multiple-channel reproduction from two channels. And that is to start with two stereo loudspeakers—two very good stereo loudspeakers—and a relatively dead room; in my own case, which I've done and John has heard, I've used a third speaker in the

middle, which is mono-combined—this has been done many times in the past. In my case I use it forward, ahead of the left and right stereo speakers. I accomplished the forward placement actually with a time delay, for the left and right. So, physically, they're in a line. This tends to give, over a wide seating range, a believable frontal orientation. I won't claim pinpoint imaging for it, but I don't claim pinpoint imaging for a concert hall, either. This, combined with probably just left and right channels, again delayed through high-quality delay units feeding multiple loudspeakers behind, in the arrangement that Bob and Stan and John have been talking about, plus controls on this so that you can throttle it back and sort of adjust it to the music...

EDITOR: So how many in the rear?

CLARK: Well, say—the more the merrier—certainly no less than four but six or eight, ten, twelve...

EDITOR: Four in the rear?

CLARK: At least. Little, tiny speakers.

EDITOR: Tiny speakers?

CLARK: Perhaps. And they don't play very loud—because they don't need to, there are so many.

EDITOR: But isn't this basically what these various sound processor units do?

CLARK: No, this is much more of a two-

“I can give you a prescription of something that somebody might do to enjoy multiple-channel reproduction from two channels...purist audiophile grade...”

channel playback system, purist audiophile grade, than that because it doesn't use gain control to manipulate the sounds going into these. These are just fixed feeds. It isn't perfect, but I would say that if you start out with two excellent stereo speakers, adding all of this stuff with controls will always result...

EDITOR: What about the middle speaker? That can also be a tiny one?

CLARK: No, it should be another good one.

EDITOR: It should be similar to the left and right speakers?

CLARK: Yes, you add a third good speaker in between, and I would make the statement that—given that all of these things have controls on them—there will be an easy-to-achieve setting of controls that will *always* sound better than just the two stereo speakers.

EARGLE: There's something that you didn't follow through on, and I think it's worth mentioning here. When you delay the two side channels and electrically pull the center a little forward, you're making the middle signal arrive at your ears a little earlier, in which case you could afford to pull it back in level...

CLARK: Yes.

EARGLE: ...and in such a case avoid a whole lot of combing and having identical

signals coming out of adjacent speakers.

LIPSHITZ: How much do you pull it down?

CLARK: In level?

LIPSHITZ: Yes.

CLARK: I would say that some signal comes out just about equal to a left-only or right-only signal.

LIPSHITZ: So it's down 6 dB, say. And how much advance do you put on it?

CLARK: Three milliseconds. Two, three milliseconds.

LIPSHITZ: That's long.

CARVER: There's one other thing that you should follow through on, too. When you make a left-plus-right and a right signal, the amount of energy that's in the room, the total ratio of L + R and L - R that's in the room, is not correct. So one way to adjust it would be to put a -R signal here and a -L signal in here, just to compensate for the extra L + R and...

EDITOR: Bob, people who read the transcript of this discussion don't know what “here” means. You're scribbling.

CARVER: Well, you have to edit it.

EDITOR: I'm willing to edit your syntax a little bit but not your oral mathematics, please!

CLARK: Rather than do that in the front channels, as you have suggested, I would rather do it in the rear.

CARVER: Yes. It doesn't really matter. Just to keep the ratio correct.

LIPSHITZ: But, Bob, what you're saying, really, is that the direct-sound ratios are being distorted by the extra speaker in the middle. I think you're saying, indirectly, what I was saying: that the pressure-velocity relationships are not right in stereo, that the three-speaker arrangement has changed the pressure-velocity relationships from what you would have gotten with the two-speaker arrangement—but none of them will have it right. And, I think, as long as we continue with the frontal reproduction system and ancillary speakers that add the reverb, we still haven't got the direct sound right. Now it may be good enough; maybe people don't believe or feel that it's necessary to make it better, but it's still fundamentally wrong, and I think it should be made better—because until it is made better there will be aberrations due to the direct sound, let alone the reverb.

CLARK: You made a convincing argument to the opposite a page or so ago.

LIPSHITZ: No. No! The comment I was making before was that the area within which things are right gets bigger as you use more speakers to reproduce the same number of channels. And that is correct for the direct sound—for the reverberant sound it's probably also correct. But it's the direct sound that I was really referring to there.

CARVER: The real challenge is to take the existing two channels and to figure out how to do it best with just those two. This goes back to being practical. It would be nice if we had three channels or *n* channels, but...

EDITOR: There is a third channel on many master tapes.

CARVER: No, but on records and CD's there are only two channels.

EDITOR: John, you mix everything down to two channels then and there?

EARGLE: I do.

McGRATH: I do, too. Everything I do is two live.

EARGLE: I've never seen any reason to do it otherwise. If you can't make that mix...

CARVER: We've got to be practical.

EDITOR: Maybe the third channel would be a good idea, even if you don't use it.

LIPSHITZ: It's unfortunate that the CD was designed as a two- or four-channel medium. It has the four-channel capability; it's in the original specs; the discs would run at double speed; you'd shuttle out the frames alternately into two stereo decoders; and you'd get four channels that would only play for 37 minutes maximum, which unfortunately is not long enough for most classical stuff. A three-channel CD that would have played for 50 minutes—and three channels are all you need according to the surround-sound theory for horizontal surround—would have been a far better idea. Now, maybe it is possible because the audio samples are arranged in blocks of 12 in the CD frame, and 12 is divisible by 2, 3, 4, and 6. So there is a three-channel possibility, but it is not compatible with the current CD specs.

EARGLE: It wouldn't play back on a normal machine.

LIPSHITZ: Not even with a four-channel one because the normal machines are made to play the other speed.

EARGLE: Then backward compatibility is not a question of...

LIPSHITZ: No, there could be a code in the subcode, saying this is a three-channel CD.

CARVER: The realities of the marketplace are going to preclude it. So, your challenge as a researcher is to take the two channels and do the very best job you can, and somehow give us the theoretical tools to generate a three-dimensional sound field that's genuinely believable, but using only the two existing channels. And I see ways to do it.

EDITOR: The system suggested by Dave starts with two channels.

LIPSHITZ: Well, I don't know. What's wrong with headphones? Come on, let's go back to it. Now you're giving me a very difficult job, and I say—just make a pair of good headphones!

EARGLE: Listen, I saw a \$4000 pair of headphones at the CE Show.

LIPSHITZ: Probably good if they were...

EARGLE: I would have said they're excellent but they're not *that* good.

EDITOR: Stanley, it's not an acceptable solution—at least not a universally acceptable solution.

CARVER: If not theoretically—for the reasons that I just enunciated—but practically because nobody wants to do it that way. People don't like to listen with headphones on.

LIPSHITZ: Yes, but they can be converted. They didn't think ten years ago they'd be walking around the streets wearing

headphones.

EARGLE: There's a reason for that. You want to be on the move and you want to hear something—and you have accept headphones for that. But not many people are going to sit in their living room with those damn little things on.

LIPSHITZ: Ones that you don't even realize you're wearing! I mean, some of these lightweight ones you may not even know you're wearing—if they're open. You can talk, do all the normal things. If they used infrared or other means of getting the signal in, or if they have cables, there's no reason you can't move around...

EARGLE: So you can save a lot of money on loudspeakers.

LIPSHITZ: Seriously. Look, the point that Bob raised, which is the problem of the pinna, the reflections, the resonances—yes, you want a headphone that has a specified voltage-to-eardrum-pressure transfer characteristic.

CARVER: Merely a technical problem.

LIPSHITZ: It's a technical problem. I mean, it's been done. Doing it commercially, at a reasonable price and so on, is a problem, but it can be done.

EDITOR: You couldn't make *me* live that way.

CARVER: You know what? I just realized why I wouldn't want to do it. I really

“...somehow give us the theoretical tools to generate a three-dimensional sound field that's genuinely believable, but using only the two existing channels...I see ways to do it.”

didn't understand why, because it works okay as far as it goes. But I listen to music with my friends; it's really hard to talk to them while you're listening to music with headphones.

LIPSHITZ: It's hard to talk to them while a symphony orchestra is playing! And, in fact, the audience objects if you do. (*General laughter.*)

CARVER: I'm being more realistic.

LIPSHITZ: But if the symphony orchestra is playing at the proper level, you have to raise your voice to talk to the guy next to you during the loud bits. So that I wouldn't expect you to be able to whisper to the guy next to you when you've got headphones on and it's playing loudly.

CARVER: We were all trying to talk to Peter when he was working on his cassette machine and he had his headphones on. And I felt very isolated from him, emotionally isolated, just because he had those headphones on.

LIPSHITZ: But if you had a pair on as well?

CARVER: Then I would be totally emotionally isolated.

LIPSHITZ: No, no, no. You'd be on an equal footing.

CARVER: No, no. I disagree. To enjoy it, we must all share the same sound field without anything between us.

EDITOR: I don't think this controversy can be resolved. What you say, Stanley, is true for you, and what Bob and I are saying is true for us, “and never the twain shall meet.”

LIPSHITZ: Well, he is a marketer *par excellence*. If we could convince him that it's worth trying, he could market it. I am sorry—I believe that it is a real possibility.

CARVER: Of course.

LIPSHITZ: And from the technical point of view, it is a better solution.

CARVER: But it would be more fun to have the sound field shared by all, so we could talk to each other...

(*Everybody talking at once.*)

LIPSHITZ: Yes, it would be more fun to have the hologram reproduced in the room.

EARGLE: Listen, we don't have a reason for *not* liking headphones...

CARVER: So I think multiple speakers are a solution...

EDITOR: Headphone listening is a solitary pleasure.

EARGLE: Even worse than that; it doesn't have any tactile, any visceral involvement. And you know, there are things about having the floor shake, about listening to an organ recording—not on a concrete slab but on a real wooden floor—and things of this sort...

EDITOR: Absolutely. We didn't even go into that.

CARVER: That's another discussion altogether. A cheap way to extend the bass response of your system... It really works...

LIPSHITZ: You can do that. Your CD player will have the vibration output, which will feed to the floor-vibrator amplifier. It doesn't stop you from wearing headphones—to get the audio bug.

McGRATH: Deep bass out of phase. (*Laughs.*)

EDITOR: Dave, your system, your simple solution, fascinates me. Could a commercial product be developed that provides the correct feed for the various branches of the system, some very simple device?

CLARK: It can be purchased right now.

CARVER: You have to build it yourself.

CLARK: You have to buy the pieces and put it together, but all it requires are signal-delay units that do not have any kind of echo associated with them.

EDITOR: But if a music-loving dentist in Muncie, Indiana, wanted to do this, what would he have to do?

LIPSHITZ: Do your teeth free. (*Lots of te-hees.*)

CLARK: Go to Miami and talk to Peter McGrath, who would set up this kind of system for him—see him through this difficult period. (*This cracks up everybody.*)

LIPSHITZ: Give him counseling!

EDITOR: That's not an answer with a commercial future.

McGRATH: I would echo that. No pun intended.

LIPSHITZ: In Nashville, at the sound reinforcement conference of the Audio Engineering Society held in May '88, Jens Blauert, who is one of the world's foremost investigators of sound localization and so on, played a demonstration digital PCM F-1 format tape through Stax SR

Lambdas. He had two sets of things on the tape. One was monaural signals, which he had processed digitally—about 15-second snippets, which he had reverberated. So it starts with a signal in the middle of your head. Then he says, right, now we'll move it forwards 3 meters, 6 meters, 9 meters, in such and such a room; now we'll do it in such and such a room—well, I found it moved forwards and then it went off to the one side. Other people didn't. But it was very good; he was synthetically adding the room and giving you the spatial impression of the source in various locations. The rest of the tape was recordings made with the Aachen head. That's an ex-student who now calls himself Head Acoustics and has this very carefully equalized dummy-head recording system...

EDITOR: Yes, Duane Cooper was telling me about that.

LIPSHITZ: ...which plays through, basically, SR Lambdas, but the equalization is properly controlled, so you get things right at the eardrum position. And they'd gone, apparently, with Alfred Brendel and some major artists on a tour of Europe, and there were all these orchestras in different halls. Here is the Concertgebouw, here is the this and the that—and, damn it, those were amongst the very best binaural recordings I've ever heard. I mean they were not "in head"—those were "out of head" halls. Very natural sounding; not totally right—I don't know if you'll ever get it totally right without the image there. The best binaural I think that I have ever heard was when a student of mine took the KEMAR mannequin home with the PCM F-1 digital recording system, and he sat this thing in a chair in his living room, and he just ran the thing while he cooked in the kitchen, switched on the TV set, munched his munchies around the place, ran the bath upstairs—I don't know—and then he invited me around, and I sat in the chair—and you know, these were just Sennheisers, these weren't properly equalized headphones, they weren't right—but anyhow, this was ridiculous! Looking past the switches, the TV set on there, and you look up and he is standing there with a big grin on his face—but I mean it was so *right*. And we took the identical setup; we put a shirt on him; we put him in the front row of a chamber music concert, a string quartet—eh, it wasn't very good. But I am sure that if I had sat in the same chair, in the same hall, and if the musicians had sort of sat there pretending to play, it would have been superb.

CARVER: No, it wouldn't have. I disagree. Because your emotional response—wow, this is great!—was due to the fact that for the first time—not the first time but probably the first time in a long time—you were exposed to *normal sounds* through a high-fidelity system with these headphones on. But you've listened to *music* through high-fidelity systems for a long time, and your standards are much higher. You're easily blown away by the first experience.

LIPSHITZ: Maybe you're right. But with proper headphones, instead of these which were not proper for that reproduction,

would it have been better?

CARVER: No, because it was the first exposure, the "wow!" first exposure, and all of your senses are focusing on other things, other than the perfection or the excellence of...

LIPSHITZ: Okay, then let me put it to you this way, Bob. I sit in this chair; there are the musicians; I have on a pair of open headphones; the music starts; they're playing. I don't know which I'm listening to. It's an A/B test, and I have to write down: live or recorded. You don't believe that that could work?

CARVER: It's hard. It's hard.

LIPSHITZ: I think it could.

CARVER: It can almost work. To make it work, I think all you have to do is to get rid of those reflections, the little reflections that are inside.

EDITOR: Well, I think we've covered this subject pretty well.

CARVER: Can I say one more thing?

EDITOR: Yes. Sure.

CARVER: We have to make it work with two channels. We have to. We must. We must develop it with two channels so it will work with speakers, frontal hemisphere with point imaging, higher—as you said, sound sources up there, down there, out beyond the speakers—and make it work in the back.

"...you don't have to have [many] little speakers. You could have a distributed speaker in the wall... You could have a whole wall of speakers."

EDITOR: Now wait a minute, Bob. You're saying we must make it work with two channels. Nobody will disagree with you because it's very unlikely that more than two channels will be captured, at least the way things are now. But are you saying that it must be done with two loudspeakers?

CARVER: No, no. Two channels. Two channels of information.

EDITOR: And as many speakers as necessary?

CARVER: As many speakers as it takes. And then I would add some practical things.

EDITOR: I couldn't disagree with that. Is there anybody who basically disagrees with that?

McGRATH: No.

EARGLE: No. I think we're all on the same wavelength.

McGRATH: There are no housewives here, though.

CARVER: They should be little tiny speakers if possible.

LIPSHITZ: Well, there are two aspects with the speakers. But just one point. I believe the people talking about digital high-definition video are talking six digital audio channels—as what they want.

CARVER: It's unnecessary.

LIPSHITZ: Quite what they're going to do

with them I don't know, but they want more than two, and much more than two. You know, they're talking huge digital bandwidth for the video, I guess, oh, it's another half megahertz here or there for each audio channel. But the second point is: you don't have to have little speakers. You could have a distributed speaker in the wall. When you start thinking about it, a distributed electrostatic or planar electromagnetic...

CARVER: Yeah! That's the way to do it. Who!

McGRATH: I'm sorry, I don't follow. What do you mean by that?

CARVER: Who! That's the way to do it.

LIPSHITZ: You could have a whole wall of speakers. For example, this Ambisonic thing I was talking about for horizontal surround—from the same three channels, the more speakers the better. More accurate. With a continuous-strip loudspeaker, it's perfect. That's the limit of infinitely many speakers.

EDITOR: With the same drive?

LIPSHITZ: Yes, it's a distributed drive.

EARGLE: How many elements?

EDITOR: Oh, so not all segments of it are driven the same way. Different segments are driven different ways.

LIPSHITZ: Absolutely. It's a function of the angle, from the front.

CLARK: Continuously changing. Perhaps like a Quad ESL-63.

LIPSHITZ: Well, look at Peter Walker's original 1955 papers in *Wireless World*, three of them on electrostatic speaker design. And you will see there a wall loudspeaker consisting of capacitive electrostatic elements with inductors between them, in other words a delay line; you feed the left channel in that end and you feed the right channel in this end. Now it wouldn't work, but each of them would produce a tilted wave front coming through. You know, the left channel comes in at this angle, the right channel comes in this way. That doesn't give you stereo. But it's a distributed loudspeaker.

EDITOR: David Ogilvy, the famous adman, who wrote several books on the subject, once had a client who said to him after a new campaign presentation, "Mr. Ogilvy, what you have here is the mucus of a great idea." (*General hilarity.*) I think that's what we have here.

LIPSHITZ: Well, on that sanitary note...

McGRATH: But Stanley, you were talking about something when we were back in the domain of two speakers and you said that there was a great deal of work that's being done on the digital processing. What do you know about that?

LIPSHITZ: There are two projects on the way that I'm aware of; there may be others. There is what is called the Archimedes project that KEF, Bang & Olufsen, and the Danish Technical University are involved in, which is funded to the tune of a few million dollars and is I think a three- or four-year project. It's on the way. The idea is to ascertain the audible influences of the room reflections on the sound. They have set up, I believe it's 33 point-source loudspeakers, in a huge anechoic chamber they

have at the Technical University. KEF has designed these spherical loudspeakers with their coaxial coincident driver that they have now developed, in a special—spherical—low diffraction—configuration, electronically equalized to be as near as damn it a pure point source, and there are 33 of these, I believe, positioned in the chamber, each being fed from its own digital signal processing channel, so that they can create—well, I think they're going to feed 65 synthetic reflections through this array all around the listener, so they can take the signal, process it, and get psycho-acoustic judgments to determine what matters. Then the second part, I guess, would be—what can we do about it? Now Floyd Toole at the National Research Council in Canada has got a number of Canadian loudspeaker companies and other interested parties working on what sounds basically like a very similar project, but it has a more practical orientation. That is to develop a technology to overcome those things, find out what matters. He has already done some work along those lines; he gave a paper in Los Angeles this past November on the effect of room reflections; and the technology is going to be digital signal processing. There are DSP chips now that can do a great deal, and it is indeed feasible to do these things. I believe that within ten years we will have them in our preamplifiers. Possibly even within five. It's going to happen faster than we know.

CARVER: Within 18 months. Yes!

LIPSHITZ: Eighteen months? Faster than I thought, then.

EDITOR: Are we all agreed, though, that there's nothing that a nontechnical but highly motivated consumer can do *today* to efficiently and effectively and more or less economically introduce this kind of surround sound in his listening room?

CLARK: You said there is nothing?

EDITOR: Is there? What can he do next week?

CLARK: There's what I suggested.

EDITOR: When I asked you where's the hardware, you said you have to buy it yourself and put it together yourself.

CLARK: That's what you have to do with a hi-fi system anyway. It's no big deal.

EARGLE: Look, everybody is really saying the same thing here. On a limited basis, you can go out and buy the pieces and bits, the delay lines and such, but the proper implementation is going to have to be done by more or less a specialist. There may be some people who are smart enough to do it themselves—anybody around this table could—but the average user, the average person who may want this, might be totally bewildered by the whole thing. So he'd have to have somebody who could do it for him, who would provide the service of setting it up and telling him how to use it and how to fix it when it didn't work right. Short of that, the only other thing is this trivial Dolby stereo decoding thing to watch movies with, which is fairly easy to implement, and since it really relies on discrete things from speakers at a time that are derived through switching and coefficient bending in the matrix, it's relatively

obvious in what it does, and it doesn't really create a continuum of a surround effect but it creates a discrete kind of surround effect to match what the movie was doing.

CARVER: Yes, it works great with the movies.

EARGLE: And that's about all that can be done at this time.

CLARK: The *Lexicon* has different modes and will control seven loudspeakers.

EARGLE: That's right, but again, outside of somebody coming in and setting it up for you, I think that you're going to have a lot of trouble with it.

LIPSHITZ: Well, Peter should comment on this.

McGRATH: Well, we do sell them and we do set them up.

LIPSHITZ: Look, you've got two classes of listeners. The audiophile, surely, is potentially in the market for this kind of thing. He doesn't mind setting it up...

EARGLE: The audio/videophile.

EDITOR: Of what's currently available, do you all feel that *Lexicon* has greater potential than the others?

McGRATH: I think it's the best thing I've ever heard in terms of that type of application.

EARGLE: *Lexicon*, yes. Easily.

McGRATH: By far. It's staggeringly good in that respect, and we are selling them.

“Of what's currently available, do you all feel that *Lexicon* has greater potential than the others?” “I think it's the best thing I've ever heard [for] that type of application.”

EDITOR: What are the alternatives? The *Yamaha* is one alternative...

EARGLE: It isn't as good. In fact, I don't mind going on record as saying that the big fault with the *Yamaha*...

EDITOR: And there's a *dbx*, isn't there?

McGRATH: The *dbx* doesn't compete with the *Lexicon*.

EARGLE: The *Yamaha* synthesizes the reverberant field through all the trickery of the trade, except that it combines L + R and operates on that. So ultimately the signal does become a statistical reverberant signal, but the early reflections that it generates are all mono. Whereas the *Lexicon*, it's “bad” stereo, and so it comes out stereo all the time.

CLARK: I would disqualify *Yamaha* from this.

EARGLE: I would, too. On that basis. Bert Whyte, if you will recall, gave it a very bad mark in *Audio*. I mean, he couldn't stand to listen to the *Yamaha* for that reason. Because it was mono. The reverberant field was derived from a mono input, and that's not the way to do it.

LIPSHITZ: Just an aside. Dave Griesinger, who is the *Lexicon* reverberation man—I think he was the designer of the *Lexicon* device we talked about—will be, I believe, presenting a paper at the conference in May in Toronto on digital audio, the AES

conference, and he will be talking about digital reverberators.

EARGLE: He knows a lot about it.

McGRATH: He is the granddaddy of them all in that.

EARGLE: That's right.

EDITOR: I'm getting a *Lexicon* unit for review. You have something to add, Bob?

CARVER: I just wanted to ask a question of John. You said about the *Yamaha*, that's just not the way to do it. Implying that, well, of course it should be better if it's in two channels. I believe that since the whole thing is randomized in the end...

EARGLE: In the end. But in the beginning it isn't.

CARVER: I know, I know. But I believe that if you retain some of the amplitude component of the stereo signal, the L - R component, and get a mono signal that has a great deal of the L - R component in it, which is the stereo component, you can do a lot with that, and that it doesn't matter in the end whether you hang on to the left and the right or hang on to the stereo component even in a mono signal, since it's all mixed up and randomized in the end.

EARGLE: Well, okay. If you're only going to feed a single reverberation system with a single input, your best choice is probably L - R rather than L + R. Wait! May I continue?

EDITOR: Stanley is shaking his head.

EARGLE: But he is being very, very quiet; he's just shaking his head. The reason being that, if you do that, then center stage information isn't going to come reverberating around you, and only left and right information will or, conversely, difference information. What bothers a lot of people in these reverberant synthesizing schemes is having the soloist or the middle of the orchestra come barreling at you and echoing around the room.

CARVER: Oh, you can't have that.

LIPSHITZ: Yes, but if you use L - R as your source for the reverberant field, then the soloist is anechoic; in other words, the whole varies with the source direction. But that's true, of course, with L + R, too.

CARVER: You can use a mixture. You can use some L + R and some L - R in the mono signal that you derive your ambience signals with.

EARGLE: Okay, and bias it largely toward difference information or have it a continuously variable control. The point is you're much better off in terms of generating early side reflections if you keep it stereo.

LIPSHITZ: You see, there's a problem here, and that is that the nature of the recording, the L + R and the L - R, or the L and R relationship, depends on the way the recording was made.

CARVER: That's right.

LIPSHITZ: Now, your sonic hologram has to make certain assumptions that will be totally wrong with some recordings and quite good with other recordings. And synthetic reverberation, too—if it's going to make an assumption about, you know, do we use L + R or do we use L - R, what do we use for the reverberant signal?—is making similar assumptions about the recording. For example, coincident versus

spaced microphone techniques will have a profound effect on the kind of reverb you'll get with these two different methods.

EDITOR: Let me ask you this. I think we're all assuming here that all this processing for now and for the future will be digital. I just want to ask you very generally—after a hundred years of analog, are we going to have a hundred years of digital, more or less the way we have it now? Obviously with a refined technology—but will this particular approach persist now in your opinion, or is it likely, or is it possible, that we'll have a totally different approach?

LIPSHITZ: Well, the reason for digital is simply that it's a more robust storage medium. Were it not for the storage problem, I don't think digital would be with us in audio.

EARGLE: As a recording medium, but I think in signal processing digital allows you to do a lot more than analog devices do.

LIPSHITZ: Yes, you're right. But the problem in audio is the storage. The storage and transmission. Many things can be done with analog with great effort that can be done relatively easily with digital methods. The big benefit so far for us, I think, has been that the digital method gives us a better storage and transmission medium, and I don't think that's going to change. And if you're asking whether there is something that will be a better medium than digital...

EDITOR: Is there an as yet unsuspected approach that may possibly be discovered?

LIPSHITZ: Not that I am aware of, not that I can conceive. You almost phrase it in a way as if you were asking, is there something that can be better than digital? And, you see, I claim that in principle there is no degradation in digital. And there is no degradation in analog until you try to store it or transmit it. If the digital medium itself, or the digital storage and recreation process itself, is free of degradations, there is no need to look for alternatives or better ones. So your question, I think, is a moot one. Once you have the capabilities of doing things so that there are no audibly perceptible degradations, put your efforts somewhere else. There are important things—room, loudspeaker, listener, psychoacoustics—there are big challenges to be met. But don't spend all your efforts on the storage business, which can't be audibly improved. I'm not saying digital systems are perfect; they're not, as currently implemented. Neither are analog ones. But don't put a lot of effort into looking for alternative systems when these things can be improved to the point where their imperfections are not perceptible and when there are bigger challenges elsewhere.

McGRATH: But even if we were to assume that there might be some logical alternative in the progression and evolution of audio, I'd say it is clear that digital obviously will be here a long time and we're going to just see it manifest itself everywhere. We're going to see it manifest

itself in term of room-to-room transmission, cables, loudspeakers, D/A's inside of speakers; it's just starting. I think it would be foolhardy to suggest that anything at this point is going to come along and usurp it. The potentials are just beginning to be scratched, obviously.

CARVER: I wanted to follow up on Stanley's comment. Put your work into psychoacoustics and the speakers. I think that's the next frontier for home audio. We need to understand how we hear things, why we hear things, and what we can practically do about it in a living room, so people can really bring home nirvana.

EARGLE: Well, let me postulate a case here. Let's say that you take two research and development groups, experimental groups in audio. One group you're going to give a set of point-source loudspeakers to. Or it might be a system built up of woofers, midranges, and tweeters, but each one ostensibly a point source. There are a lot of speakers like this; that's why I pull that out of the air. Okay, and you give these people that and a listening room of their choice to develop a recording system, to develop any kind of room enhancement system, or whatever. The next group, completely operating in a different county, no communication between the two, will have a pair of electrostatic loudspeakers. And

"The big benefit so far for us, I think, has been that the digital method gives us a better storage and transmission medium, and I don't think that's going to change."

you're going to give them the same challenge. What are your end results going to be and how different are they going to be?

EDITOR: Very different.

CARVER: I'm not so sure about that.

EARGLE: I don't know whether they'd be very different but I'm sure, because of the totally different methods of launching sound into a space, that the solutions they come up with and the values they establish in the process would be significantly different.

EDITOR: I think that's a very, very fundamental point, and it raises the bottom-line question of what should be standardized first: the playback system or the recording system?

LIPSHITZ: Well, what are we trying to do?

EARGLE: Well, okay. On the subject of standardizing a recording system—those of us who commit things to two tracks are making some bold decisions at the time, whether we realize it or not. And we're making those either based upon previous experience of what we know works, previous spacings that we know work, or if we're starting from scratch we make our judgments based upon a set of loudspeakers right in the "green room" adjacent to the room that we're recording in. The fact is that if I go in with a pair of omni micro-

phones—which I don't, but a lot of people do—and space them maybe upwards of six or eight feet apart, and if those are being monitored over loudspeakers with 30 or 40 degrees spacing between, you're going to have a great wash of sound with a great big whopping hole in the middle, and you're going to have other problems, too. However, if you monitor that recording with very closely spaced loudspeakers—and I'm talking about 15 degrees, 15 to 20 degrees, which a lot of people play at; the subtended angle may be that small in many homes—that recording will begin to take on focus and body, and sound very, very nice under those conditions. It will still have the combining problems in mono, but we're not really going to worry about that; we're listening only in stereo. So that the very basic microphoning that you do, the very basic choices in the kind of mikes you use and where you put them, depend very much on how you play them back, how you monitor them.

EDITOR: How do we deal with this problem?

EARGLE: Well, I don't know. I don't think it's up to us to deal with it; it's up to record companies to deal with it; whatever signature a company wants to have is based upon what the owner of the company likes, what the chief producer likes.

McGRATH: I think that's absolutely correct.

EDITOR: But that means we need a different playback system for every company's recordings.

McGRATH: No, you buy the ones you like. (*Laughs.*)

LIPSHITZ: A different switch, like the old pre-RIAA days. You know, you set it to Delos or RCA or...

CARVER: Spaced arrays...

McGRATH: Harmonia Mundi... Audiofon...

LIPSHITZ: Harmonia Mundi, Type 1... (*Inside joke. General hilarity.*)

EDITOR: And you reposition your speakers.

CARVER: I have a preamp with the names of the records on it, just like that. An old, old one.

EARGLE: No record company wants to think in terms of its records fitting only over a given kind of loudspeaker. Every record company wants to think that its product is going to sound good over all loudspeakers, including the front seat of your car.

LIPSHITZ: You have a number of playback rooms. You have your CBS room and your...

EARGLE: I like the idea of calibrating the preamp or your ambience machine in terms of labels.

McGRATH: Or engineer's name I think is even more specific.

LIPSHITZ: Well, of course, with elaborate processing... But Peter's question is a very good question. He is saying, look, unless you standardize the recording how can you know how to play it back? Or unless you standardize the playback how can you know how to make the recording? Now, one can conceive of the situation where it

doesn't matter how the recording is made; we pass it through processor box A, and out comes a standardized format, called the Lipshitz format.

EARGLE: Type 1. (*Laughter.*)

LIPSHITZ: Yes, Type 1. Then you pass it through processor box B, where you now reprocess it to your reproduction preference or format or room or whatever. And the interchange format is the Lipshitz format. Now, I mean, that's not really that facetious.

McGRATH: And it's not that farfetched, either.

LIPSHITZ: No. But it would be more sensible to standardize something. And your question is: what do you standardize? Well, I think you have to start with how we hear, and then make some kind of rational decisions as to what is an achievable compromise quantity of information that one can imagine transmitting, and what makes a sensible way of transmitting it once you've made that decision—and standardize that as the format. That information. And then you ask yourself, well, how do I capture the sound and convert it into that format, so that from that I can reproduce it? It's something along the lines of what the Ambisonics people asked themselves, with surround sound. What's wrong with the existing systems; what is it that we really want to try to achieve; what is the sort of basic, minimum, first-order set of information that we need to be able to achieve that? Then they standardized that as the four-channel pressure/velocity signals, three orthogonal velocity signals, forward, sideways, and up-down, and the pressure signal. From those you can do a first-order reconstruction to get the pressure and the velocities right. If you wanted to do a second-order reconstruction, you need nine channels, not just four. That would be the next stage, nine channels and of course a hell of a lot more than nine loudspeakers. But that is sensible; I'm not saying it's the only way, or the best way, but it seems the best way to me for that kind of order. You have to follow a rational path.

CARVER: However, we're stuck with two. John, when you make a recording, do you think of which speakers the customers are going to use? Do you make them for sort of point sources or for electrostatics or dipoles or Bose speakers or...

EARGLE: No. Most definitely not Bose.

LIPSHITZ: "This recording is not to be listened to through the following loudspeakers." (*Laughter.*)

EARGLE: It will self-destruct over anything except an XYZ loudspeaker.

McGRATH: Should you accept this impossible mission, it will self-destruct.

EARGLE: As a matter of fact, Bob, there are so many pressing decisions at the time; the two hours before a session are not easy times, normally. That's when you're checking everything out and making sure that it's all working, and it isn't always working exactly right all the time. And there are always problems on stage; there are always placement problems; the conductor wants to talk about something; and

you end up—basically, if you've worked the room before and have had a successful recording—you end up as a point of departure putting the mikes exactly where you had them the time before, as best you can document it, and the players exactly where you had them before, and all the hall treatments exactly as you had them before. And then from that point on, when the whistle blows, you're on union time; you can't screw around with anything more. You make a very sudden decision in the first 30 seconds, and if it's not right you've got to stop, take a five-minute break...

CARVER: And that's on union time?

EARGLE: No, the break isn't. You're only allowed 20 minutes break time per hour, and you go out and solve the problem; you don't sit there and wonder if you have a problem. You've got to make a decision. And that's very hard to do sometimes. Do you really have a problem? Do you think you do? Is it the opening excerpt that he's playing for you that really has the problem, and it will be okay later? And you've got to make a decision at that point to do one of several things. Usually you end up making minute microphone adjustments, either fore or aft or up or down, on the frontal mikes, and that makes a big difference.

CARVER: Minute? Like inches or feet?

EARGLE: Inches. Six inches would be a

"...when you make a recording, do you think of... point sources or electrostatics or dipoles or Bose speakers?"
"No. Most definitely not Bose."

big change.

CARVER: Wow.

EARGLE: When you're already nine feet above a bunch of violin players, coming down six inches is going to change the texture audibly. It will. Then there might be a matter of balances, if you have house mikes for example. Three dB more of the room is going to be a significant difference, and you've got to make *that* decision. So, to come back to your question, you can't really worry at that point about loudspeakers because you've got noisy machines going in the same room, you've got an air-conditioning unit in the room where you work; in other words, it's rarely ideal from the point of view of being able to optimize everything, unless you're paying for an experimental session.

McGRATH: And loudspeakers that you know and love sound like absolute strangers in nine out of the ten rooms you put them in, so you're completely at a loss.

LIPSHITZ: You may use headphones.

EARGLE: I use headphones.

CARVER: So you really can't listen to your work as you envision it, completely, until you're home with it in the sanctity of your house.

McGRATH: That's it.

EARGLE: That's exactly it.

McGRATH: Oh, boy, it's exactly the same

thing. I come back from San Francisco...

EARGLE: You wonder if you've got it, sometimes. And then you have that moment of relief.

McGRATH: Yeah, you just let it sit there, and you wonder as the tape is going round, and then you say—ah! Oh, my God!

CARVER: Peter, are the speakers that you used to play it back direct radiators or dipoles?

McGRATH: For me the moment of truth generally is in the Quad ESL-63's.

CARVER: Okay. Dipoles.

McGRATH: Yes, dipoles.

LIPSHITZ: I have four Quad ESL-63's.

CARVER: John, how about you?

EARGLE: I use a pair of the JBL 250Ti's at home, and I take them on sessions whenever I can, whenever I can get them from a dealer.

CARVER: Okay, so it's split.

LIPSHITZ: I think you get used to your room and your speakers. Part of the point that John is making—especially if, as he has just mentioned, he uses headphones frequently for monitoring recordings—is that you get to know what the sound should be like on phones...

McGRATH: You do.

LIPSHITZ: ...to get what you want on speakers.

McGRATH: That's exactly it.

LIPSHITZ: A least approximately that. And the phones are a constant item which aren't room dependent. But you may make wrong decisions; you know, it won't always work out.

McGRATH: It's hard. But you at least have an idea.

EARGLE: The hardest decision to make is if you're doing a concerto, balancing the instrument with the orchestra. If you make a multitrack recording of this, you're only inviting the worst in people later, because they'll fight bitterly over balance.

LIPSHITZ: Turn me up a bit.

EARGLE: Yeah, that's right. If you lock yourself into a two-channel recording at the beginning—that's it.

EDITOR: That's interesting.

EARGLE: Whatever we all decided collectively to do is *it*, and nobody has any recourse.

EDITOR: Sorry, maestro. Can't change it.

EARGLE: Yeah. That has to be established very, very quickly, and I've been fortunate in dealing with solo performers who are not the prima donnas who want everything right up front. In other words, an easier balance. That doesn't happen very often, frankly. In fact, Tom Frost, whom many of you may know, an independent producer now, related the story to me that when he was working with CBS there was only one soloist, ever, who during the playback said, "Don't you think the piano is a little bit too loud?" And that was Leon Fleischer, a consummate musician who understands what balance is all about. But most of them want it right up in the middle.

LIPSHITZ: There are some very well-known violinists who produce grotesque recordings because they demand it. And they *can* demand it, I guess.

EARGLE: Well, but listen to what a violin player listens to.

McGRATH: He's got this thing right *here* all day long.

LIPSHITZ: I understand that. But he's not making the recording for himself.

EARGLE: But he may be able to sway the producer.

LIPSHITZ: That's exactly what I mean. And his name is big enough that he can command that, and so he gets consistently bad balances.

EARGLE: That's right.

EDITOR: This may be a good moment to become more specific about recording techniques.

LIPSHITZ: But one thing first. You're asking about standardized formats, and that's where this started. And then Bob was talking two channels. I think I would like to say this—that if you then circumscribe it further to say, standardize the two-channel format, I think you have to talk about ear signals. That would be the only sensible two-channel format to standardize, whether it's eardrum pressure or entrance-to-ear-canal pressure or whatever. All the talk that we have had so far is talking about recording acoustic events. I think that's sort of a given. That's what proves it.

EARGLE: That's the hardest thing to do. The other is a purely creative painting of pictures.

LIPSHITZ: If you can do that, you can do the others. You can manipulate the sound many ways. What's difficult to get is the reality. But if you want to standardize a two-channel one, I think it's got to be binaurally related.

EDITOR: Even though it may be loud-speaker binaural or whatever.

LIPSHITZ: You standardize the standard thing; you process it for the other formats.

CARVER: That's right. That's irrelevant. But, you know, the saving grace here is that our ear/brain system is so marvelous at using any number of sounds to make us believe that we really are listening to an event that could have happened. There is a bunch of realities possible from one format or another, and our brain will make up for any discrepancy, and it will still seem as if it could have been real. I don't think it's a critical problem, I really don't. I think on this problem, this issue of a format, we can make a mountain out of a molehill. That's what I believe.

LIPSHITZ: It doesn't matter to the user if there is painless processing to whatever he wants. You know, you don't worry about the fact that when you press the Dolby C button the signal is being processed a particular way. What you know is that that type requires that button to get the right result coming out. If he had to twiddle all sorts of equalization knobs and what have you before he could play the tape, that would be a major headache. The point is it's a standardized format. And you want to choose a format which will give you maximum flexibility.

EDITOR: Bob, I didn't quite understand what you were saying. Are you saying that this alienation of the recording format from the playback format is unimportant or

irrelevant?

CARVER: Oh, I'm almost saying that but not quite. It's not unimportant and it's not irrelevant. But it's not such a bad, horrible, difficult, insurmountable problem. For example, from the practical point of view, we might say, my goodness, the recording engineers all have their own magical mixture to make a sound field that they enjoy, and there's no way that there's going to ever be a format that will be established. And I believe that.

EDITOR: The format doesn't prevent the individualized application thereof.

LIPSHITZ: No, we have a standardized playback format, not a standardized room or loudspeaker or relationship, and we have stereo, two channels—that's standardized.

EDITOR: That's right.

LIPSHITZ: You presuppose that for every recording you make; you do not presuppose binaural.

CARVER: That's right. And the requirement is that binaural, or some form of binaural, was [*probably meant "should be"*—*Ed.*] presupposed by John and recording engineers. But actually...

EARGLE: No, no, no. It really isn't so.

EDITOR: He didn't say that, Bob.

CARVER: That's what I thought *you* said.

EARGLE: No, no.

“...there's a body of general practice among recording engineers who are successful today. And that's about the only degree of standardization you're likely to find.”

EDITOR: No. I have no strong opinion—I have no right to any strong opinions—on this subject, not being a practitioner in that area. But I do feel that some sort of standardization is necessary. Otherwise it's a free-for-all. And this is one of the reasons why we are not satisfied all the time.

EARGLE: Look, there's a body of general practice among recording engineers who are successful today. And that's about the only degree of standardization you're likely to find. It's a body of common practice, and many musicians are exposed to all of these people, working around as they do, because many groups today record for various companies. And we all learn from each other; we all steal from each other; we analyze each other's work. So, there is commonality.

EDITOR: Well, if there's a commonality there, then maybe that should be accepted as the guidelines for the playback system.

CARVER: Yes.

EDITOR: Stanley is not happy with that.

CARVER: No, I am happy with that. I am very happy with it.

EDITOR: It's not a professorial concept, admittedly.

LIPSHITZ: It wasn't a professorial frown. (*General laughter.*)

EARGLE: I will tell you gentlemen this: that every time I've taken a recording I had

made into an LEDE control room, I have heard altogether too much middle of the orchestra. In other words, the violins sound drawn into the middle instead of spread out, and any soloist just sort of hangs there much, much louder. I think I know why that's happening. I'm used to listening to my product—to the things that I do—at home, and in most rooms you normally have a bunch of early side reflections; in other words the “light” into the room is the front end, and you get early side reflections which enhance the spread. Now, if I were monitoring a classical recording in an LEDE control room, I would do all the tricks that I knew. I would splay the coincident pair out, so that the summing on axis would be much less; I would tend to take any flanking microphones and raise them to pull things out. Now, when I play *that* recording back at home, what would I have? A big hole in the middle. So, the thing is that you just have to be aware of all this. I put forth the notion that, as good as the LEDE approach is for certain kinds of music creation, for generally auditing classical material to be played back in a lot of living rooms it may not give you ideal results.

LIPSHITZ: You see, we're getting a bit of a conflict here, at least an apparent conflict. And that is between a theoretical, ideal system, or what we might want to achieve, and reality. Now, what I said before is that I think, if you wanted to standardize a two-channel system, the logical way to go would be to standardize something based on ear signals and process it from that to get other things. If you're saying, well look, there's a reality out there; people have existing systems; we are “two-channel;” so if you want to standardize a two-channel system, shouldn't you standardize something based on what the average listener uses, which is not ear based and is not binaural...

EARGLE: It's room based.

LIPSHITZ: ...and is not live-end-dead-end or anechoic? That is true. But my point was that, from a theoretical point of view, that standard that you've just mentioned, John, would not be the best standard. It may be the best practical standard; it may be the most sensible thing to do; that is what's being done—it's a de facto, pragmatic thing.

CARVER: And a live-end-dead-end room more closely approaches an ear signal playback system.

LIPSHITZ: But the question, ultimately, was: what's the best we can do? Where should we be going? Yes, with the live-end-dead-end thing you hear more of what's in the recording. In principle, if you could reproduce the surround sound field, probably you would want to suppress your room because you don't want to listen to Symphony Hall inside your listening room; it's not credible. You want to get rid of your room. And it does depend on the type of speakers one monitors on. People who monitor with dipoles probably want to suppress their room more than people who do not monitor with dipoles. That exactly, I think, correlates with what John was say-

ing about the nature of the image width and the spread that you get, depending on the live-end-dead-end versus reflective front end of the room. Those are realities.

EDITOR: Very often, in other disciplines, the de facto standard becomes the official standard.

EARGLE: In addition to the things we've been talking about here—variations in imaging caused by the room and so forth—there's also another very fundamental problem, and that's the general equalization curve on loudspeakers. There are a lot of loudspeakers that are dead flat on axis; there are not so many that are flat in terms of overall power response because of the narrowing of the overall polar pattern. If you make a recording for a system that has flat power response and play it back over one that has rolled-off power response, that's exactly what you're going to get and it ain't gonna sound right.

LIPSHITZ: And not everybody agrees when they say flat power response. What do you mean? When I say flat power response, I mean 4π steradians. I mean omniscience. Most people, when you say flat power, they seem to think horizontally flat—and that can be an enormous difference. True flat power is *very* bright.

EARGLE: Well, we're talking about a constant solid angle, whatever that solid angle might be. If you maintain flat on axis anywhere in that solid angle, you have flat power response.

LIPSHITZ: Yes, if you say "constant solid angle." (*Lipshitz and Eargle continue to discuss this in whispers—naughty, naughty!—while the following is being said.*)

EDITOR: We're getting ahead of ourselves. This is a fascinating subject, and I think we should focus on it at some length later. Dave, you had your hand up a while ago and you were somehow bypassed.

CLARK: I wanted to make a comment on that standardization. It might be—and you hinted at this—too lofty a goal to standardize on the ear signals. One problem I have with that is—of course you're going to say processing will fix everything—but an implication is that, as I turn my head, the orchestra goes with me rather than staying here.

CARVER: Oh, no. No, no, no, no, no.

LIPSHITZ: The recording is made with a fixed head.

CARVER: No, no. You can do it so it doesn't do that.

CLARK: I knew you'd say that. I suppose that it can be done. But we're talking about something that's very complicated.

EDITOR: That's the starting point, not the product.

CLARK: What's that?

EDITOR: I think this is what Stanley was saying, that you have to start somewhere, and the only logical place to start is pressure here, at my left ear, and pressure here, at my right ear.

CLARK: I heard him correctly. I think that's what I'm disagreeing with.

EDITOR: Once you have that you can manipulate it any way you like.

LIPSHITZ: Well, Dave, if we made a recording with a dummy head—I'm not say-

ing we must, it doesn't matter how you do it—but if you did it with a dummy head, you'd want the head to be fixed; I don't think you'd want it to move. Now, your complaint then would be that if you reproduced it with headphones and you moved your head, it would be unnatural.

CLARK: Right.

LIPSHITZ: And I think Bob was saying, ah, but I can fix that.

CLARK: Which I believe you can. Let me go on with this. What I wanted to say is that I think that you're proposing something that's very idealistic, and if we could only put our energies into standardizing one thing, maybe rather than standardizing something idealistic and the ultimate, a practical interim standard could be made, which would be a standardized playback environment. It's what I would suggest. That environment would be derived from what we have in the room now, and this would follow what Floyd Toole did, very closely.

CARVER: That's a great idea.

EARGLE: Well, there is an IEC standard playback room.

CLARK: That's Toole's.

EDITOR: But standardizing your room is part of the solution; it's not the entire solution.

CLARK: I think it is because if we had a

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standardized playback room—and standard within a range, this is what Toole had—the recording engineers would do whatever is needed, all of their tricks, in order to make it sound the way they wanted it to sound in that room.

EDITOR: Out of conventionally spaced speakers, one left, one right?

LIPSHITZ: It's not standardized. Only the room is standardized.

EARGLE: That's only part of the problem.

EDITOR: If you move your speakers around in your standard room, you won't get the same sound.

CLARK: No, no. You asked me what I'd standardize. So that's what I propose to talk about—what I would standardize. Number one, the room.

EDITOR: Okay.

CLARK: Number two, the position of the speakers in the room.

EDITOR: Ah! Sorry.

EARGLE: And equalization, and the solid angle at the speakers—the power response.

CLARK: What I would actually standardize is a reflection signature that you get.

CARVER: Oh! Yeah! I agree with that.

McGRATH: Bipolar speakers and straight radiators would be totally different in that regard.

CLARK: Not necessarily.

CARVER: So what? It doesn't matter.

LIPSHITZ: Now you standardize the reproduction system, essentially.

CLARK: Yes.

LIPSHITZ: If you say we've got to fix the room, and the position of the speakers, and the polar patterns—you know, the type of radiators—and the way the listeners sit...

CARVER: No, not all of that.

LIPSHITZ: But then you've fixed the whole playback system. Once you've done that, then I guess the format is pretty circumscribed. But what I was aiming at is that the...

CLARK: Let me finish this, and then I'll be all through. Recording engineers could then do as much as they could, knowing how it was going to be played back; you don't have to install that standardized system in your living room; it will still work; but if you're going for the ultimate as we audiophiles are, you would try to produce this reflection pattern, even if your room didn't look quite right, by a combination of room and speakers.

LIPSHITZ: It's like a color card to make sure you've got your processing right when you develop the film.

CLARK: Exactly.

LIPSHITZ: So the recording engineer would have one of these systems, with the specified loudspeakers in the specified places, and the listening chair in the specified place, and that would be his reference.

CLARK: I'm not tying it down that much.

LIPSHITZ: It doesn't mean he would prefer to listen in this; it doesn't mean he would listen for pleasure in that; but it means he would use that as the standardizing criterion.

CLARK: That's not exactly what I mean. You'd have a range of things—what you need to accomplish. You wouldn't specify the loudspeakers.

CARVER: You would specify the reverberation pattern.

CLARK: Right.

* * *

CLARK: You could improve upon this in playback. You could come up with something that had additional speakers, perhaps with the time delays or whatever, that actually took the standardized thing that the recording was made for and made an improvement on that, made it more realistic. It's possible that the standard you chose wouldn't give you—even though the recording was focused towards it—the best you could get. But I think with something fixed, and fixed close to what we have right now... We have a standard for home playback right now, to an extent; we have—I'll claim this—the speakers out from the wall; we have an initial delay gap in every good sound system; there are some early reflections, but I would say that in the best ones they're minimized, so there's an initial delay gap. There is 60° between the speakers; it almost never varies...

EARGLE: That's pretty wide. I like 45° much better.

CLARK: Well, sixty, forty-five, you know where... (*Clark tends to stop when interrupted.—Ed.*)

LIPSHITZ: Just one very brief aside here. The original Bell stereo experiments, as written up, had I think a 37° subtended angle from the speakers at the listeners, which is very narrow—which is perhaps why the spaced omni experiments came out satisfactory.

CLARK: It was even less than 37°, wasn't it?

LIPSHITZ: It was asymmetrical, too; the listeners weren't in the center—it's funny. But it was a small angle, a lot less than 60°.

CLARK: I thought it was less than 37°. Oh, 60° included!

LIPSHITZ: Yes, I mean a 37° included angle.

CLARK: What I mean is the speakers' 60° included angle between them...

EARGLE: That's *big*. When you're talking about an equilateral triangle, that's...

CLARK: Equilateral, right.

CARVER: That was the Bell thing? Equilateral?

LIPSHITZ: No, no, no. The Bell was about 37°.

CLARK: Much closer. But my point is that if we took what we have now and we just fixed it into this IEC-like standard kind of a thing, people would know what to make recordings for, and we'd know what to start improving upon in playback, and I think that's in fact what we do right now; it's just that that standard is a little nebulous. Is it 60°, is it 45°...?

EDITOR: So you think it might be realistic just to tighten it up a little bit, make it a little bit more formal, and there would be some improvement, and that's a standard that could actually happen and that we could live with.

CLARK: Yes.

EARGLE: Yeah, but it's not likely to happen as a matter of consensus among practitioners.

EDITOR: Yes. Exactly. I think we've sort of exhausted this subject, and I'd like to go on to recording techniques, microphones, microphone placement—I know there are some strong opinions in this room.

EARGLE: That's a very, very heavy set of topics that deserves to be gone into and not interrupted. Are we going to have a spot of lunch?

EDITOR: Oh, absolutely. In a few minutes. Shall we stop now? It doesn't matter. Or let me pick a shorter topic. This is a little bit unrelated. I'll change the subject flamboyantly and throw this at you. You're a pretty bright bunch here; I don't think anybody would deny that. Do you feel that this stuff, audio, challenges your intellect to a sufficient degree?

EARGLE: Absolutely.

EDITOR: Okay.

CARVER: I'd have a brain meltdown if it challenged me any more.

EARGLE: I have very, very little video challenge. I am with video the way most musicians are with audio.

McGRATH: That's a very good analogy.

LIPSHITZ: I don't have a color TV set.

EARGLE: Well, I have one of those.

LIPSHITZ: I have for 18 years refused to buy one, and I should have not made that

resolve because it is better than black and white, but I will refuse to buy one until the system is better. It's not good enough.

CARVER: Oh, the system is fabulous. The system itself is a miracle, and I cannot believe that RCA did it.

LIPSHITZ: But what you get in practice is not what RCA did.

CARVER: In the best examples of the best practice and the best production of that practice, it's almost impossible to ask for anything better—at the proper reference viewing distance. *(They continue the debate sotto voce.)*

EDITOR: Let's hear from all the others. Dave, would you rather apply your keen mind to some other discipline?

CLARK: I'm very happy in the audio business. I've been doing it for 25 years or more.

EARGLE: It's all I know.

CLARK: An interesting thing to me is that when I started out it was mainly circuitry. I won't say that I totally mastered it, of course, but it got kind of old after a while, and I started discovering loudspeakers and rooms and acoustics, and compared to what I spend most of my time on now, that's gotten a little bit old—certainly not mastered but a little bit old—and the thing now is *perception* of what goes on. And I can't see an end to that. It's fascinating,

“Do you feel that this stuff, audio, challenges your intellect to a sufficient degree?”

“I'd have a brain meltdown if it challenged me any more.”

extremely difficult...

EDITOR: That's certainly the most challenging subject.

CLARK: Sound reproduction is an illusion; that's why I resist so many of the things Stanley says about trying to make it “perfect” for people. I accept the challenge of making the illusion work rather than extracting the exact right signals.

EDITOR: The reason why I even brought up the subject is that a lot of people say, come on, audio—it's elementary stuff, it's trivial. What do you think, Stanley?

LIPSHITZ: Let me give you my point of view. The audio area is not a popular area in academia. It normally would be done in electrical engineering departments. Well, I am in applied mathematics and physics, and my colleague John Vanderkooy is in physics, with a training in engineering physics. So we have a broad background, jointly. But it is not a glamour area; it is looked down upon by many people; but there are very big challenges there. I mean there are big questions, and they are not the kinds of questions that fall into any simple little categories. They are not circuit design problems, although circuit design and signal processing problems are part of the thing; it is not pure acoustics, although acoustics is part of it; it's not pure psychoacoustics, but that is part of it.

It's not just physics or mathematics or electrical or mechanical or acoustical engineering; it's a synthesis of a lot of these things. It's very challenging, and there are a lot of questions that aren't answered, and they're difficult questions. Many of the easy things we know how to do. Yes, it is challenging; there are big areas where work needs to be done, and there are enough things to keep us busy.

EARGLE: Well, I will say that, from the manufacturing point of view, it's very, very difficult to get new engineers to choose audio as a discipline to go into. Most of the people that you get are people who are sort of drawn to it, who are audio junkies, the way we all are here. Because people who are coming out of engineering school today have much more dashing challenges from other areas. They'll make more money; they'll rise faster through the ranks; there are very few people today coming out of school who really have that love of analog circuitry—and amplifiers are still analog devices for the most part. It's getting harder and harder to find people who will learn to love audio. I'm repeating myself now. You look for the person for whom it is the only thing.

EDITOR: It has to originate with a love of music.

EARGLE: That's right.

EDITOR: There is no other rationale, at least as far as I can see it. If you don't love music, how can you possibly love audio technology if you're a keen technologist?

McGRATH: Well, that is a premise that I would also appeal to very strongly in terms of the retailing of it, but unfortunately it's rarely the case. The love of the music is what got me interested in it in the first place, and the love of the toy and the gadgetry, etcetera. But by and large I would have to say that the vast majority of the people that I've met in this industry who sell the stuff are really not...

EDITOR: If you could live in the style to which you're accustomed on music alone, would you close the store? *(Laughter.)*

McGRATH: That's a tough question. I would have answered that question unhesitatingly maybe a year or so ago: yes. I would have done anything to have gotten out. But not now. I see some new challenges coming on the horizon in terms of marketing. And, as I said, for me the real goal is to try and see if there is a way that I can come up with, a way of marketing and attracting the person who loves music. And I think that's a very important goal.

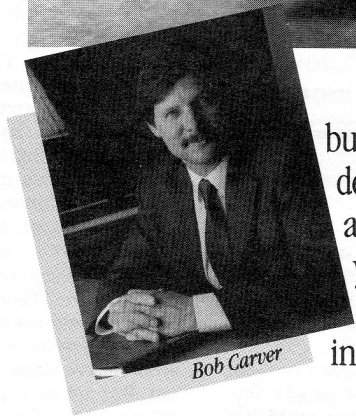
LIPSHITZ: Aren't there a lot of audiophile purchasers who have a handful of demonstration records and that's it?

McGRATH: And nothing more. That's correct.

LIPSHITZ: It's a perversion in some ways. McGRATH: It's a perversion, and that is something that I, in whatever way I possibly can, am trying to correct. I don't know how I'm going to do that yet. That's why I intend to stay in retail. I think that that's the only area. It's my charge, so to speak, to do that. It's not the manufacturers and it's not the writers of the magazines; I

(continued on page 39)

What's A Transfer F

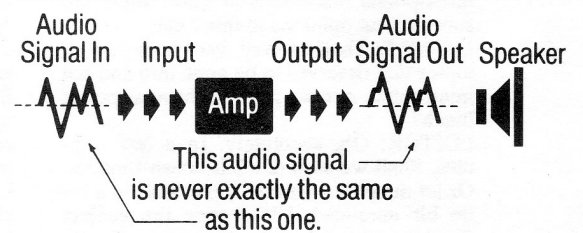


Good question, but before I get deeply into the answer, let me tell you a little bit about amplifiers in general.

Every amplifier known to humankind changes the audio signal just a little bit as it passes through from input to output. This is because, simply, no amplifier is absolutely perfect, and each must, because it exists in the real world, slightly modify the audio as it goes through.

Most modern amplifiers change and modify the audio signal very little, but all do it, and the subtle changes, different in each

amplifier design, are responsible for the characteristic 'sound' or 'sonic signature' of different designs. And each is ever so subtly unique.



The TRANSFER FUNCTION is simply the scientific expression of the exact way the audio signal is changed as it passes through. If you know the transfer function, and if you can give that same transfer function to ten different amplifier designs, they will all sound the same.

unction?

By Bob Carver



Does that mean a dirt cheap amplifier can be made to sound the same as a \$5,000 reference amp?

I wish it were so, but no, not by a long shot. In order to successfully give an amplifier a specific transfer function, the basic design must have fundamental performance characteristics that equal or exceed the reference amplifier from which the original transfer function was obtained.

For example, the 'dirt cheap' amp must have a lower noise floor than the reference; it must have instantaneous current and voltage rise time speeds as fast or faster; it must have an intrinsic input impedance equal to or greater than the reference.

Its output voltage swing must be greater, its phase shift must be less, and of course, its output power must be at least as much. Then, and only then, can the reference transfer function be successfully cloned into the 'copy-cat' amp, and unfortunately, the 'dirt cheap' amp becomes not so dirt cheap anymore.

Output current, heat sink metal, output voltage, and power... that's where most of the money is in an amplifier design.

But, Bob, how can your new M-4.0t amplifier at \$799 possibly deliver almost as much output current into 2 ohms as the *big* Krell?

Absolute Maximum Output Current, continuous, per channel, 2 ohm reactive load, both channels operating

AMPLIFIERS

Krell KSA 200

28

Carver M-4.0t

25

Threshold SA-2

22

I have a great patent, the Magnetic Field Power Supply, a power supply that can easily deliver five times as much current as any other power supply of the same manufacturing cost. That's how. And my patent doesn't run out for another 11 years.

Until then, or until my next ad,
Warmest regards,

Bob Carver

P.S. If you'd like to know more about my transfer functions, write to Carver Corporation, in care of me, at P. O. Box 1237, Lynnwood, WA 98046.

CARVER

Accurate

A JANIS BASS SYSTEM

FOR MANY YEARS A
REFERENCE STANDARD FOR SUBWOOFER PERFORMANCE
ITS THE CHOICE WHEN ONLY THE BEST WILL DO



ASK FOR OUR COMPLETE LITERATURE THE JANIS SUBWOOFERS

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NITTY GRITTY HYBRID

Now it is possible to achieve perfect record cleaning and state-of-the-art compact disc cleaning in one convenient and affordable unit. Nitty Gritty has just combined its .5Fi design with its CD cleaner to come up with the "Hybrid."

The Hybrid incorporates all the features of the 1.5Fi; things like: the velvet lined, hemicylindrical lip; capstan drive; cleaning fluid injection; 16 ounce fluid reservoir; powerful vacuum motor; and slide-out waste fluid tray. Everything that has made it the most popular record cleaner in the world.

Added to that in the Hybrid are all the unique features of the CD-1: bidirectional cleaning motion, motorized disc rotation, and built-in dust cover.

What is not built-in is the price and size of two separate cleaners; a dramatic savings in both categories.

How it works

When cleaning records the Hybrid operates exactly like a 1.5Fi: the cleaning fluid is injected, the record spindled and fluid applied during rotation, and then vacuumed dry.

When cleaning CD's, the user simply installs the CD adapter into the specially "keyed" capstan shaft, places the CD on to the adapter, applies the CD cleaning fluid, lowers the cleaning pad/dust cover, and activates the drive motor. The weight of the dust cover automatically provides exactly the right amount of cleaning action.

The conversion back to record cleaner takes all of 1½ seconds. The CD adapter and CD cleaning fluid have built-in storage facilities located on the Hybrid's top.

The Hybrid is available in either of two versions: Hybrid 1 comes with the economical vinyl-wrapped cabinet and the Hybrid 2 comes in our gorgeous, solid oak cabinet.

The Hybrid solves the problem of where to put two cleaning machines. And which to buy first. It's cost and space effective. It has a built-in dust cover. And it offers state-of-the-art cleaning of both records and CD's.

It's the one and only Nitty Gritty Hybrid.

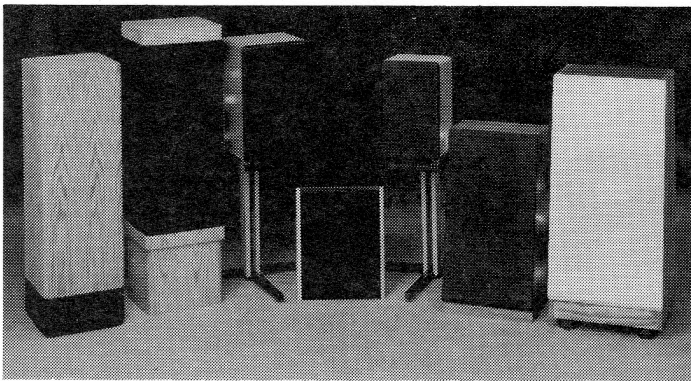
**The first
cleaning machine
for both
records and
compact discs**



**For audiophiles
who want
the best
of both
worlds**



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UNIT F4
MONTCLAIR, CA 91763
(714) 625-5525



AC Speaker Kits for 1988-89

Audiophiles all around the world are getting to know us for the outstanding value of our products, as well as the respect we treat our customers with. While much of the audio industry has stagnated, we've been growing at a strong, steady rate. Why?

Our factory direct marketing, combined with a very efficient operation, allow us to sell our products at prices that save you a lot of money.

Our kits are refined enough that anyone can put them together in a few hours. We supply you with everything you need.

Our kits may be purchased without cabinets for those of you with woodworking skills, or desiring a custom installation.

Our kits feature the highest level of engineering. We spend thousands of hours on the research and development of our systems.

You are guaranteed full satisfaction when you purchase one of our kits. If you're not pleased, you can return them for a full refund. Try them in your home, in your system.

THE MAIN REASON; Sound quality. Our speakers just plain sound more like music than other speakers anywhere near their price range.

As an importer/distributor for high-quality speaker components, we have the opportunity to choose from the best quality components manufactured around the world. Additionally, we have the capability of having custom drive units

made to our specific requirements if we need them.

We are able to provide all these raw components to hobbyists and manufacturers at advantageous prices. If you need woofers, midranges, tweeters, capacitors, coils, resistors, dampening materials, electronic cross-overs, or anything else for building speakers, look at our catalog.

We stock:

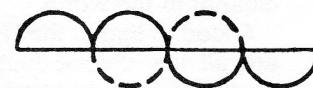
PERFECT LAY WINDING

DYNAUDIO'

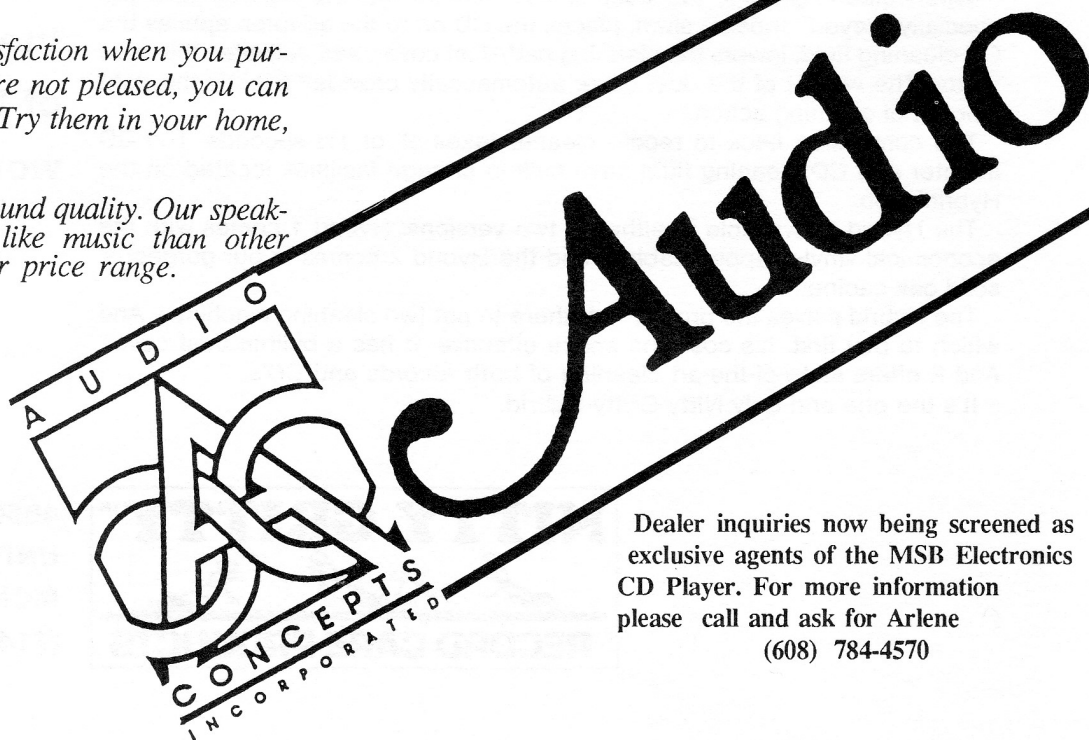
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FOTAL



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Dealer inquiries now being screened as exclusive agents of the MSB Electronics CD Player. For more information please call and ask for Arlene
(608) 784-4570



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Monday - Friday; 9 am - 5 pm

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**Concepts,
Inc!**



The MSB CD Player is a high quality unit that employs the very latest analog and digital technology. It is a direct coupled, DC Servo design that uses a newly released, (early 88) opamp for the first gain stage. This device has a very high slew rate, 330 v/us and fast settling (120 Ns to .1%).

The same family of opamps, that are used for the gain stage, are also used in the power supply regulator circuit, in fact these are even faster than the signal path devices and higher gain. The circuit is more stable with the higher frequency devices in the power supply possibly due to being able to react faster to any changes in load demand from the signal path opamp. The speed and low output impedance of this power supply configuration is truly remarkable.

The circuit board is single sided to prevent any high frequency coupling between the top and bottom traces. The traces are wider and more direct than with most boards. Also close attention was paid to the way the ground traces, and power feed traces, were routed. This type of circuit layout is normally only needed in very high frequency applications but this was done in order to allow each circuit to run at the highest frequency possible, without oscillation, and thus reduce the phase shift in the feedback loops of each stage.

The output filter circuit has been changed to make it have less impact on the audio passband. This circuit also uses a discrete amplifier that decreases the effect of phase shifts normally associated with active filters.

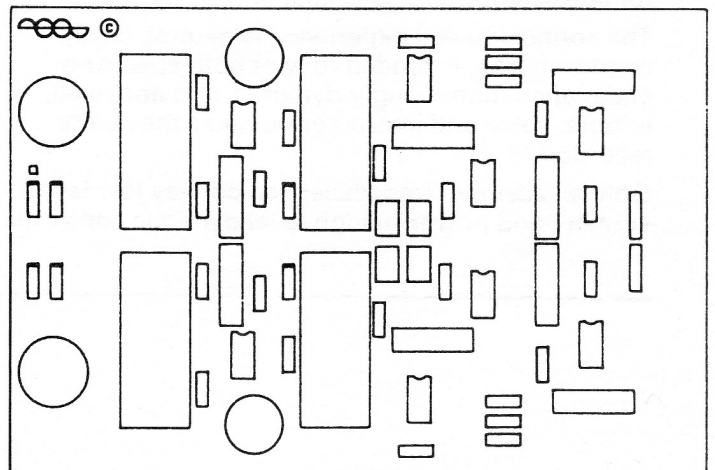
Development of this unit has taken over two years, but 14 years of experience in the field of analog control systems has gone into it. It is a relatively simple, but elegant circuit using parts of much higher quality and cost than the original. Polyprop 2.5% caps in signal path, 10% polyprop in most other places. Resistors are 1% metal film, the board is FR-4 material.

Over the last several years, many hundreds of hours of testing and listening have gone into the final version. In fact, every unit is carefully evaluated and listened to before it leaves the factory.

Listen to the MSB CD player in your system, and enjoy the music as it was meant to be heard!

Purchase a completely modified player, or your Magnavox player can be modified. See your local dealer, or call us direct for more information (608) 784-4570.

Circuit Board Drawing



THE
WAVEFORM[®]
LOUDSPEAKER

C L A R I T Y
N E U T R A L I T Y
D Y N A M I C

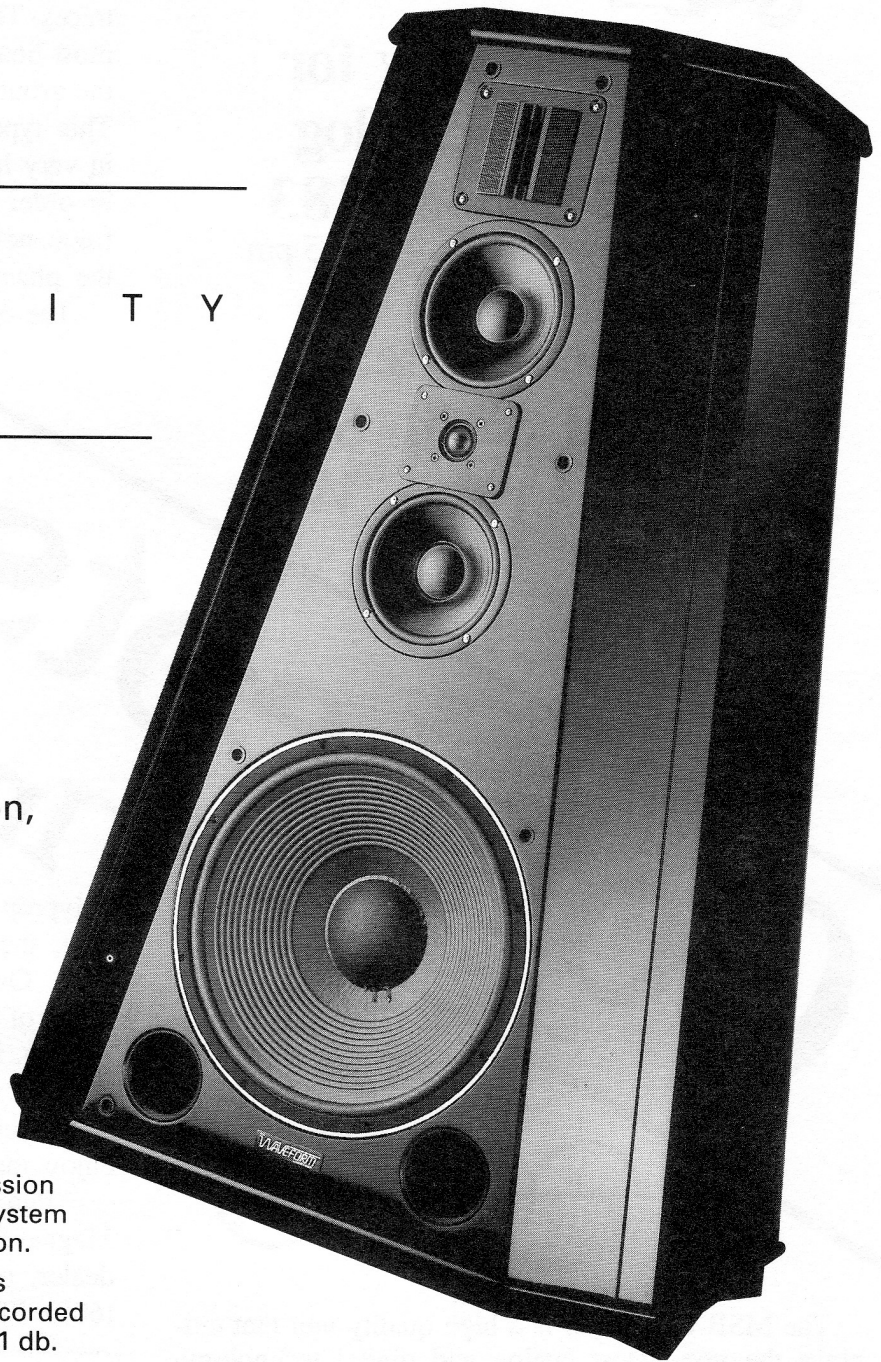
Flat frequency, wide dispersion,
controllable room bass,
rugged, reliable and
repeatable!

Dimitri Shostakovich stated that "music is fundamentally the expression of emotion." State of the art standards of accuracy come and go in hi-fi, when set by taste or proclamation. The Waveform loudspeaker is the highest product expression of a real standard setting measurement system utilizing subjective and objective evaluation.

Using Canada's NRC facility, each driver is anechoically measured, numbered and recorded for consistency and pair matching within 1 db.

The sound you will experience is neutral, clear, distortion free, extended fully at both spectrum ends, open, unnervingly dynamic, and above all, in tune, voice and instrumentation as they were recorded.

Only an accurate transducer can convey low level subtlety and powerful high level dynamic contrasts.



"Art is a product of voluntary work; it is man's expression of his joy in labour. Art is the intelligent production of beautiful things."
WILLIAM MORRIS

\$9,800⁰⁰ U.S.

Two speakers, 20 x 31 x 48, with
an external electronic crossover.

WAVEFORM RESEARCH

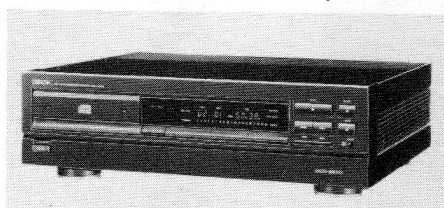
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Dealer inquiries invited.

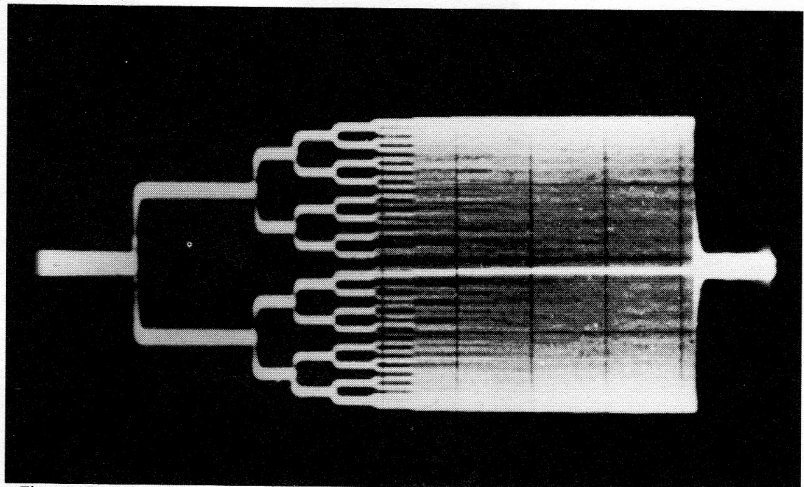
WHY IT TAKES A 20-BIT CD PLAYER TO APPROACH TRUE 16-BIT LINEARITY.

If human ingenuity could build the perfect 16-bit digital-to-analog converter, there would be no need for Denon's new 20-bit approach to building CD Players. Unfortunately, 16-bit players have always been susceptible to distortion-inducing non-linearities and quantization errors. This means they can't maintain accurate spacing between all of the 65,536 amplitude levels available from the 16-bit samples of the Compact Disc.

Enter Denon's "Delta" system. It combines the world's first 20-bit 8x resampling digital filter with the first true 20-bit linear converters to process each 16-bit sample to four additional digits of accuracy. (That's something like using 3.141593 as the value of "pi" when everyone else uses 3.14.)



DCD-3520 Compact Disc Player



This oscilloscope trace confirms the even spacing of amplitude levels in Denon's 20-bit system.

This is no mere computational trick: Denon 20-bit CD Players literally extract more music from the Compact Disc. They exhibit better dynamic range, lower noise, and lower distortion during quiet passages. In the process, Denon 20-bit machines reveal more of the low-level detail that defines musical timbre. On well-recorded CDs, you'll hear more of what makes a french horn sound like a french horn.

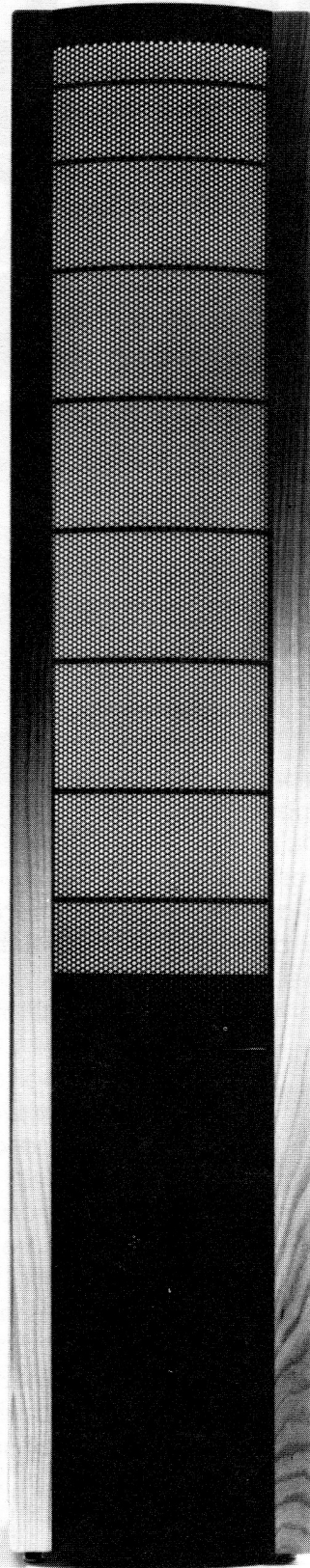
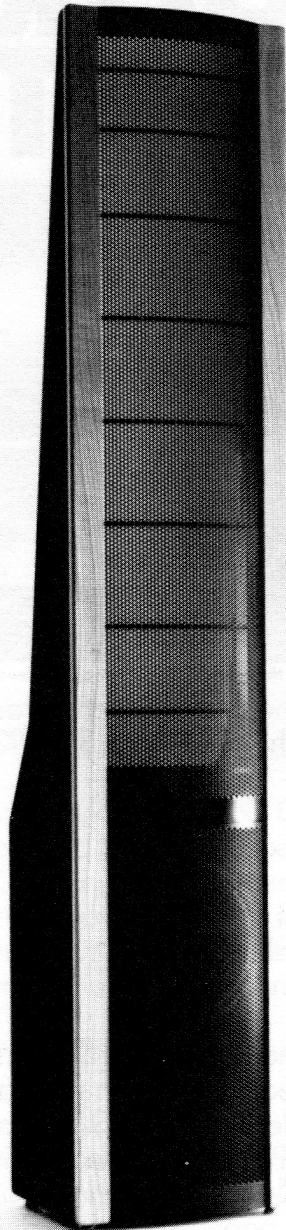
There's more. Since the days of Denon's early digital recorders, we've understood that not all digital bits are created equal. The digital word's Most Significant Bit (MSB) contributes 32,768 times the amplitude of the Least Significant Bit (LSB).

That's why every Denon Compact Disc Player since 1983 has included the Super Linear Converter—a circuit we use to hand-adjust the MSB of every Player for superior accuracy. Recognizing the wisdom of Denon's approach, independent academic papers have now identified D/A conversion error in the MSB as the primary culprit behind audible distortion in Compact Disc Players.

With Super Linear Converters, the 20-bit "Delta" circuit, and Denon refinements in power supply, laser transport and chassis design, the new Denon DCD-3520 and DCD-1520 elevate digital playback to a new level of musicality. In the process, they achieve the closest approach yet to true 16-bit linearity.

DENON

DESIGN INTEGRITY



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the electrostatic loudspeaker technology co.

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“A stunning realization of digital theory.”

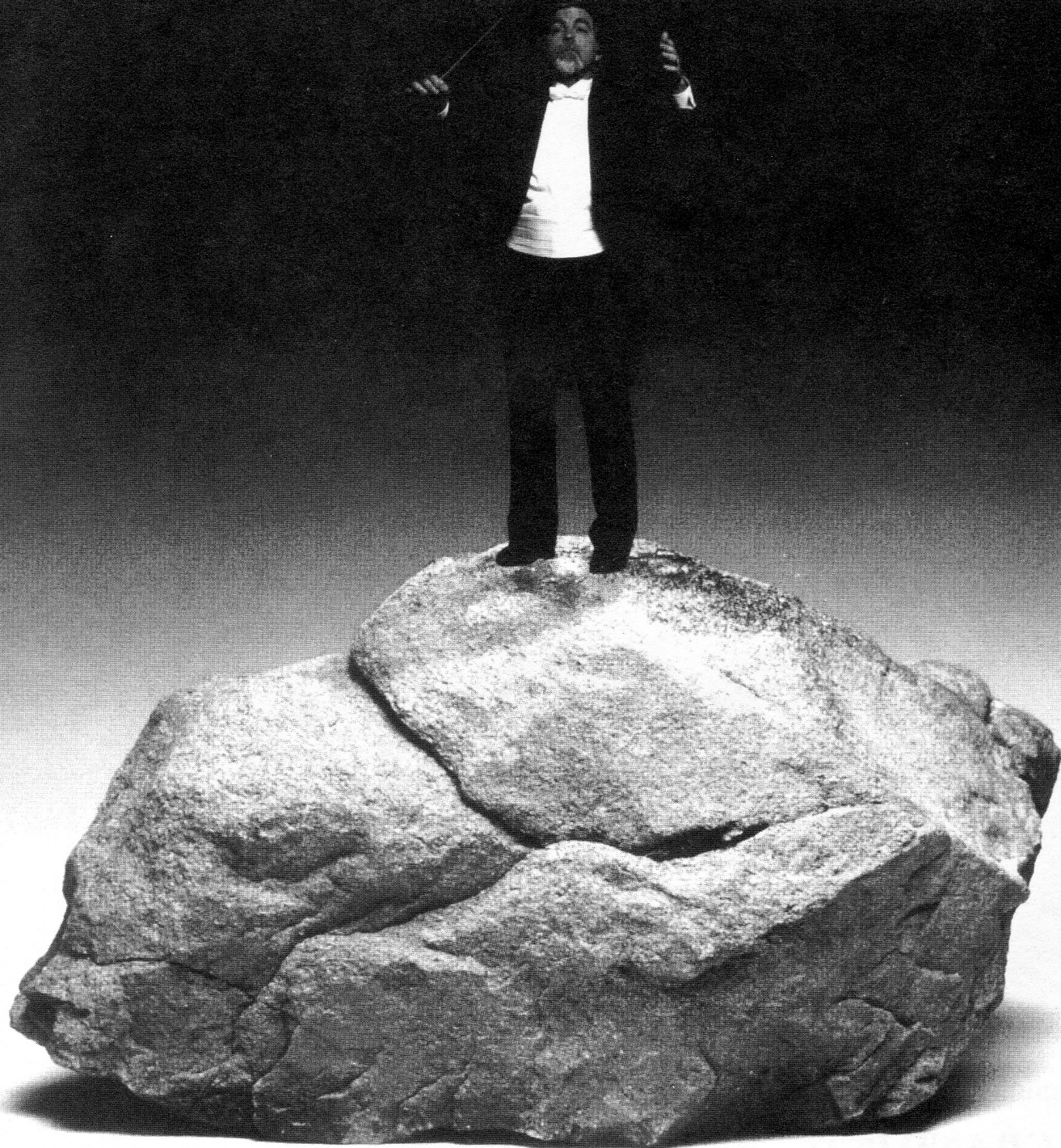
THE GRAND INTEGRA DX-G10 Compact Disc Player

- Linear 18 bit, 8x oversampling digital processing • Epoxy-damped D/A converters with calibrated accuracy to the 4th significant bit • Optical power supply stage • Dual transformers • Cast graphite and steel alloy anti-vibration chassis • Separate optical data paths for audio and control signals • Variable speed bidirectional disc scan • Absolute Phase control

Since the introduction of the M-510 amplifier, the name Grand Integra has been acknowledged by the high end community as the benchmark of Japanese audio technology. We are pleased to continue this tradition with the DX-G10 and other limited-production components for your pursuit of the elusive musical ideal.

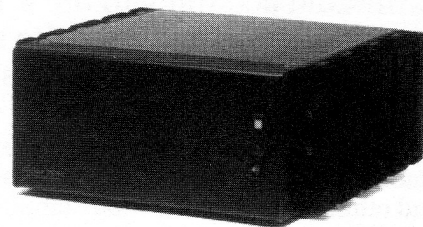
Grand Integra

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For hard Bach you need a Boulder.

From rolling overtures to smashing finales, our audio products will get the maestro in you moving. Take the Boulder 500AE Power Amplifier. Its engineering breaks new ground in sonic clarity, so you'll hear every note on a grand scale. And because it sounds magnificent in both balanced mono and stereo, you can orchestrate your system one step at a time. Like all our components, the Boulder 500AE conducts a solid performance you can take for granite. Audition it soon at a dealer near you.



Boulder
AMPLIFIERS, INC.

There's no stopping a Boulder.

Seminar 1989

(continued from page 27)

think it's really those of us in retail who are the interface between the creation of the product and the end user. It's our job to try and figure out how we attract those people to this product. And that's a stimulating thing to me, trying to figure out how to crack that particular nut. It's as exciting a thing as I can possibly ask for.

EDITOR: It's as big a job as any in the field.

EARGLE: Every worker in this business who is really serious about it makes no dis-

inction between vocation and avocation. I can plug away; I can make recordings all one week, I can listen to loudspeakers all the next week, and I still come home that evening and put on music and listen to it.

LIPSHITZ: But you know, it's a funny thing that many musicians don't attend concerts and probably don't do *that*. It's funny.

EARGLE: Okay. For a lot of musicians it's a nine-to-five job. I'm talking about a lot of fine players and a lot of fine symphony orchestras. I mean competent players, including many principals. These are peo-

ple who work their asses off; they teach, unless they are members of very large orchestras with large incomes; they have to teach to supplement everything; and when you've been rehearsing three hours a day and then have a concert that night, teaching that afternoon isn't much fun. And the last thing you want to do is play music on the weekend over your hi-fi system.

(The participants adjourned for lunch at this point. Part II of the transcript, which is somewhat longer and brings the seminar to its midnight conclusion, will appear in Issue No. 14.)

WOULDN'T IT BE GREAT IF...

...someone had the perception to make a box speaker completely transparent from top to bottom and double the apparent dynamic range?

Someone has. ACOUSTICAL MAGIC can do that for any commercially manufactured speaker today. (Except those already using ACOUSTICAL MAGIC.)

Looking back, approximately two years ago ACOUSTICAL MAGIC was

introduced to audiophiles for their approval. Almost 2000 customers later—and no negative reaction—our record tells us that we have been correct in what we say.

Phonos can be made to sound as clean and dynamic as any other source. We ship via UPS, \$17.00 per quart or \$58.00 per gallon, plus shipping costs. We will be happy to serve you, and we accept Visa or MasterCard.



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Hip Boots

Wading through the Mire of Misinformation in the Audio Press



As a weapon against irresponsible or downright fraudulent statements in the audio press, this column is a peashooter, without stopping power, able only to irritate and provoke, but that is better than doing nothing about these outrages against reason. When it comes to industry-wide deceptions like the claims for high-end wires and cables, we also have more elaborate countermeasures waiting in the wings.

“To avoid causing distress to small firms selling CD damping gadgets in small quantities, we have decided not to bring up specific names, although we have tested such items on our ABX setup and found them meaningless. They are solutions in search of a problem.”

—**The Audio Critic**, Issue No. 11, page 35

It is always a mistake to be soft on voodoo technology, and this was one of those mistakes. We even published what we figured was an unimportant half-page ad on such a gadget, an act of tolerance we are not particularly proud of. Meanwhile some not so small firms have gotten into the act; there is an attempt to create a mainstream market for these ridiculous items; so the time has come to blow the whistle on them a little more loudly.

Monster Cable (through Berkeley SoundLab)

“Are you hearing only 4/5th of Beethoven’s Fifth?” was the headline of the one-page, full-color ad we saw in *Audio* and *High Fidelity* in February and March of this year. It may also have appeared elsewhere, of course.

Under the headline were two photographs. The one on the left was a fuzzy picture of a CD, with the caption “Photo represents sound without Monster Cable’s CD SoundRing™.” The one on the right was a sharply detailed picture of a CD sporting a red ring around its edge, captioned “Photo represents sound with Monster Cable’s CD SoundRing™.” Very graphic—before and after. The name at the bottom of the ad was not Monster Cable but Berkeley SoundLab, possibly a mail-order arm of the Monster. There was a toll-free 800 number (“24 Hours a Day, 7 Days a Week”), a mail-order coupon as well, a price of \$29.95 for 24 or \$49.95 for 50 rings, and a policy statement including “just return it within 30 days for a prompt and courteous refund.” Big-time marketing this time, although we are not

sure how you return a highly adhesive, virtually nonremovable CD ring if you are “not delighted with the order you receive.” But wait, we are just coming to the good part.

A smaller insert photograph illustrates the “Tap Test.” You suspend the CD loosely on your finger, hold it close to your ear, and tap it. Lo and behold, it vibrates and makes a kind of ringing sound. Bad! The CD SoundRing by Monster Cable makes it good by providing damping as well as a “gyrostabilizer” effect. The copy does not state why the pits representing 0’s and 1’s should not be allowed to vibrate a little, as long as they are still recognizable as 0’s and 1’s. (Again, see page 35 of Issue No. 11 for the modicum of theory needed to understand this.) Instead, the ad throws in every cliché about depth, presence, soundstage, imaging, highs, lows, etc.—“the CD improvements anyone can hear.” We have seen street hawkers get arrested for smaller deceptions.

What is being shamelessly exploited here is the audiophile’s analog-conditioned reflex on the subject of mechanical imperfections. LP discs sound better if they are clamped, damped, and stabilized, so why not sell him the CD equivalent? Persuasion by bogus analogy is an old Madison Avenue stratagem. The glory of digital audio is that there is only a single worry—accurate encoding and decoding of 0’s and 1’s—instead of the myriad nagging little flaws and inaccuracies of analog reproduction. There is no such thing as a slightly distorted 0 or 1. Monster Cable has apparently decided that the digital market can profitably support additional worries, even if they are fictional.

We are not just setting a theory in opposition to a product here, although that would be sufficient when the theory is so firmly established. We have also done the test. What we tested was the original CD Ring manufactured by Sims Vibration Dynamics, distributed at the time by both

Euphonic Technology and AudioQuest. The Monster Cable product appears to be the exactly same thing, except that it is now available in blue, green, red, and yellow. (Did the marketing man come from Life Savers? That would explain the sophistication of the "Tap Test.")

We took two copies of the same orchestral CD, applied a CD Ring to one of them, and left the other one *au naturel*. Then we put these into two identical Philips-based CD players, which we had adjusted for equal 1 kHz test signal output within 0.10 to 0.15 dB and hooked up to our ABX double-blind comparator. Extensive double-blind switching and listening revealed no audible difference whatsoever between the two copies. It was hardly a surprise, as there was no mechanism known to us that could have caused a difference. (Please spare us the contrary reports by various underground reviewers, all based on pathetically unrigorous before-and-after listening coupled with a strong desire to discover a difference. A refutation must be based on equal or greater rigor.)

We find the Berkeley SoundLab ad and the general tone of the marketing effort behind it to be depressingly untutored and irresponsible. We are using those adjectives in preference to "fraudulent" only because there exists the outside possibility that these people actually believe their own voodoo. That, however, would be even more depressing.

Michael Fremer in *Goldmine*

Michael Fremer is listed on the masthead of *The Absolute Sound* under "Music Reviewers" with the title of "Senior Editor: Popular." That is not exactly a provenance suggesting scientific objectivity or scholarly detachment, but the article we are reacting to here actually appeared in the December 2, 1988 issue of *Goldmine*, a reasonably sane biweekly trade tabloid for record collectors, where it had been reprinted from *Music Connection* according to the footnote.

"What's Wrong with Compact Discs?" was the title of the article, labeled "A Commentary." It starts with the now stale canard of "laser rot," which is not even worth discussing at this point because, if it ever existed, it was a specific manufacturing defect rather than anything generic or permanent. But the article goes on to state: "CD's are to records what videos are to movies: sampled, scanned, and coarse, missing huge chunks of information. If your CD player sounds better than your turntable, you have a lousy turntable." And later: "Digital recording is a sick joke in its current state of development, but that's another article." And still later: "If you want fake, processed, artificial, lifeless, dimensionless sound from all your music, if you want one-note 'bass' where you can't tell a Hoffner from a Precision from a Jazzmaster, a pick from a thumb, go spend \$15 for the privilege and buy CD's."

Now, there are two possibilities. The first is that this Michael Fremer has various technical, musical, and intellectual credentials we are not aware of and simply knows more about digital signal processing, recording techniques,

equipment evaluation, and playback quality than the world's leading audio technologists, recording engineers, recording artists, and testing laboratories put together. In that case we should heed his contrary opinion. The other possibility is that he is a bratty, self-indulgent, scientifically undisciplined cultist with a sophomoric desire to attract attention by making outrageous and indefensible statements. Take your choice; there is no third possibility.

Anyone who has ever played one of John Eargle's, Craig Dory's, Jack Renner's, Keith Johnson's, or Tom Jung's CD's over a decent stereo system knows what to think of Michael Fremer's exudations. Mind you, he is not merely aligning himself with the dwindling ranks of anti-digital, analog diehards; he goes far beyond them by saying that CD's are hopelessly bad. What we cannot understand is where the editors of *Music Connection* and *Goldmine* are coming from in this matter. How and why did they decide to publish what even *The Absolute Sound* would not? And where does this kind of extracurricular tantrum by a Senior Editor leave the credibility of *The Absolute Sound*?

Dick Olsher in *Stereophile* (Not Again!)

This guy's *bête noire* is quite obviously your humble Editor. Just to be able to take a swipe at us, "DO" will not hesitate for a moment to make a jackass of himself. In the January 1989 issue of *Stereophile* he writes: "...a well-known reviewer on the comeback trail—OK, Peter Aczel—preferred the bass of the Carver 'Amazing' speaker to that of the Apogee Scintilla and Celestion SL600's. Speak about a blatant preference for heavy and featureless bass!"

We hate to tell you this, DO, because it undermines the entire school of reviewing you come from, but bass performance is not a matter of opinion. It is objectively quantifiable beyond argument—and then of course verifiable by ear. The Scintilla has roller-coaster bass response and all kinds of buzzes; the SL600 has no bass at all; the Carver has reasonably flat and very extended bass, the "heaviness" of which can be controlled by means of the passive line equalizer that comes with the package. (We are talking about the 1987-88 "Amazing," not the improved and higher-priced "Platinum" version, which we are about to test.)

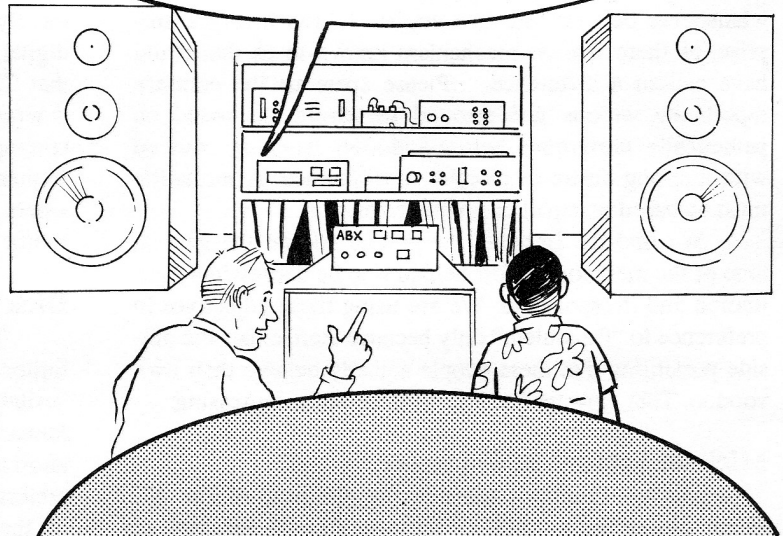
Of course, the whole article by DO on subwoofers, from which the above incidental tidbit was taken, is a mess. The man is simply not a clear thinker. Among other things, he believes that there is some kind of inevitable trade-off between the "quantity" and the "quality" of bass in a speaker system, as if he had never heard of such a thing as the *correct* quantity, which automatically results in the best quality. We have no intention to refute his article point by point—any more than we would wish to do so with *Mein Kampf* just because we believe in democracy—but we do wonder why every DO review must be prefaced with a screwed-up tutorial on the particular equipment category in question. Is he unsuccessfully imitating someone? And who could that be? ◇

In Your Ear

THE ABX SYNDROME



NEVER MIND WHETHER YOUR MARK LEVINSON IS HOOKED UP AS "A" AND MY AMP AS "B" OR VICE VERSA. I'VE MATCHED THE LEVELS WITHIN 0.1 dB, AND ALL YOU HAVE TO TELL ME IS WHETHER THE "X" SOUND IS THE SAME AS THE "A" SOUND OR THE SAME AS THE "B" SOUND.



LOOK, I AGREE THAT UNDER THESE CONDITIONS "A" AND "B" SOUND EXACTLY THE SAME. I CAN'T TELL THEM APART TO SAVE MY LIFE.



BUT THE MARK LEVINSON IS BETTER!



Correct Speaker Placement for Optimum Bass Response: A Simple Mathematical Method

By William Rasnake
President, Pacific Northwest Audio Society
Senior Product Planner, John Fluke Mfg. Co., Inc.

For the first time, the complex interaction of corner proximity and room shape is mathematically massaged to yield the theoretically and/or practically best speaker placement for smooth and extended low-frequency response in any room.

For years I have found the ideal positions in a room for speakers by using high-volume white noise and hours of experimentation. I carefully positioned both speakers until there were no longer any peaks or dips in the response as I walked around the general listening area. This procedure drove the wife, daughter, and cats out of the house until they were sure the torture was over. Experimentation is still a good procedure for checking midrange and treble smoothness, but this article is about using math and science to position speakers in your room for the best bass response. This is especially useful if the room has not been built yet! Some of the positions you find through this method may not be the best for the couch, the spouse, or the house, but I hope you will find at least one option that will work both musically and aesthetically.

Many fine articles, papers, and books about room resonances and corner positioning of speakers have been written. The ones I used most are listed in the references. My premise is that you can dramatically flatten the frequency response of a woofer by combining two theories: placing the woofer so it is in a favorable position with respect to the nearest corner, as well as in a good position to minimize resonances caused by the shape of the room. Like many good things in life, the answer isn't as easy as telling you to place the speakers 1/3 of the way down a wall. This is a start, however, and with a little effort and a simple calculator you will be able to improve bass clarity further and even lower frequency response.

Room dimensions and room resonances.

First, let's take a look at the effect room resonances have on a speaker's bass response. If you were to position yourself in every corner of the room and draw a straight line to every other corner in the room, you would end up with all the possible resonant lengths of the room. You would also have many different straight lines! Every sound

wavelength and harmonic that matches one of these lengths creates a resonant standing wave. The standing waves add to or subtract from the speaker output, depending on the speaker's position and the listener's position in the room.

These standing waves are created by three resonant modes. Axial resonant modes are created by the distance between facing parallel walls or floor and ceiling. Tangential resonant modes are created by the distances represented by the diagonals on the floor, walls, and ceiling. Oblique resonant modes are created by the distance through air from a corner to another corner. Since the axial resonant modes are twice as powerful as any other mode, let's examine how to avoid their effects.

The primary (fundamental) axial resonance occurs when sound has a wavelength equal to twice the distance between two facing walls (or floor and ceiling). To find the frequency, we must know the speed of sound and the distance between the two walls. At sea level the speed of sound is about 1127 feet per second (an international compromise between 1126.3 ft/s @ 20° C and 1128.4 ft/s @ 70° F). The primary (fundamental) axial resonant frequency is calculated by dividing 1127 by 2 times the distance between the walls (in feet). For example, a room that is 8' 10" high by 19' 4" wide by 21' 3" long (typical of a remodeled garage for a displaced audiophile and also the size of the newly built studio of **The Audio Critic**) has primary resonances of 63.8 Hz, 29.1 Hz, and 26.5 Hz ($1127/2 \times 8.83$, $1127/2 \times 19.33$, and $1127/2 \times 21.25$).

The dark line in Figure 1 represents the effect this has on the sound pressure level at locations between the walls. Halfway across the room (50% in Figure 1) there is a deep null. The lighter lines represent the harmonics. At the second harmonic of this frequency there is a peak at 50% and a deep null at 25%. Each additional harmonic causes new peaks and nulls to occur, some at the same location of the lower-frequency peaks and nulls. The room basically

becomes the inside of an organ pipe for low frequencies. It also means that a single-channel subwoofer should never be in the center of a wall.

Figure 2 plots only the minimum and maximum sound pressure levels versus position, for the primary (fundamental) resonance and each harmonic up to the sixth. As you vary the frequency, the sound pressure varies the least when you are 33.3% (1/3) of the way across the room. The next best positions are 20% or 40% (1/5 or 2/5) of the way across the room. The next best positions are 14.3%, 28.6%, or 42.9% (1/7, 2/7, or 3/7) of the way across the room. Note also that in Figure 2 there is more margin for error at the 33.3% (1/3) and 20% (1/5) positions. There is less margin for error at the 40% (2/5) position.

In other words, if you divide the distance between the walls by odd numbers, you will locate the points of least sound pressure variation; and the smaller the odd number, the smaller the variation. The corollary is also true: if you divide the distance between the walls by even numbers, you locate the points of maximum sound pressure variation; and the smaller the even number, the greater the variation (1/2, 1/4, 1/8, 3/8).

The 28.6% (2/7) position between walls may be a good position for planar speakers because planar speakers are velocity devices instead of pressure devices, and the sound pressure never quite reaches maximum in this position. If you are a "golden ratio" fan, this position (2/7 and 5/7) also divides the two speaker positions and the room walls into sections where the next number in the series is the sum of the preceding two (2/7 to the first wall, 3/7 between speakers, and 5/7 to the second wall; 5/7 equals the sum of 2/7 and 3/7).

At higher frequencies—above 500 to 1000 Hz—the peaks and nulls become so closely located to one another that the texture of the walls, sound absorption materials, furniture, and furnishings become the dominant factor in the character of the sound.

Table 1 will be used to calculate the height positions in your room that have minimum resonance. The results are the best heights from the floor for your speaker's woofer. A room with an 8-foot (96") ceiling would have 13.7", 19.2", 27.4", 32", 38.4", and 41.1" as minimum resonance positions. My choices are 19.2" (1/5), 27.4" (2/7), or 32" (1/3). If your speaker is floor-standing, the manufacturer has already made the choice for you.

Table 3 will be used to calculate the minimum resonant positions for the floor plan of your room. The intersections create a map of low-resonance positions for one corner of your room. If your room is L-shaped, or is not a rectangle, use the rectangular end nearest the speakers. Bass response for irregular rooms can be improved by properly positioning the woofer with respect to the nearest corner.

Finding an acceptable woofer position with respect to the nearest corner is also the next step. We all know that moving the speakers changes the bass response for better or

worse depending on the kind of music. A major factor is that the reflections from the floor and walls at the nearest corner cause destructive interference with the speaker's direct output. This interference adds to or subtracts from the direct output, depending on both the frequency and the position of the speaker. The result is more total power for some frequencies and less power for others. The goal is to keep the bass power response as flat as possible and get boost from the corner only at very low frequencies, where most speakers need help.

The relevant mathematical relationships.

You don't have to understand this paragraph and the equation below to enjoy the results. They are presented for the mathematically inclined. The total radiated power (at a given frequency) from a speaker near a corner is estimated by calculating the radiation resistance of the speaker in the corner compared to the radiation resistance in free space. The following equation is used to estimate the power:

$$R/R_0 = 1 + j_0(4\pi X/\lambda) + j_0(4\pi Y/\lambda) + j_0(4\pi Z/\lambda) \\ + j_0[4\pi(X^2 + Y^2)^{1/2}/\lambda] + j_0[4\pi(X^2 + Z^2)^{1/2}/\lambda] \\ + j_0[4\pi(Y^2 + Z^2)^{1/2}/\lambda] \\ + j_0[4\pi(X^2 + Y^2 + Z^2)^{1/2}/\lambda]$$

where

- R = radiation resistance
- R_0 = free-space radiation resistance
- $j_0(a)$ = $(\sin a)/a$
- π = 3.141592653589...
- λ = lambda, the wavelength of sound
- X, Y, Z = the perpendicular distances to the nearest walls and floor forming the corner

The graphs and tables use X as the shortest distance, set λ to 1 wavelength, and increment $X, Y,$ and Z versus λ . The only variable the user has control over is the perpendicular distance from the center of the woofer to the walls (and to the floor if the speaker is not floor-standing). So, you get to experiment with moving the speaker closer to or farther away from the back and side walls.

Figure 3 illustrates the effect on power output versus wavelength (which we will convert to frequency) of positioning a speaker exactly the same distance from the floor, back wall, and side wall (a ratio of 1:1:1). When this distance is about 0.28 of the sound's wavelength, there will be a deep null. The wavelength scale on the graph can be converted to frequency once we know the distance of X . For example, 24" is one wavelength of 564 Hz. If the center of a speaker's woofer is 24" high and 24" from both the back and side walls, we would have a deep null at about 158 Hz (0.28×564 Hz). If the walls are rigid (like concrete) and reflect all the sound, the null will be about 11.4 dB from the speaker's free air response. This is the worst-case position

with respect to the corner. Don't think of concrete walls as a detriment, though; they are actually more predictable and will be a benefit in the better solutions that follow.

Figure 4 illustrates power output variations if we choose the best ratio of distances I have found. That ratio is 1:1.67:2.46 instead of 1:1:1. Note that the power output variation is less than +1 dB down to a wavelength of 0.12, where you start getting bass boost from the corner. The bass boost is +3 dB at 0.1 wavelength and will theoretically increase up to +9 dB. A practical maximum bass boost is +6 dB to +8 dB because the walls will not be perfectly rigid. If we use the same speaker with the 24" high woofer, the three distances would be 24", 40.1", and 59.0". At this position from the corner, we would get a +3 dB boost at 0.1 wavelength on the scale, equivalent to 56 Hz (0.1×564 Hz).

The graphs in Figures 5 through 16 illustrate the effect on power output with different ratios of distances from the woofer to the three reflecting surfaces (walls and floor). Each ratio solution has two graphs, one that extends to 2 wavelengths of X for an overall view, and one to 0.5 wavelength to help you see where +3 dB boost occurs. All the "Corner Response" graphs are scaled to the wavelength of X , the distance to the floor (or to the nearest wall if the woofer is closer to a wall than the floor).

The best ratio solutions were found with a program developed to calculate the peak-to-peak change in power output after the power dropped below 0 dB. The exact solutions, including the peak-to-peak variation and +3 dB wavelength, are also part of Table 2. Table 4 converts the 1.0 wavelength of X to frequency once you know the distance of X for your speaker.

Another benefit of this procedure is that the acoustical loading of the speaker into the room is more uniform. This provides better control of the speaker's excursions and a more uniform load to the amplifier. The result is more power output before distortion.

How to proceed to optimize your own setup.

Now comes the part where you find the best positions in your room for your speakers. Start by measuring the width, length, and height of your room to the nearest inch. Use the hard surfaces as references (bass does not "see" carpet, padding, drapes, etc.). Next measure the height of the center of the speaker's woofer. If there is more than one woofer or the woofer is a panel speaker, use the center of the woofer array or panel.

Take out your calculator and fill in every blank location in Table 1, Table 2 (both A and B), and Table 3. Do this even though some of the calculations are not practical for your speakers or room. It will give you a better feel for the solutions and make compromise selections of good locations easier. If your speaker is not floor-standing, choose a height for your woofer from Table 1 before completing Table 2 or 3.

Examine the pairs of distances calculated in Table 2. Are there any pair combinations from Table 2 close to the

pair combinations on the Table 3 map? The dimensions calculated in Table 2 are interchangeable between back or side walls. For every good match between a Table 2 (corner) solution and a Table 3 (room) solution, mark the intersection on the Table 3 map.

Also use the Table 3 map to find a good listening position. The best listening positions are 1/3, 1/5, 2/5, or 2/7 of the distance between the wall behind the listener and the wall behind the speakers. Measure from the wall behind the listener for normal rooms. Measure from the wall behind the speakers for long rooms. Select a listening position that is also 0.87 to 1.4 times the distance between the centers of the two speakers.

Position your speaker at one of the final solutions you marked on the map in Table 3. Use a position that works for your room and listening position. The front center of the woofer should be at the calculated intersection. This is a reasonable compromise for path length differences around the back of the speaker compared to the side or towards the floor. If the woofer faces the rear, measure the distance to the back wall from the apex of the woofer.

Simplify the positioning of the second speaker by measuring the distance from the back wall to the back of the first speaker and the distance from the side wall to the side of the first speaker. If you toe in your speakers, measure the distance from both back corners of the first speaker to the back wall. I personally select a speaker and listening position, aim the center of the first speaker at the listener's ear on that side, and then measure from the speaker's rear corners to the walls. Use these three measurements to position the second speaker.

If none of the pair combinations in Table 2 match intersections on the Table 3 map, mark the intersections on the Table 3 map that are close to pair combinations in Table 2. Calculate a compromise position by splitting the difference between the Table 2 and Table 3 solutions.

The **Audio Critic's** room and a new speaker arrival will be a good example to experiment with. The speaker is a floor-standing model with the center of the woofer 13" from the floor. The following pair combination solutions are calculated using Table 2A:

(1)	21.7"	&	32.0"	(1:1.67:2.46)
(2)	19.5"	&	29.0"	(1:1.50:2.23)
(3)	41.9"	&	68.9"	(1:3.22:5.30)
(4)	23.1"	&	38.7"	(1:1.78:2.98)
(5)	22.1"	&	64.2"	(1:1.70:4.94)
(6)	26.7"	&	49.9"	(1:2.05:3.84)
(7)	19.5"	&	57.7"	(1:1.50:4.44)

The room is 255" long and 232" wide. The following minimum room resonance positions are calculated using Table 3:

Longer Wall (255")

<u>1/11</u>	<u>1/9</u>	<u>1/7</u>	<u>1/5</u>	<u>2/9</u>	<u>2/7</u>
23.2"	28.3"	36.4"	51.0"	56.7"	72.9"

Shorter Wall (232")

33.1"	46.4"	66.3"
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The shorter wall is the back wall in this room. The woofer of this particular speaker is close to the floor; this will cause some of the above solutions to be impractical. Also, the strong low-bass response of this speaker suggests that it be placed at one of the more distant solutions.

The first of the Table 2 solutions above (21.7" & 32.0") is nearly a perfect match to the room but too close to the corner. The bass boost will occur at too high a frequency. The second solution (19.5" & 29.0") is even closer to the corner. The third solution (41.9" & 68.9") is close to the 66.3" position along the shorter wall but somewhat off the 36.4" position along the longer wall. The fourth solution (23.1" & 38.7") is a poor match along the shorter wall and probably too close to the corner. The fifth solution (22.1" & 64.2") is near 23.2" along the longer wall and 66.3" along the shorter wall but too close to the shorter (back) wall. The sixth solution (26.7" & 49.9") is near 28.3" along the longer wall and 46.4" along the shorter wall but probably still too close to the corner. The seventh solution is too close.

The best probable choice is the third solution with a compromise. The first and sixth solutions are possible alternates. The modified third solution is a compromise between 41.9" & 36.4" from the back wall and 68.9" & 66.3" from the side wall. Use 39" from the back wall and 68" from the side wall. The spread between 41.9" and 36.4" (about $\pm 7\%$ from 39") is an example of the maximum compromise you should make. The large size of this room is more forgiving and will allow more compromise.

Use Table 4 to find the frequency with a wavelength of 13" (the X distance for this example). It is 1040 Hz. Use Table 2A to estimate the +3 dB frequency for this solution (the third solution). The frequency is approximately 52 Hz (0.05×1040 Hz). In this example, the room will start to boost the bass at about 52 Hz.

Also use Table 3 to find a good listening position. This room is 255" long. Good listening positions are 102" (2/5), 85" (1/3), or 73" (2/7) from the wall *behind* the listener.

The final step of course is the purpose of suffering through all this work. Listen to the results in your room. Especially listen to acoustical bass, acoustical organ, large drums, and familiar male voices. Individual bass notes will be clearer, and male voices will lose their artificial resonances. The bass frequency response will be closer to the natural free-air response of your woofer system. Large peaks and dips in the midbass response will be absent, and a surprising amount of energy at truly low frequencies will

be present. The improvements, of course, will depend on how good the speaker positions were to begin with.

Editor's Note

Bill Rasnake and a partner have formed a small avocational company specializing in listening-room acoustics. If you send them \$29.00, they will provide you with a computer optimization and printout for your particular speakers and room. For additional speakers in the same room they charge \$15.00. Carefully measure the dimensions of your room and the height of your woofer—or woofers, if there is also a subwoofer—from the floor, and send the data along with the appropriate fee to Clear Image Audio, 10020A Main Street, Suite 388, Bellevue, WA 98004. Include any constraints or special requests. We are told that room design and consultation at your site are also available. This is for your information only and does not imply a recommendation of the company by The Audio Critic; all we know is that the method presented in this article is valid and worked exactly as claimed in our room. The only caveat we would add is that the best possible speaker location for bass is not necessarily the best for imaging, high-frequency dispersion and reflections, etc. Further "difference splitting" may be consequently be required. At the very least, however, Bill Rasnake's method takes the guesswork out of speaker placement for bass optimization.

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Table 1: Best Choices from Center of Woofer to Floor

_____ " Room Height	× 0.1429 (1/7)	0.2000 (1/5)	0.2857 (2/7)	0.3333 (1/3)	0.4000 (2/5)	0.4286 (3/7)
	= _____ "	_____ "	_____ "	_____ "	_____ "	_____ "

Table 2A: Best Choices from Center of Woofer to Back or Side Walls

_____ " Woofer Height (X) (Y)			X : Y : Z Ratio	Peak-to-Peak Change (dB)	+3 dB Coefficient @ X Wavelength
× 1.67 = _____ "	× 2.46 = _____ "		1 : 1.67 : 2.46	1.9	0.10
× 1.50 = _____ "	× 2.23 = _____ "		1 : 1.50 : 2.23	2.0	0.11
× 3.22 = _____ "	× 5.30 = _____ "		1 : 3.22 : 5.30	2.1	0.05
× 1.78 = _____ "	× 2.98 = _____ "		1 : 1.78 : 2.98	2.5	0.09
× 1.70 = _____ "	× 4.94 = _____ "		1 : 1.70 : 4.94	2.6	0.08
× 2.05 = _____ "	× 3.84 = _____ "		1 : 2.05 : 3.84	2.7	0.08
× 1.50 = _____ "	× 4.44 = _____ "		1 : 1.50 : 4.44	3.0	0.09

Table 2B: Best Choices from Center of Woofer to Back or Side Walls (Tall Speakers or Unusual Cases)

_____ " Woofer Height (Y) (X)			X : Y : Z Ratio	Peak-to-Peak Change (dB)	+3 dB Coefficient @ X Wavelength
× 0.598 = _____ "	× 1.47 = _____ "		1 : 1.67 : 2.46	1.9	0.10
× 0.667 = _____ "	× 1.49 = _____ "		1 : 1.50 : 2.23	2.0	0.11
× 0.311 = _____ "	× 1.65 = _____ "		1 : 3.22 : 5.30	2.1	0.05
× 0.562 = _____ "	× 1.67 = _____ "		1 : 1.78 : 2.98	2.5	0.09
× 0.588 = _____ "	× 2.91 = _____ "		1 : 1.70 : 4.94	2.6	0.08
× 0.487 = _____ "	× 1.87 = _____ "		1 : 2.05 : 3.84	2.7	0.08
× 0.667 = _____ "	× 2.96 = _____ "		1 : 1.50 : 4.44	3.0	0.09

Table 3: Floor Plan for Position of One Speaker

Calculate the minimum resonance positions along your shorter and longer walls on the floor-plan map below. The map is for the *left speaker* if the shorter wall is the back wall and for the *right speaker* if the longer wall is the back wall. Mark the intersections on the floor plan that also match the pairs of corner-position calculations in Table 2 (within about 5%). Locate the front center of the woofer at one of the practical intersections. Split the difference between the calculations in Table 2 and the intersections below if you cannot find the perfect match. Make sure the center of the woofer is *not* located at 1/2, 1/4, 1/8, or 3/8 of the distance between walls. Use the mirror-image location for the other speaker.

____ Speaker Shorter Wall = ____" × 0.1429 0.2000 0.2857 0.3333 0.4000 0.4286
 (Left or Right) (1/7) (1/5) (2/7) (1/3) (2/5) (3/7)
 = ____" ____" ____" ____" ____" ____"

Longer Wall = ____" ×

0.0909 (1/11) = ____"

0.1111 (1/9) = ____"

0.1429 (1/7) = ____"

0.2000 (1/5) = ____"

0.2222 (2/9) = ____"

0.2857 (2/7) = ____"

0.3333 (1/3) = ____"

0.4000 (2/5) = ____"

0.4286 (3/7) = ____"

0.4444 (4/9) = ____"

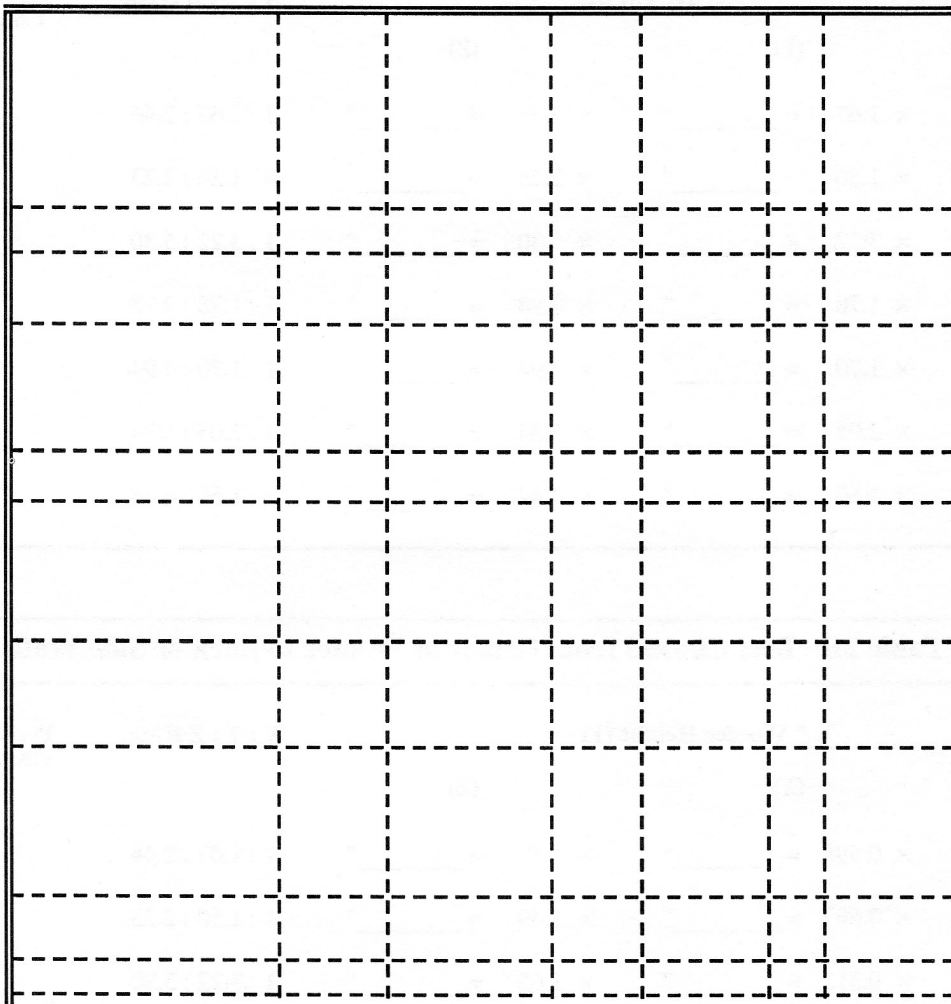


Table 4: One Full Wavelength Conversion to Frequency (for sound @ 1127 ft/sec)

10" = 1352 Hz	16" = 845 Hz	22" = 615 Hz	28" = 483 Hz	34" = 398 Hz
11" = 1229 Hz	17" = 796 Hz	23" = 588 Hz	29" = 466 Hz	35" = 386 Hz
12" = 1127 Hz	18" = 751 Hz	24" = 564 Hz	30" = 451 Hz	36" = 376 Hz
13" = 1040 Hz	19" = 712 Hz	25" = 541 Hz	31" = 436 Hz	37" = 366 Hz
14" = 966 Hz	20" = 676 Hz	26" = 520 Hz	32" = 423 Hz	38" = 356 Hz
15" = 902 Hz	21" = 644 Hz	27" = 501 Hz	33" = 410 Hz	39" = 347 Hz

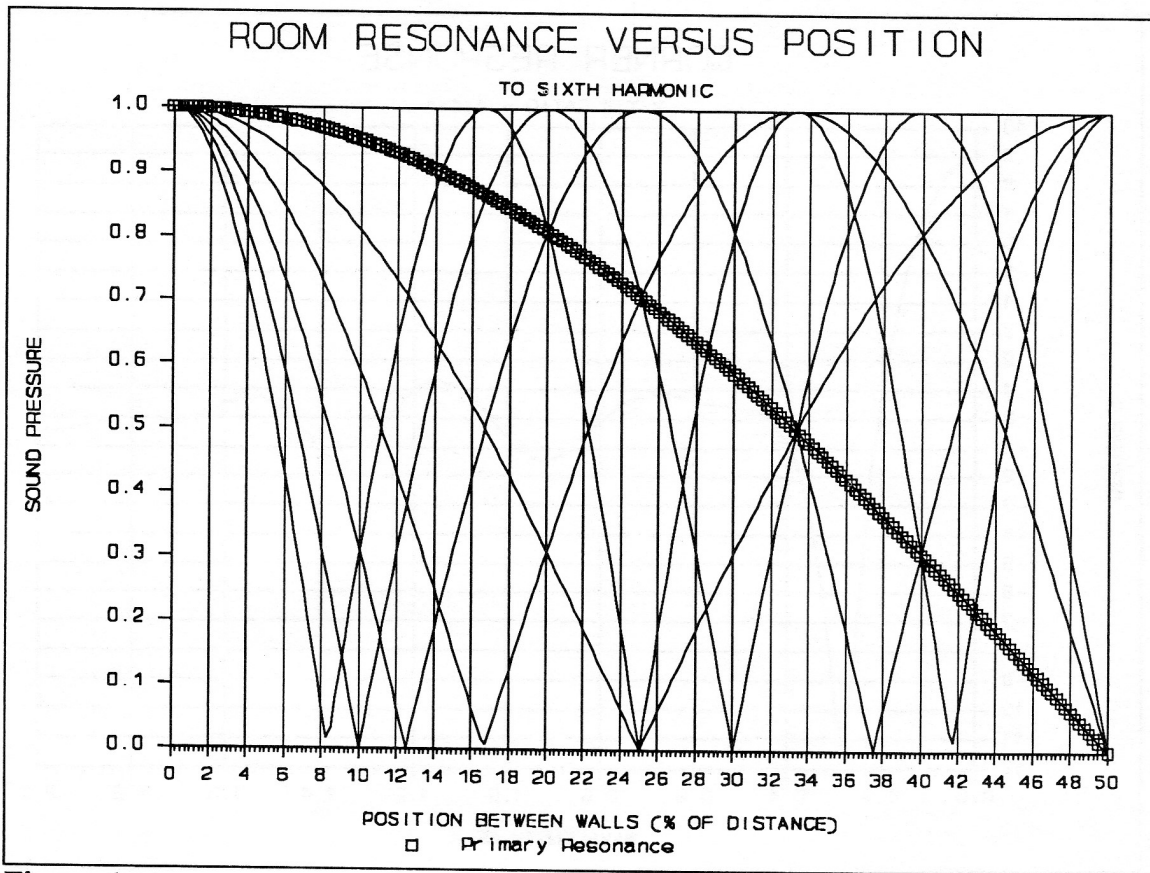


Figure 1

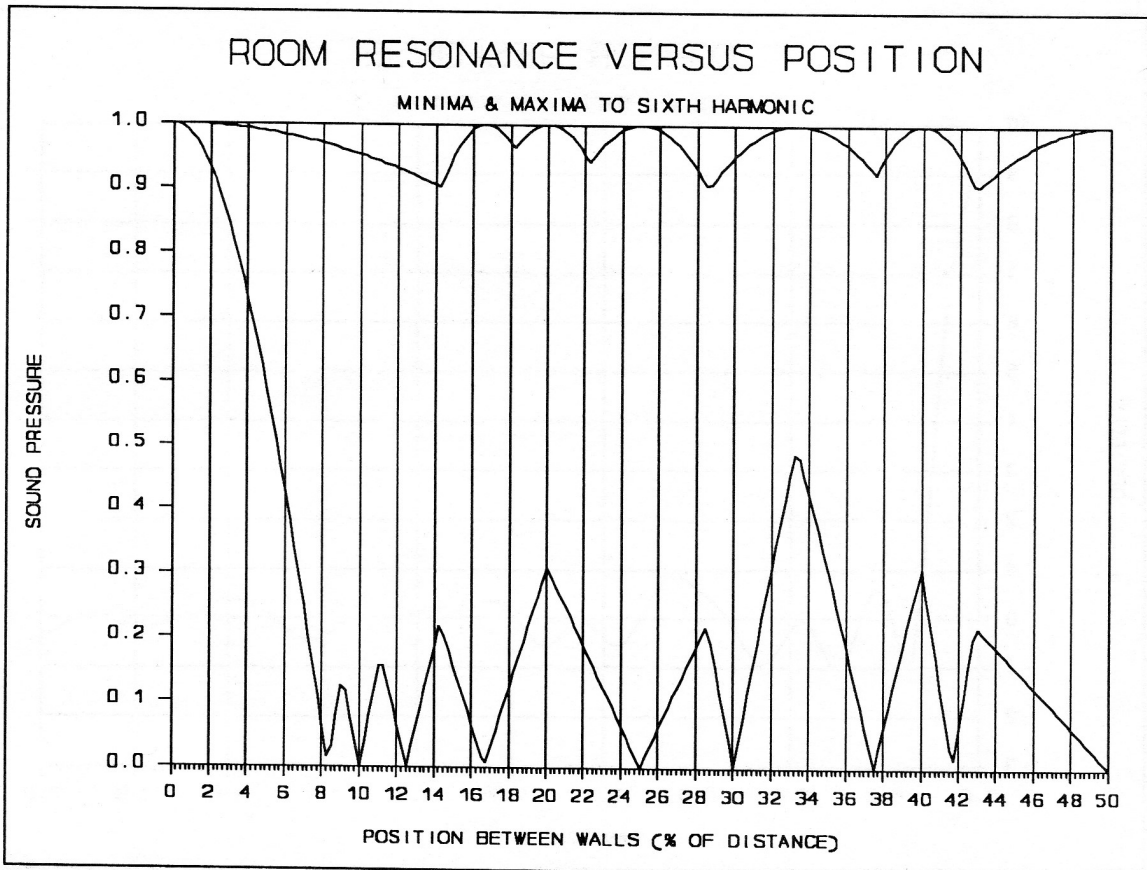


Figure 2

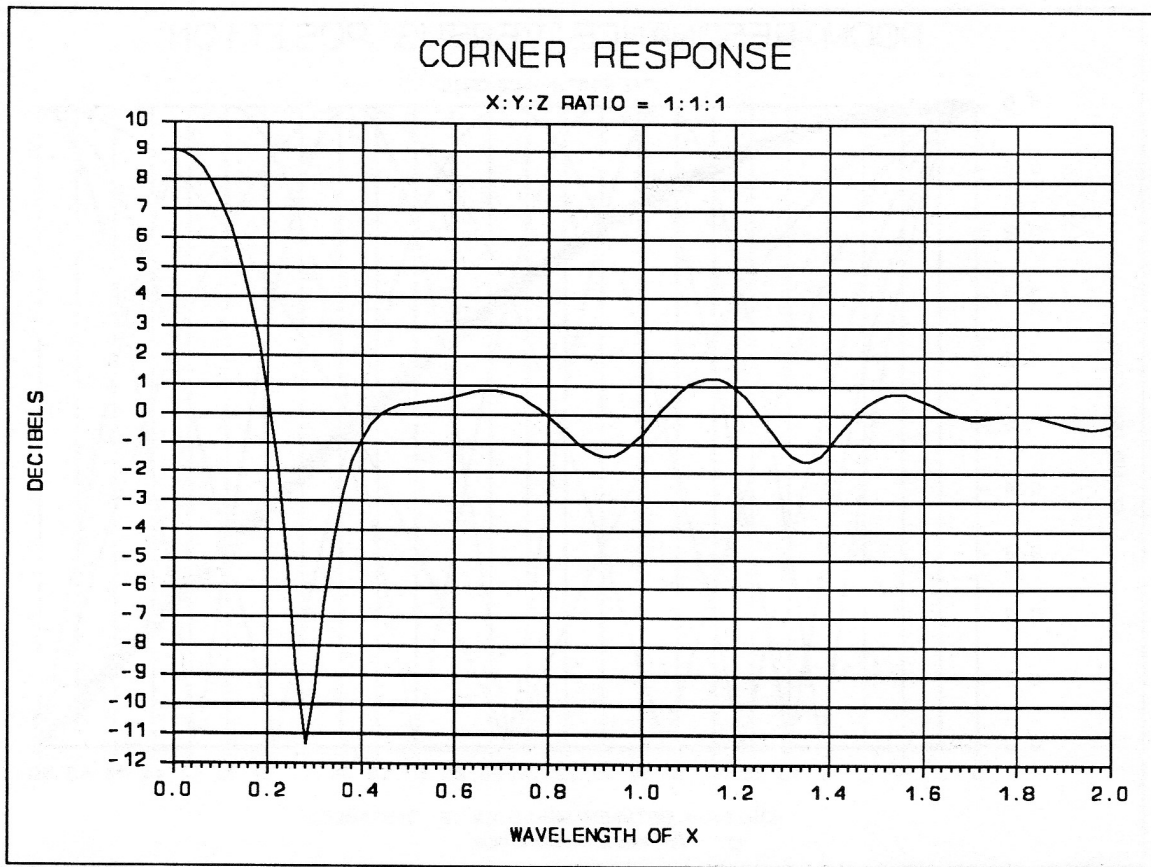


Figure 3

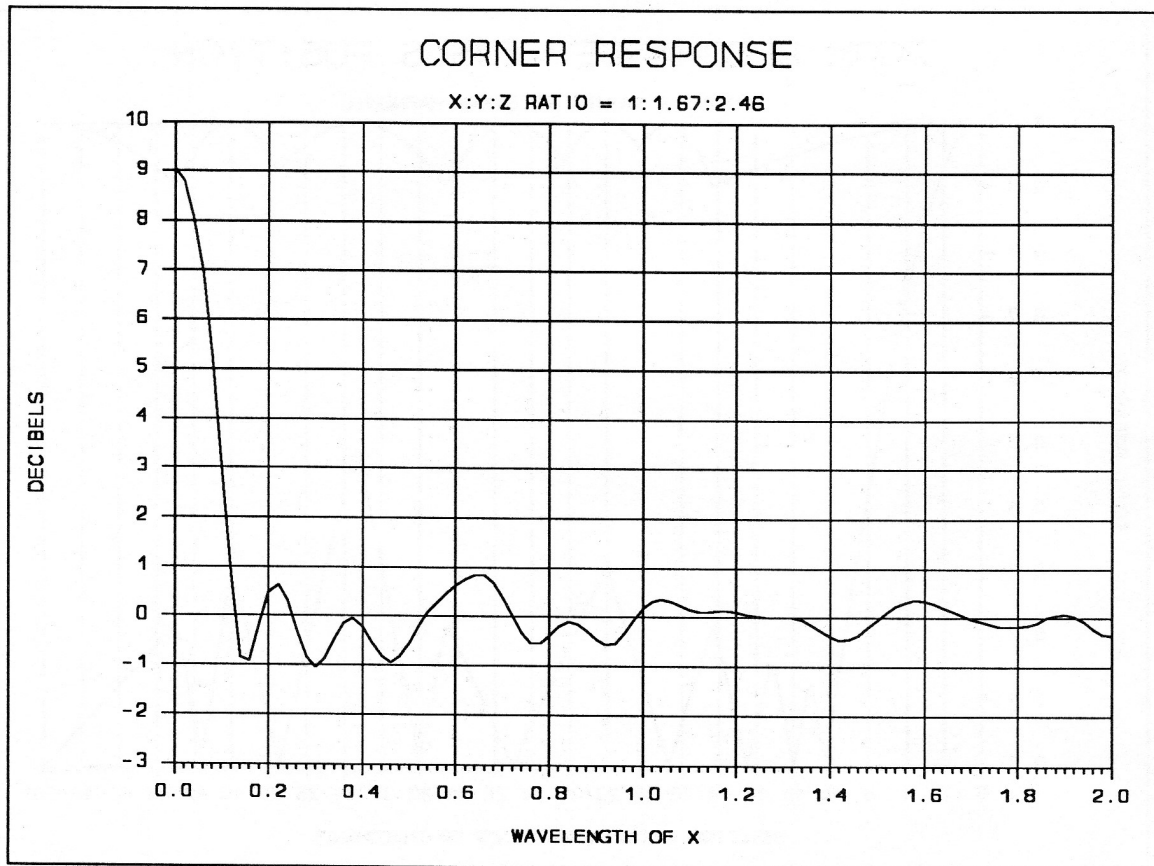


Figure 4

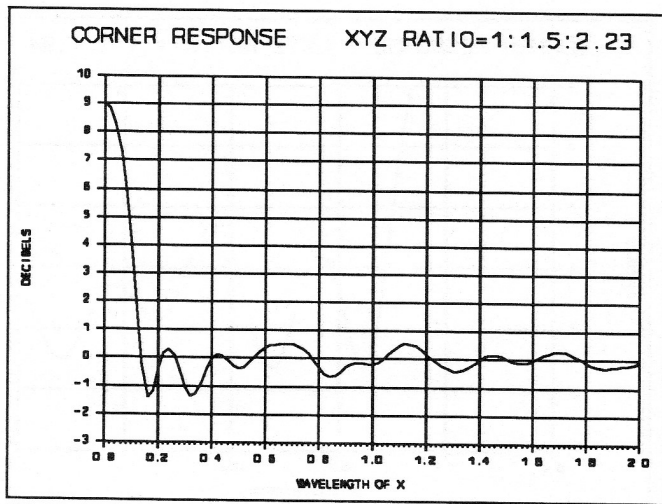


Figure 5

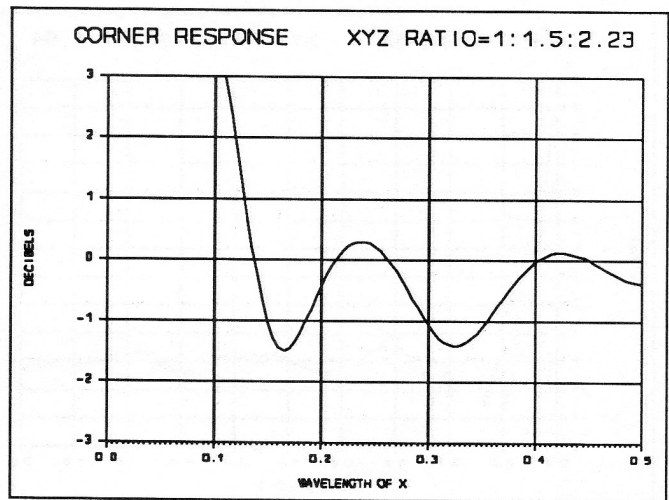


Figure 6

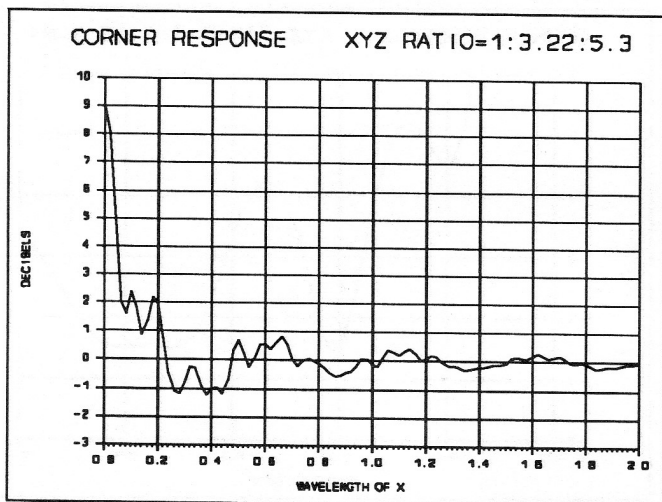


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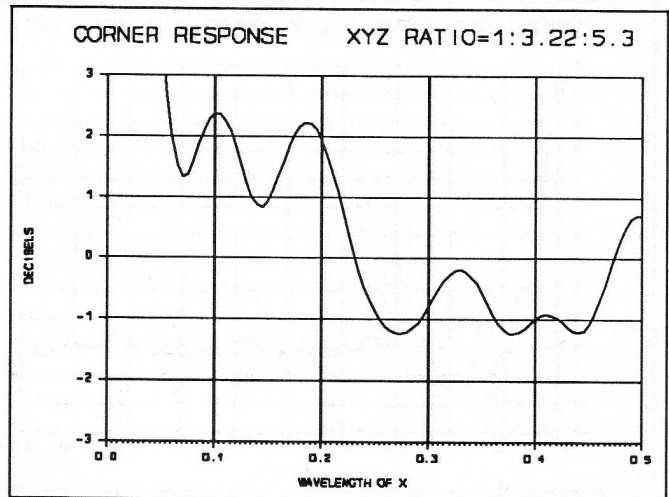


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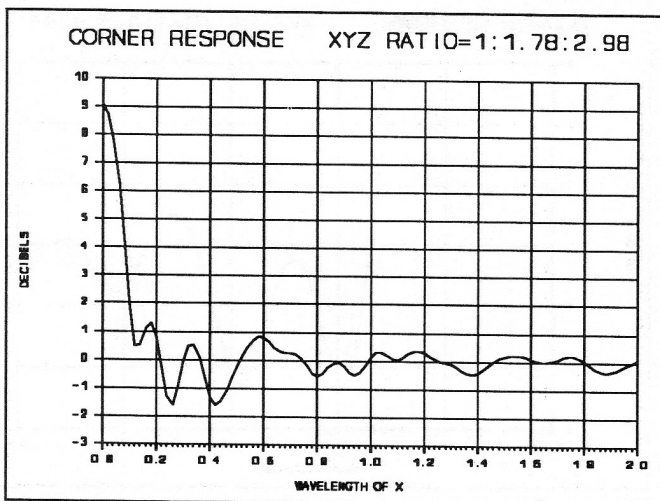


Figure 9

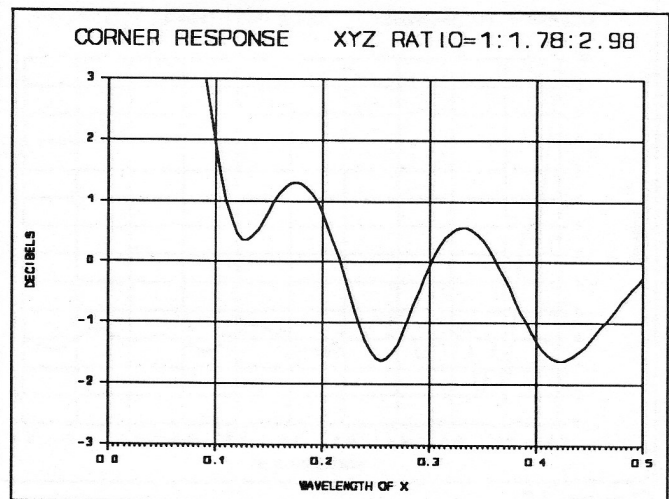


Figure 10

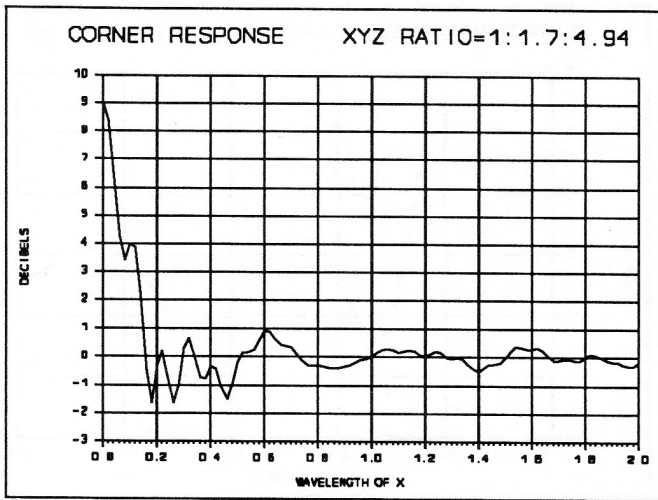


Figure 11

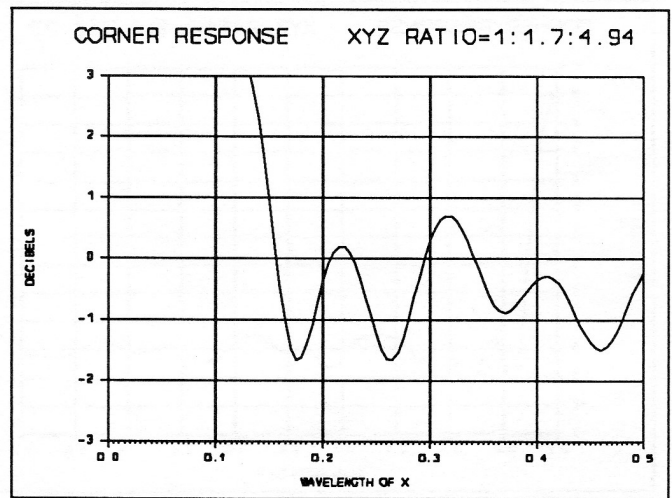


Figure 12

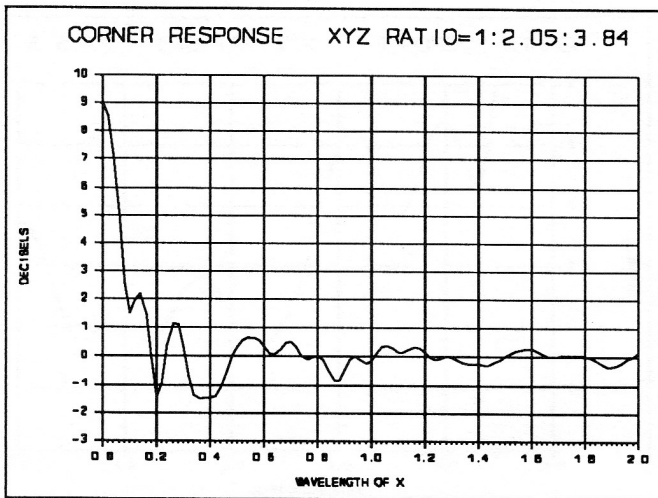


Figure 13

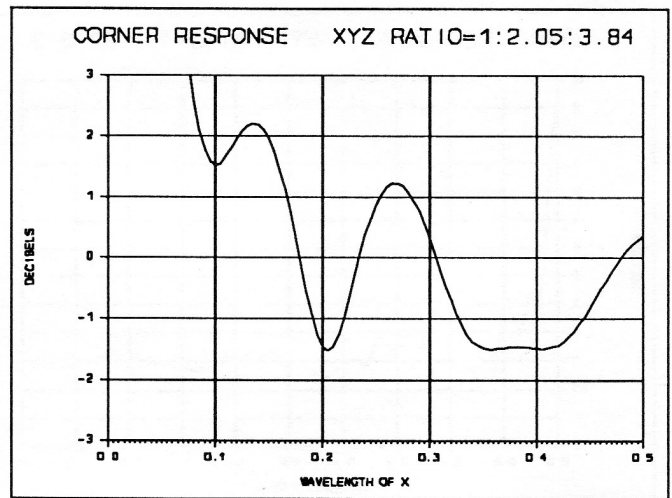


Figure 14

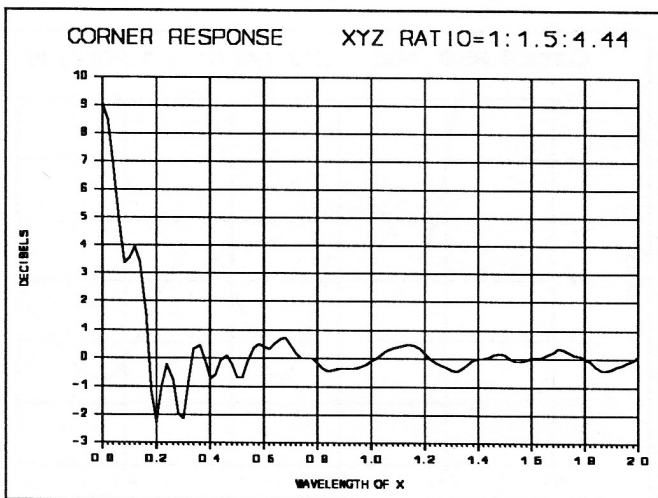


Figure 15

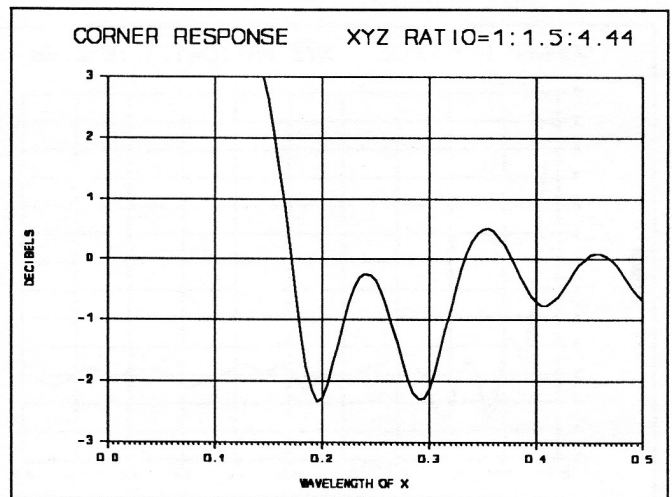
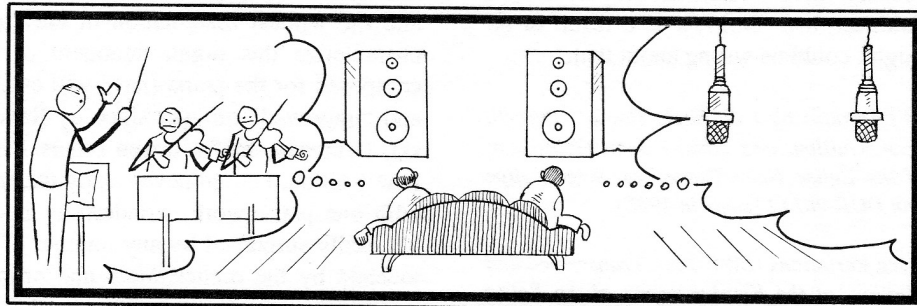


Figure 16

Records & Recording



*This column has nothing against rock, pop, country, gospel, or any other demotic form of music. The trouble is that your Editor's attention tends to wander after more than ten minutes of exposure to the very best of these genres (with the exception of jazz). This is not necessarily a manifestation of exquisite taste, just a simple, empirical fact. Since many of the readers of *The Audio Critic* are undoubtedly of another persuasion, guest reviewers in these areas need to be, and will be, found.*

The Ultimate Organ-Music Experience on CD: Jean Guillou Playing the Organs He Designed, Recorded by Craig Dory

By Peter Aczel
Editor and Publisher

The unspeakable truth about organ music is that most performances of it are quite boring, even though the organ literature comprises some of the world's most thrilling compositions.

The reason lies in the very nature of the instrument, which is somewhat like an electric buzzer when it comes to attack, release, and dynamics; there is no "touch," in the pianist's sense, that can alter the quality of either the beginning or the end of a tone, and pressing harder will not make the tone louder. As a result, the phrasing of most organists tends to be flabby and uninflected (the famous E. Power Biggs of early LP days used to be referred to by his detractors as E. Plodding Biggs), a steady legato without crescendo or diminuendo being the sonic nature of the beast.

Only the greatest organ virtuosi, and especially those who understand their instrument from the organ builder's as well as the musician's point of view, are able to create the impression of having a pianist's keyboard mastery, not only by manipulating the stops for timbre and volume but also by the subtle use of rhythm and pauses to make the buzzer-like mechanism speak with a semblance of ictus and inflection. When that kind of knowledge and musicianship is applied to the unsurpassable tonal resources of the organ, it becomes indeed the king of instruments.

The most impressive organist in terms of the above considerations that I have ever encountered, live or on records, is Jean Guillou, of the Église Saint-Eustache, the glorious parish church of Les Halles in Paris. His virtuosity can only be described as outrageous; his temperament is fiery; his keyboard artistry also extends to the piano; he designs organs according to his own visionary ideas (the one now being completed at Saint-Eustache will be his biggest and best, I hear); his knowledge of music is profound enough to give plausibility to an iconoclastic interpretation in one instance and a deep reverence for tradition in another. He is simply one hell of a fellow on the organ, possibly without an equal anywhere.

Combine that with Craig Dory's compulsive perfectionism in microphoning, taping, and digital processing, which I discussed in Issue No. 12 in connection with the debut of Dorian Recordings, and you have organ music in your listening room such as you are unlikely to have heard before. The bass is of phenomenal power and clarity on all these CD's; the midrange and highs are transparent and pure to the nth degree; the acoustical character of each church is captured with great credibility. I am inclined to rate these discs even a notch above John Eargle's outstanding organ recordings on the Delos label, mainly because of

Jean Guillou's playing and the unique quality of his organs, but possibly also because Dory's channels may be even a tiny bit lower in distortion than Eargle's as a result of all that tweaking, although I could be wrong about that.

"Organ Encores" (23 selections by J. S. Bach, Handel, Purcell, Haydn, Schumann, Liszt, Guillou, and others). Jean Guillou, at the Kleuker organ of the Église Notre-Dame des Neiges, Alpe d'Huez, France. Dorian DOR-90112 (made in 1988).

J. S. Bach: The Goldberg Variations (BWV 988). Transcribed and performed by Jean Guillou, at the Kleuker organ of the Église Notre-Dame des Neiges, Alpe d'Huez, France. Dorian DOR-90110 (made in 1988).

The organ played by Jean Guillou on these two CD's is located in a church built in 1969 for the parishioners of a French ski resort, more than 6000 feet above sea level, with peaks twice that high looming above. The disposition of the tracker-action instrument was designed by Guillou, and the actual construction was the work of the West German organ builder, Detlef Kleuker. It is not a large organ, but it sounds amazingly rich and majestic in the tutti passages, and the individual stops are incredibly varied and beautiful in timbre. "My favorite organ!" was my spontaneous reaction after ten minutes of listening.

In "Organ Encores" Guillou wrings out the instrument in every possible way, unabashedly showing off his virtuosity and musicianship while using only unquestionably good music in the process. If you have never bought an organ recording before, try this one and you will be hooked. And if you own hundreds of them, you will still be blown away by the irresistible sweep of Guillou's performance of Purcell's "Trumpet Tune in D Major" and by the beauty of his phrasing in pieces like the Bach "Sarabande." His playing of the "Hornpipe" from Handel's *Water Music* in his own transcription is more exciting than any "authentic" performance of it that I have ever heard. I could go on; this CD is an experience.

As for *The Goldberg Variations*, I was not prepared for the unproblematic convincingness of Guillou's organ transcription, having been raised on Wanda Landowska's harpsichord—and only halfway converted to Glenn Gould's piano—in this music. I was unable to deny, however, that the counterpoint is clearer on the organ in some of the variations, or that Guillou plays the sublime Variation 25 in the minor as movingly as anyone could ever hope to hear it. Even so this a *nouvelle cuisine* version of classic fare and, no matter how tasteful, not for every taste. The Guillou magic applied to *The Art of the Fugue*, for example, would have been a greater event in my musical life and one that I hope Dorian will eventually make happen.

Modest Mussorgsky: Pictures at an Exhibition. Igor Stravinsky: Three Dances from Petrouchka. Transcribed and performed by Jean Gillou, at the Kleuker-Steinmeyer organ of the Tonhalle, Zürich, Switzerland. Dorian DOR-90117 (made in 1988).

Immodest Mussorgsky would be a better label for this. Extroverted virtuosity of the most untrammelled sort and the wildest imagination in the choice of tone colors characterize this organ treatment of *Pictures*, originally composed for the piano (have you ever heard it that way?) and "improved" on ever since by Ravel, Cailliet, Stokowski, Ormandy, half a dozen others I have forgotten—and now Guillou. I could never really understand this obsession with one piano work, wonderfully imaginative to be sure but easily surpassed by any number of compositions never touched by the orchestrators and arrangers. Why is it so important to be one up on Ravel? This particular version is marvelous fun, however, if you just sit back, forget about comparisons, and enjoy it. That goes for the *Petrouchka* transcriptions as well. Guillou's keyboard technique and his ear for organ sonorities, the instrument itself, and Craig Dory's recording are all endless sources of delight.

The organ is altogether new, inaugurated in 1988; this is the first commercial recording of it. Designed by Guillou for the Zürich Tonhalle, famed for its acoustics, its construction is credited to Kleuker-Steinmeyer (the same Detlef Kleuker, now deceased, as above). This is a much bigger and more complex instrument than the one in the Alps, with a tremendous range of tone colors and incredible bass delineation. It is said to be equally suitable for Bach and contemporary music; all I can say is that it rivals the impact and colors of Ravel's and Stravinsky's orchestras in these pieces. When I tried to impress a recent visitor to my new sound room, this was the first CD I played for him. The bass is possibly the most fabulous I have ever heard on any recording, absolutely true, undistorted, unexaggerated, and melodious to the lowest frequencies. The midrange and highs are merely great.

Definitely take this disc along when you go speaker shopping.

And on Other Labels...

I disavow any inclination to avoid the major labels, but the small audiophile-oriented labels keep sending me good stuff, and as Editor of a small audiophile-oriented journal I naturally gravitate toward members of my club.

Delos

Igor Stravinsky: Petrouchka (original 1911 version); Scherzo Fantastique, Op. 3; Fireworks (Fantasy for Orchestra), Op. 4. Nikolai Rimsky-Korsakov: Russian Easter Overture. Seattle Symphony Orchestra, Gerard Schwarz, conductor. Delos D/CD 3054 (made in 1988).

The Seattle Symphony is improving. Gerard Schwarz is improving. John Eargle is improving, if such a thing is possible, at least in the sense that he has added the Colossus digital processor to his recording lash-up. The result is perhaps the best Delos orchestral recording yet, and that is

saying a lot. (Read this column in the last two issues for an introduction to the Delos/Eargle orchestral sound.)

The original 1911 scoring of *Petrouchka* has a much richer texture than the composer's elegantly pared-down 1947 version, the reasons for which were largely political and economic. I think Schwarz is at his best in music that does not demand a great deal of "expressivity," a quality Stravinsky's aesthetic was opposed to; *Petrouchka* happens to work perfectly if you get the all the notes, the rhythm, and the orchestral balances right. Schwarz does, and that makes this an excellent performance. Highly recommended for both the music and the sound.

Harmonia Mundi

Wolfgang Amadeus Mozart: Horn Concertos, K. 412, 417, 447, and 495; Rondeau, K. 371; Rondo, K. 514. Lowell Greer, natural horn; Philharmonia Baroque Orchestra, Nicholas McGegan, conductor. Harmonia Mundi HMU 907012 (made in 1988).

Peter McGrath considers this to be an example of his best recent work as a free-lance recording engineer. That constitutes my principal motivation for writing about it, since Lowell Greer's highly competent tootling on a natural (valveless) horn cannot erase, or even compete with, memories of the great Dennis Brain, and Nicholas McGegan's overly vigorous attacks and inflections, "authentic" as they may be, are not in the idiom a Beecham/Walter disciple like me associates with the divine Amadeus. Do not misunderstand me; despite the little roughnesses, this is thoroughly enjoyable music making, with oodles of love and gusto.

As for the recording, it is very fine indeed, rather closely miked, with a bright and "rosiny" but never nasty string sound, probably a totally accurate portrayal of the actual string quality of the orchestra. The exact location of the horn soloist is occasionally a little vague, but that is also true in actual concert-hall listening. There is only a limited amount of hall sound; I know that Peter is a Quad man and probably anticipated some dipole-reflective contributions by the listening room. His master was analog, by the way (AAD coding), and with Mozart's limited dynamic range, why not? He will need Wagner to de-digitize me.

Reference Recordings

Jean-Philippe Rameau: Pièces de Clavecin, Suite in A. Albert Fuller, harpsichord. Reference Recordings RR-27CD (made in 1988).

Considering what a great composer Rameau was and how profoundly moving his best music is, he has not been played nearly enough. This wonderful collection of some of his most impressive harpsichord works immediately took its place among the very small handful of my favorite harpsichord recordings. Albert Fuller is the leader of the Helicon Foundation group I enthused over in the last issue, and his playing here is absolutely beautiful, with the kind of

inflection and phrasing that shows a total grasp of the long line of each composition, not just the next four bars. He rivets your attention right to the end of each of these pieces, which range from less than two minutes in length to over seven minutes. His William Hyman harpsichord is a magnificent instrument.

There is even the possibility, if the harpsichord music of Bach or Scarlatti is not exactly your cup of tea, that this will convert you. Rameau is not as severely architectonic as Bach and not quite as *brut*, in the champagne sense, as Scarlatti; he is a kind of Chopin of the 18th century, almost Romantic at moments and occasionally impressionistic. Very seductive Louis XV art.

The recording is special. "Professor" Keith O. Johnson put the microphones quite close, obtaining a sound of great richness, far from the usual tinkly, lightweight, guitar-like quality of so many harpsichord recordings; yet the hall sound (that of a San Francisco high-school auditorium) is all there, in good balance. Best of all, there is not a trace of hardness, glassiness, or steeliness throughout the entire 64 minutes of the CD. Lovely; in fact, I am unaware of a better example of the genre. The Prof's microphone preamps are still slightly hissy, however; how about some JE-990's, KOJ—or is there some kind of circuit mysticism involved here?

Telarc

Richard Wagner: Der "Ring" ohne Worte (The "Ring" Without Words): Orchestral Highlights from the Ring Cycle. Berliner Philharmoniker, Lorin Maazel, conductor. Telarc CD-80154 (made in 1988).

This CD has gained some notoriety, and I just wanted to get in my two cents worth before the subject became altogether stale.

The best thing about this recording is the playing of the Berlin Philharmonic. Awesome. When it comes to preferences in symphony orchestras, *ich bin ein Berliner*. The worst thing about the production is Lorin Maazel's concept of playing just about every bar of purely orchestral music in the *Ring*, but not a bar with an independent vocal line in it. The music refuses to hang together that way. Every major conductor who cultivated these orchestral excerpts, from Wagner himself to Stokowski and Toscanini, knew that an occasional vocal line (such as Wotan's "*Leb' wohl, du kühnes, herrliches Kind!*" at the end of *Die Walküre*) had to be woven instrumentally into the orchestral fabric to give the music its intended thrust.

Maazel's conducting is very respectable but he is no Stokowski and no Toscanini. No Jimmy Levine, either. Competently played Wagner always sounds good, though, so I am not complaining. The recording is also good in the ordinary sense but lacks the spaciousness, free-breathing dynamism, and edgeless finesse of John Eargle's Wagner as recorded for Delos. All in all, this is no super disc, as some would have you believe. But that Berlin orchestra... ◇

Can't Wait to Tell You...

This is a fat issue, yet a number of items that should have gone into it were left out for lack of space. The not quite clockwork-like regularity of our publishing schedule (ahem) makes it seem advisable to give a quick preview here of opinions to be expressed in greater and more precise detail in upcoming reviews.

As most of our readers know, we consider loudspeakers to be our *spécialité de la maison*, and we have quite a few genuine goodies scheduled for full-length reviews. On at least two of them our opinion is quite firm at this writing.

Snell Type C/II

In a way, your Editor feels relieved that he is no longer involved with Fourier loudspeakers because this recent Kevin Voecks design is more or less in the Fourier 1 mold—floor-standing 3-way system with a smallish footprint, vented 10" woofer, passive crossover, price of a pair in the upper teens of hundreds—but in a number of ways it is significantly better than even the third-generation Fourier 1L. In fact, we feel that with currently available electrodynamic drivers not much more can be done in this particular format and size; the Snell Type C/II is just about a state-of-the-art "monkey coffin" (trade slang for a conventional forward-firing one-piece speaker system in a rectangular box). Testing and fine-tuning at the National Research Council acoustical facility in Ottawa, Canada (Floyd Toole's domain) seems to be producing something close to a convergence toward a single standard of loudspeaker performance, and a very impressive standard it is.

Waveform

The Waveform loudspeaker is another graduate of Dr. Toole's finishing school; unlike the Snell, however, it is strictly of Canadian design and manufacture—and about five times as costly. Harry Pearson, in a cavalierly tossed-off footnote typical of *The Absolute Sound*, recently contrasted the Waveform to the Mirage M-1 by remarking that the latter "stands in bold relief to the other Canadian state-of-the-art speaker effort, the [Waveform], which it resembles not at all sonically. In the Waveform, you can not only hear the crossover points, but the individual drivers as well, which are not so well integrated nor nearly as coherent, nor, for that matter, as smooth." This is irresponsible audio-store-cowboy babble, an unattractive excuse for which might be that it is only politically motivated rather than actually believed. The Waveform happens to be the finest example of the breed known to us, the breed being high-priced forward-firing electrodynamic speakers with large woofer systems and electronic crossovers. It exhibits none of the characteristics quoted above. The only question it raises is whether or not totally different approaches are worth pursuing when price is not the issue.

We are also reasonably sure at this point about a number of interesting electronic components also scheduled for detailed reviews.

Philips LHH1000

This 4-k\$ (four-kilobuck) two-piece CD player and DAC system is pretty much in the same mold as Sony's top-of-the-line 8-k\$ system, so it is probably a fantastic bargain, right? We are not going to commit ourselves to any comparisons just yet, but we do love to play with and listen to this gorgeous equipment. We have recently inspected the various Philips facilities in Holland and Belgium, and came back tremendously impressed by the total commitment of the gigantic Philips organization to the CD medium. The future of the internal combustion engine in Detroit is not nearly as certain as the future of the compact disc and the CD player in the audio industry. The industrial muscle behind these products is awesome, and the research on new refinements is proceeding at a very fast pace. We are highly intrigued by the new Philips "Bit Stream A/D, D/A Conversion" system, which uses a one-bit data stream in conjunction with extremely sophisticated oversampling and noise shaping. It promises to achieve performance at least as good as, and maybe even better than, that of the LHH1000 for example, at a much lower cost. You will be reading a lot more about it in *The Audio Critic*; meanwhile, if you must urgently have an "ultimate" CD player based on the hard-to-beat TDA 1541A S1 and SAA 7220P/B chips (see Issue No. 12), you have our blessing to go out and buy the LHH1000 without waiting for the review.

Carver M-4.0t

The review of this widely debated power amplifier will be in the next issue, but if you are looking for tweako perceptions about the liquidity of the upper midrange, etc., you will be disappointed. We have severed even our most vestigial links to that school. What we can tell you without hesitation is that the amplifier does exactly what it is claimed to do. You must remember that the model for it was not the infinite-input-impedance-zero-output-impedance textbook block diagram but Bob Carver's wish-fulfillment tube amplifier, the Silver Seven, which has a highish output impedance, among other things. That means an ever-so-slight "soft" signature rather than the nth degree of sonic neutrality. If that is your preference, the M-4.0t is a powerhouse, impeccably clean, at a price unrelated to its quality.

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The Audio Critic

Coming:

Part II of the "Seminar 1989" transcript, in which the plot thickens before coming to its midnight conclusion.

In-depth loudspeaker reviews, lots of them, and always with objective cause-and-effect explanations of our subjective perceptions. In the pipeline: Snell Type C/II, Waveform, the "Platinum" version of the Carver "Amazing," JBL L40t3, and several others.

The promised full-scale exposé of the ultrahigh-end wire/cable racket, where the low overhead and high profits are irresistibly corruptive. We demonstrate the technical reasons for the audible differences, if any.

Our first look at digital surround-sound processors, with a comparison of the Lexicon and the JVC XP-A1000.
