

The Audio Critic®

Retail price: \$6

In this issue:

We introduce you to a floor-standing 3-way dynamic speaker system (\$1190 the pair) which is basically conventional—except that there are no conventional errors in its design. That alone seems to be enough to make it sound like no other.

We review a \$650 preamplifier that equals or possibly even surpasses in sheer listening quality the costliest units known to us.

A \$4915 phonograph, complete as a “front end” and ready to be plugged into your power amplifier, is evaluated both as a system and as a collection of separate phono components.

Plus other speakers, power amps, cartridges and more.



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Spring through Fall 1980

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The Audio Critic® is an advisory service and technical review for consumers of sophisticated audio equipment. It is published by The Audio Critic, Inc., and is available by subscription only (except for limited sales of individual copies at a higher price in selected audio stores). This issue is the last one in the present format; starting in January 1981 the format will change to much shorter *biweekly* Bulletins plus a periodically revised Handbook containing all reference material. To maintain total dedication to the consumer's point of view, **The Audio Critic** carries no advertising by equipment manufacturers, distributors, reps, dealers or other commercial interests. 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, Box 392, Bronxville, New York 10708.

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For subscription information and rates, see inside back cover.

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Publisher's Announcement: Your Waiting Days Are Over

Our last issue was mailed in April. You may have been wondering where we were hiding all these months, especially since we had indicated in that issue our intention to publish thinner issues more often. Well, we were going through a period of "agonizing reappraisal" of our priorities as journalists and publishers, and of our subscribers' needs as we perceive them. Our conclusion was that thinner and more often would not suffice; to keep the listening/measuring/writing/printing/ mailing cycle absolutely regular and predictable, it would have to be *much* thinner *much* more often. In other words, more like a newsletter than like a magazine. And that's what we finally decided.

This is our last issue in the original magazine-like format. Starting in January 1981, **The Audio Critic** will be published biweekly (meaning every other week) in the form of newsletter-size Bulletins, each containing just a small number of reviews. Bulletin 1 will be dated January 15th and mailed on or immediately after that date; Bulletin 2 will follow on January 29th, Bulletin 3 on February 12th, and so on. With two issues skipped during the summer vacation, our frequency will be 24 Bulletins a year. This is a schedule we feel we can realistically maintain.

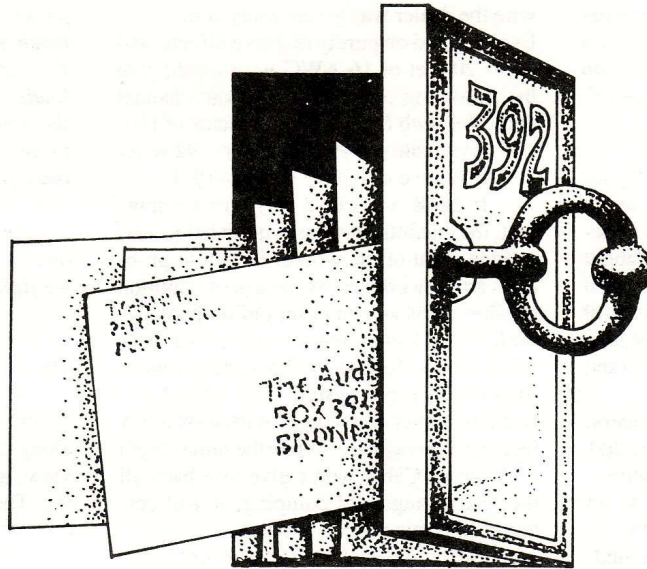
Much later in 1981, subscribers will also receive **The Audio Critic Handbook**, a book-length summary of all the reference material, discussions of theory, engineering viewpoints, philosophical arguments, how-to instructions and other long-winded stuff that can't be accommodated in the Bulletins. We're hoping to make the Handbook a classic, a sort of semipermanent bible for the enlightened audiophile. It will be revised from time to time as the need arises, probably not every year. (No, we won't commit ourselves to an exact publishing date as we do for the Bulletins. Sometime in 1981, that's all.)

We're convinced that this new package is a much more flexible and effective vehicle for disseminating audiophile information than our original format. New equipment that comes in will be tested and our review of it published within the span of a few weeks; there will be no more waiting until we have accumulated enough material to publish one magazine-size issue. Editorially, the Bulletins and the Handbook will retain our accustomed style; we aren't contemplating any major changes beyond the inevitable evolutionary ones. What's more, the subscription price also remains the same: \$30 for the 24 Bulletins plus the Handbook, \$36 to overseas subscribers. We haven't raised the price as we had contemplated, even though we'll be giving you roughly the same amount of reading material per subscription, because we expect to save some money on the postage. The Bulletins will be coming to you by second-class mail (actually third class during the initial few weeks while we wait for our second-class permit); this might turn out to be marginally slower than the first class you're used to, but with the new biweekly frequency we don't think you'll find the wait very frustrating. There's no other way for us to do it.

In addition, we'll be offering to subscribers at nominal extra cost a handsome loose-leaf binder for the Bulletins. It should be available before you have more than two or three issues to put in it. Watch for the announcement.

The conversion formula for currently running subscriptions will be six Bulletins for each old-style issue still due to you. The Handbook, when it comes out, will count as the equivalent of two old-style issues. If your subscription hasn't expired with the present issue, you'll start getting the Bulletins automatically and will then be notified in plenty of time before expiration to renew, so you can keep the Bulletins coming.

And that's the story. We hope you all like it because it's the only one we've got. Thank you.



Box 392

Letters to the Editor

Since we intend to continue this column in our forthcoming biweekly bulletins (see announcement on page 2), and since that tight new format leaves no room for the various forms of long-windedness and/or irrelevance we occasionally allowed to slip through here in the past, we must emphasize once again that only letters from which our readers can learn something—anything!—will be deemed suitable for publication. Undocumented disagreements with our findings by individuals without a track record in audio testing (“Silver cable does so sound better, turkeys—are you deaf or something?”) are, for example, of no editorial value whatsoever. Nor is “What’s a nanosecond—you guys use funny words my local hi-fi salesman can’t explain.” Manufacturers whose equipment we review will continue to have the privilege of having their letters printed in their entirety. Other correspondence may or may not be excerpted, at the discretion of the Editor. Ellipsis (. . .) indicates omission. But please, everybody, keep it as short as you can from now on. Letters should be addressed to The Editor, The Audio Critic, Box 392, Bronxville, NY 10708.

The Audio Critic:

In the past, Win Laboratories has always maintained an “open door policy” at our research and development facilities as well as at our factory to friends, peers and audio journalists alike. This was done in good faith that the more information in research and development we can share, the better it would be for the continuing growth of our American audio industry.

However, within the last year and a half, this privilege has been jeopardized by one audio journalist, who used the research information he had received from Win Laboratories to help a foreign firm develop a product similar to ours in appearance and fundamental design, without prior authorization by or consultation with Win Laboratories. Although the consequences of such actions will mainly affect manufacturers in the forefront of the industry for the short term, it is the general public that pays the final price in the long run.

Manufacturers in our capacity rely on the integrity of audio reviewers to print an honest opinion. However, when a reviewer claims that a new product “is, in terms of

parts, design and construction quality (not to mention aesthetic beauty), in the same class as” our SDC-10, we expect to see a truly remarkable product. When such expectations are unfulfilled, the credibility of the particular journalist becomes tainted. It is unfortunate from our perspective that many people will not have the opportunity to see both products side by side and judge for themselves.

For this reason, although we will still retain an “open door policy,” specific design information will only be revealed after a written nondisclosure agreement has been signed.

We deem this action regrettable but necessary.

Yours very truly,
Dr. Sao Zaw Win
President
Win Laboratories, Inc.
Goleta, CA

We’re glad Dr. Win didn’t deign to mention the name of the audio reviewer in question, since printing it would have con-

*flicted with our previously established policy of disregarding our journalistic bad-mouthers, of whom this same individual has been the most obsessive (he seems to be thinking about **The Audio Critic** night and day) and the most shrilly personal, though probably the least important. Some of our readers will know who he is from the circumstances of the case; the rest of you may consider yourselves lucky.*

We can tell you, however, the name of the “foreign” turntable Dr. Win is referring to: it’s the Oracle, made in Canada. We have a sample of it in our possession and are planning to review it in one of the early issues of our forthcoming biweekly Bulletins. We’re willing to go on record right now, though, that it isn’t a Win SDC-10 by any stretch of the most dilettantish imagination.

There are basically two lessons to be learned here. One is that an ethical reviewer owes his readers full disclosure regarding any personal interest or involvement he may have in a product he is reviewing. The other is that audio designers must beware of worshipful techno-groupies who want to know

all about the nuts-and-bolts engineering details. The one who is picking your brain while he is kissing your behind may be an industrial spy.
—Ed.

The Audio Critic:

We were mostly overjoyed to read your comments about speaker wires and audio cables in Volume 2, Number 2. The widespread confusion and misinformation about speaker wire has especially been aggravated by the cultists, mysteriosos and wishful thinkers pushing their own theories of how electronics travel from amp to speaker (and back). Thanks for the debunking.

Your point about thinking numbers, not labels, is well taken if one considers resistance alone, but each wire presents a combination of cumulative changes to an audio signal. These changes include the inductance and capacitance you mentioned, plus a couple of phenomena for which no name yet exists—as well as resistance. In taking that part of your article literally, an enthusiast would be confused whether or not to switch from zip cord to something better in a run of 8 to 15 feet.

In blind listening tests, our panel was able to distinguish with better than 90% accuracy between speakers connected with 5 feet of Monster Cable compared with 5 feet of 18 gauge. We know of a case where the sound of a two-module speaker improved noticeably on the top end when an 18-inch “jumper” between top and bottom was replaced with Monster Cable. There are several cases where consumers and manufacturers have used Monster Cable to internally wire their speakers and have reported a discernable improvement. This leads us to conclude that 18 gauge should not be used under any circumstances, and that even in very short runs Monster Cable would be sonically preferable to zip cord.

We agree completely with your comments about series inductance and shunt capacitance affecting the stability of amplifiers. Most audiophiles are not capable of determining whether a particular “exotic” speaker wire is going to have a detrimental effect on a given amplifier, but we can make this (gross) generalization:

Many amplifiers which are of wide-bandwidth design, employ high slew rates and utilize a speaker feedback loop, may tend to destabilize when connected with a speaker cable that has ultra-low inductance and (by definition) high capacitance characteristics.

It should be pointed out that we haven't found an amplifier yet which is adversely affected by Monster Cable.

One point where we disagree is the nature of the status quo. “Would any audiophile use thinner wire for such a long run?” Our surveys indicate the majority of audiophiles, having made an otherwise intelligent decision on their other system components, are still using whatever speaker

wire the dealer was giving away at the time. Even figured on purely resistive effects, at 4 ohms 20 feet of 16 AWG wire would give the following result in a 100-watt/channel amplifier with rated damping factor of 100:

Available power to speaker—92 watts
Effective damping factor—19.9

If the 8 watts (0.3 dB) aren't important, the uncontrolled bass output below resonance point of the woofer is. These problems are exacerbated by the use of common speaker fuses as you point out on page 27. So here we have a not-too-theoretical case where the performance of a system similar to your reference system “B” (\$2700 ±) could be noticeably compromised by a few feet of giveaway wire. While the same length of Monster Cable won't give you back all the lost wattage and damping, it will certainly minimize those losses.

Lastly, we get back to the most important criterion—listening. Without naming the phenomena involved, may I suggest that you duplicate one of our experiments:

Compare 30 feet or more of Monster Cable to an equal length of either commercially available 10 or 12 gauge stranded wire or Romex. We used wide-band noise and full-range music for the comparison. Since there are similar amounts of copper conductor involved, the audible differences should be attributable to construction and stranding.

Agreed, sometimes we're talking about some relatively subtle differences, but in a climate where a consumer must spend approximately \$500 to change from an FR-1 Mk 3 to a Koetsu, the results of switching to Monster Cable far outweigh the extra cost involved.

Thanks for listening!

Best regards,
Joe Abrams
National Sales Manager
Monster Cable
San Francisco, CA

We won't deny, and never did, that in a given chain of components an audible difference may result when the speaker wire is changed. What we do deny is that such an audible difference will be unfathomable in terms of resistance, inductance, capacitance, dielectric properties, diode effects at joints, RF pickup or other known electrical phenomena. We insist that the burden of proof is on those who can hear still other differences due to “phenomena for which no name yet exists”—not on us squares who can't. We have yet to hear a successful demonstration of the no-name stuff.

What the exact thresholds of audibility are when it comes to small differences in R, L, C, etc., is an open question; your observations are as valid as ours or anyone else's. We can tell you, however, that your damping factor analysis is invalid. As Richard H. Small himself points out in one of his classic

papers, damping factor specifications are much more meaningful at 50 Hz than in the midband, and nominally 4-ohm speaker loads aren't 4 ohms at 50 Hz but well into the double digits. Therefore the effect due to the 16-gauge wire will be much smaller than you claim. “Uncontrolled bass output” is a vast exaggeration.

In any event, you like Monster Cable and we like Monster Cable, so why should we fight?

—Ed.

The Audio Critic:

I was about to send you . . . a request to return my tone arms when surprise, surprise, along comes The Audio Critic with its review, as you stated, two years in the making. The review is full of assumptions which compel me to correct and clarify.

The Rabco mod you reviewed is not the first one but an improved version sent to you at request over one year ago. This arm used a hollow balsa shell. One of two other reviewers had described the sound of this arm as “magnificent” and the other in a letter to me as “superb”. Neither of them has had an arm as cosmetically attractive as the one you have. The slight coloration you refer to has for the last six months been removed by the simple expediency of packing the shell with foam rubber. I have a letter written by an audiophile whose opinion differs from yours concerning the merits of your “best tone arm”. He prefers the Wheaton Rabco to his FR-64. His Rabco tone arm was *deadened* by the above-mentioned method.

Your review was interesting because it indicated there was no sonic difference between the Rabco with a hollow shell and the Wheaton 240 with a hollow shell. In other words, the importance of straight-line tracking is somewhat exaggerated. A pivoted arm, correctly designed, can sound as good or maybe with correct geometry even better.

The only Wheaton 240 that I have cared to sell to date had its hollow shell deadened by foam rubber. With all the errors you might have found in the 240 but didn't, I think it's remarkable that your only complaint could be the hollow shell. With the recent acquisition of certain equipment, the shells of both arms will be milled from solid hard balsa. Both the solid and rubber filled shells in my opinion are deader than any metal arm, and that is the reason I opted for balsa, not because “lighter is better.” For tracking warped records, lighter is better. In addition, the balsa arm affords more isolation to any cartridge, which is the reason for the “magnificent, superb” sound.

The Wheaton 240 is now a 250, this to accommodate the Kenwood KD 600, for example, which is slightly different from the KD 500. The cueing arm is shorter to accommodate the Oracle turntable. The axis of the vertical pivots is canted 22 degrees. The head shell will be made of solid balsa,

and the geometry further improved.

Beauty is in the eye of the beholder, and since everything was done for a purpose, its appearance is usual in many respects.

Yours truly,
Herbert Papier
Wheaton Music
Wheaton, MD

We could only evaluate the damping characteristics of the samples sent to us, not of variant versions owned by others. As for pivoted vs. straight-line tracking arms, we agree that various construction details may end up having a greater influence on the sound than lateral geometry; however, we can readily hear the maxima and minima of a correctly offset and overhung pivoted arm as it traverses the record, so we still believe in the inherent superiority of the SLT concept. Lastly, solid balsa wood is not the acoustically deadest material you could use, although it's a lot deader than some.

—Ed.

The Audio Critic:

Thank you for printing my letters, but unfortunately I find your replies unacceptable, and for the benefit of your readers a further response is required.

You seem to be unaware that the original and earliest solution to the problem of tonearm geometry was devised and presented by Percy Wilson, Britain's first and most distinguished hi-fi reviewer, in the *Gramophone* during 1924, when he was the first to use offset and overhang principles.

Second, an arm should be designed *not* for minimum tracking error but for minimum distortion—a different thing, since distortion becomes greater (for a given error angle) as the groove radius become less. It follows a simple law, not a square law. The geometric technique Percy Wilson described became common in Britain and was taken up much later in the U.S.A., in fact "rediscovered" (P.W.'s own word) by Bauer and Baerwald, who both got their calculations wrong. The Master had to put them right in another article which also appeared in *Gramophone*. Baerwald's 1941 equations were approximations, but a further analysis by J.K. Stevenson in 1966 was not. In fact, the basis of Stevenson's arm design technique ensures that peak distortion levels remain constant as an arm tracks inwards; most importantly he provides an arm design technique that allows the best values of offset and overhang to be found for any particular length of arm, including one optimized purely for 12" LP discs.

I have shown The Audio Critic's alignment table to J.K. Stevenson, who says as follows: "The quoted values of overhang and offset angle are obtained by disregarding all other forms of distortion and making the tracking error maximum at the inner grooves of a 12" record. The maximum distortion is

then slightly less than in my design, but it occurs on the worst possible occasion, namely at the inner grooves where all other forms of distortion are maximum."

Finally would my American friends please note that the incorrect term antiskating is a complete misnomer; the correct expression is sidethrust or bias, and the adjustment is called sidethrust correction or bias compensation.

Yours sincerely,
Gerald Bearman
Director
Mayware Ltd. (Formula 4)
England

After your third communication to us on this subject, we must reluctantly conclude that you have no clear understanding of the basic mathematics involved and apparently rely on others to supply you with arguments, which then become garbled in your translation.

Baerwald's 1941 solution is not an approximation, nor did he get his calculations wrong, nor could someone as intelligent as Percy Wilson have said anything so asinine. You yourself quote J.K. Stevenson as confirming that our Baerwald-derived alignment table minimizes the maximum values of distortion, which is what a purely geometrical solution is all about. What Stevenson is trying to tell you, and what you don't appear to grasp, is that his design also takes into consideration an additional factor totally different from geometrical tracking error—namely inner-groove distortion due to loss of stylus contact with the groove wall. This is at least a rational argument at first blush (we shall take it up in greater detail in our forthcoming Handbook), but it certainly isn't a refutation of Baerwald. In any event, a modern stylus like the Vital or Paroc or especially the Van den Hul hardly knows the difference between outer and inner grooves—it traces the innermost better than a 1966 spherical stylus did the outermost. What's more, tracking distortion and tracing distortion are in quadrature (90° phase angle between the two) and therefore not cumulative in a simple way.

Speaking of the benefit of our readers, they should also be informed that your arguments are, on top of everything else, obviously self-serving. Your advertisement in the back pages of Audio offers a \$10 protractor with a dire warning against "outdated 1941 tonearm geometry (that) gives maximum distortion from the critical listening area instead of (the) required minimum." This language is so blatantly misleading that after we saw the ad your high-pitched defensiveness suddenly began to make sense.

As for antiskating/sidethrust correction, it's exactly like truck/lorry, apartment/flat, candy/sweets or snake oil/Mayware. American/British equivalents.

—Ed.

The Audio Critic:

. . . I would like you to comment on what I see as a commonly held "Audio Myth": on the record jacket of most Mobile Fidelity master recordings there is an essay on the MFSL philosophy and technique of record mastering. Included is a statement on "record memory" that I find hard to swallow. MFSL contends that softer vinyl pressings experience "stretching" of the groove walls from stylus pressure, which can last up to 24 hours before returning to its ordinary shape. This effect is supposed to be audible on most ordinary recordings.

I differ with this assertion for two reasons. First, I presently own a system of Reference B quality with the cartridge (an FR-1 Mk 3F) properly aligned, and I have never heard any audible degradation of the sound quality of a record played 2 or more times within a short period of time. Second, considering the comments made by Mr. Cotter in the first installment of your "state-of-the-art seminar" in Vol. 2, No. 1 pertaining to the interface between the stylus tip and the groove wall, it was stated that the stylus does not play the surface but the subsurface of a groove wall. With the stylus "sinking" into the groove wall only 3 or 4 microns (actually he said only 0.3 or 0.4 microns—Ed.), it does not seem to me that even if the vinyl did not immediately "bounce" back to its original shape that there would be an audible difference in sound. I see no reason why the vinyl should not return to its original shape after the stylus passes over it, however. Considering the small scale involved, as Mr. Cotter so aptly states, one cannot discuss the elastic properties of vinyl solely in terms of classical physics—the quantum mechanical effects must also be reckoned with.

All in all, it appears that many audiophiles have fallen prey to a popular misconception. I have had audio enthusiasts and dealers alike swear up and down that "record memory" does indeed exist. I would appreciate your comments on this subject. If I am correct, then tally one more strike against the "audio sophists"; if not then please correct my errant ways.

Sincerely,
Lt. Dale W. Wittig
United States Army

What Mobile Fidelity Sound Lab actually claims is that their so-called Super Vinyl, available only in Japan from JVC, has no "memory," whereas ordinary vinyl does. Vinyl comes in different grades and qualities, some much softer than others. One can't really make any sweeping generalizations about the integrity of the groove walls after repeated plays. In rare cases the vinyl is never the same again after a single play. If vinyl memory were a major problem, however, it would be impossible for us to run cartridge, arm or preamp A/B tests, all of

which require playing the same passage on a record over and over again. The very fact that we haven't observed any significant inconsistencies in the course of these tests seems to indicate that vinyl memory, if it exists at all, is no big deal. We refuse to state categorically, however, that it cannot exist under any and all circumstances.

—Ed.

The Audio Critic:

Over several years of following the audio press (both mass market and high-end publications such as your own), I have consistently noted a peculiar phenomenon.

Often, I will find that a speaker system which has been highly acclaimed by underground reviewers and other such "high-end" sources will be panned by the less specialized publications. These reviews will suggest, either overtly or covertly, that while the speaker is excellent in areas which golden-eared audiophiles deem important, it nevertheless lacks the punch and dynamism necessary to satisfy lovers of rock and other such popular music. There is often the subtle insinuation that the system is somehow "too neutral" to satisfy primeval savages such as myself. The Dahlquist DQ-10 is one example which comes to mind.

This confuses me, since I feel that if a speaker system is acknowledged as an accurate reproducer, it should be able to (with the proper electronics) recreate whatever type of music you prefer.

Two possible explanations suggest themselves to me:

1. These reviewers are right, and since any speaker system design is a mass of trade-offs, the particular design goals embodied in the product in question make it preferable for symphonic and other such classical music rather than Tom Petty and the Heartbreakers.

Or:

2. These reviewers are wrong and what they are actually suggesting is that a little deliberate distortion in the design could enhance the immediacy and excitement of popular music. I find this idea not entirely repugnant, due to the fact that, as you noted in a previous issue of *The Audio Critic*, rock-pop music is "as processed as Kraft cheese" by the time it leaves the studio. Therefore a little additional "enhancement" on the listener's end seems hard to condemn. The ideal of course would be an accurate reproducer which is at home with any musical preference.

Your comments please.

Very truly yours,
Marc Loos
Tampa, FL

We believe that a highly accurate speaker—i.e., wide-range, dead flat, coherent, nonringing—would be a great success with the rock-pop-disco crowd, provided it could at the same time play very loud with-

out breaking up. If extra sizzle and boom are indeed what the fans desire (which isn't always true), the effects could at the option of the record producer be mixed right into the master tape and reproduced unaltered through such a speaker. And, of course, accurately recorded classical music would be equally well served by the same design.

The trouble is that, with very few exceptions, accurate audiophile-type speakers can't produce the kind of SPL the rock-pop market demands; furthermore, rock-pop producers rely heavily on loud, inaccurate, sizzle-and-boom monitor speakers to mix the kind of sound they believe will sell. The same mix played through an accurate speaker might not sound punchy enough.

So it's basically a question of whether the fans want fun-house mirrors or genuine pointy-headed fat ladies. The "production values" will be about the same either way, except that in the first instance you give up the kind of accurate mirror in which the occasional beauties look best.

—Ed.

The Audio Critic:

I read with interest your short article on FM tuners (Volume 2, Number 2), but I feel your "walking away" from FM is turning a deaf ear on a tremendous potential: variety. After all, where else can one hear all this diverse music from which to make his buying decisions? Granted, FM is technically quite poor (my favorite station's turntables make me swear there is an invisible train in my living room), but from the comfort of my apartment, I can listen to classical, jazz, bluegrass, all styles of rock, et cetera, as well as many rare performances of which I could never get a personal copy. This is all leading up to my technical complaint within your review.

Assuming that one wishes to listen to FM (which I feel is a safe assumption), the market is so glutted with FM stations that selectivity becomes a very important factor. For example, my favorite station, with its unique format to the area, is 80 miles away and 140 watts ERP. Two miles away, approximately 30 degrees off axis, is a 250-watt campus radio station on the adjacent channel playing disco. My landlord would not permit towers in the back yard, nor would he allow horizontally stacked arrays of antennas; two ten-element yagis stacked vertically was the most he would allow. Therefore, I need a tuner with very good adjacent-channel rejection. This is a subject that reviewers in commercial audio magazines seem to ignore, and, unfortunately, you did also. This left me to the whim of manufacturers' published specs and salesmen. It sure was lucky that I found a store with a two-week take-home test privilege.

Sincerely yours,
Fred Rosenberg
West Springfield, MA

Everything you say is undeniably true; we agree with all of it. You must remember, however, that our editorial turf has boundaries; it doesn't extend over the entire domain of electronically reproduced music, at least not at the present stage of our growth. So far we have concentrated on "purist" sound and have walked away from areas where such an outlook seemed hopeless. That doesn't mean that making the most of a technically bad situation for the sake of music isn't a 100% worthwhile concern. (What about all those priceless old 78's? They can be made to sound much better with a little sophisticated massaging.) We just haven't moved in those directions so far; furthermore, in the specific case of poor FM sound and chaotic airwave management, we don't particularly wish to reward or encourage the perpetrators by accepting the present mess as a given and exploring temporary band-aid remedies on the receiving end.

—Ed.

The Audio Critic:

Referring back to your 'Admonitor', as I occasionally do for a chuckle or two, I noticed in your admonition of an AR9 ad you make reference to Bjorn Edvardsen's assertion that "time domain distortions in musical program material are inaudible."

Later, in your praiseworthy review of the NAD 3020, you credit Mr. Edvardsen with designing it.

I agree that the NAD 3020 is a "sonic" beauty, and the designer must obviously have a lot on the ball. If he is, in fact, one and the same being, has he thus found the cure, and therefore no longer possesses the disease, or is his disease related only to speaker design?

Perhaps the disease isn't all that serious after all, and you just have a touch of hypochondria!

Sincerely,
Gerald DeLotto
San Francisco, CA

We just knew that some eagle eye would notice that. The explanation, though, is quite simple. The Audio Engineering Society paper referred to in the Vol. 1, No. 6 'Admonitor' was coauthored by Robert Berkovitz and Bjorn-Erik Evardsen, and we clearly identified both. It just so happens that all the general philosophical ideas presented in that paper came from Berkovitz; Edvardsen, who is no longer with AR, was responsible only for the laboratory measurements and got second billing. We know Bjorn-Erik slightly, have had some technical discussions with him, and are very much under the impression that he believes in the audibility of time-domain distortions. Maybe Karl Marx's copy editor wasn't a communist, either.

—Ed.

Introducing the First Speaker Designed to the Specifications of *The Audio Critic*

It should have happened long ago but never did: a simple, straightforward 3-way dynamic system without any highfalutin engineering shenanigans but also without the usual vulgar errors in design.

This is the speaker we've been hinting at in our ads announcing this issue. It's called the **Fourier 1** and is the first product of Fourier Systems, Inc., a recently formed New York company named after the French mathematician of the Napoleonic era who developed the integral transform that establishes (among other things) the relationship between the frequency domain and the time domain.

The speaker started out as an intramural laboratory project to satisfy the curiosity and vindicate one of the pet peeves of your Editor and was never meant to be a consumer product; when its unexpectedly wide margin of superiority to other dynamic speakers resulted in a reversal of that decision, it was our impression that a few stores would definitely have it in stock by the time you read this. As we go to press, that projection appears to have been just a little on the optimistic side; the earliest dealer shipments of the Fourier 1 are now expected to start around March 1, 1981, we're told. If our ads caused you to defer the purchase of speakers for a longer time than you intended, we're truly sorry for our faulty timing; on the other hand, would you have preferred to remain totally ignorant of what was coming?

Although we can't take credit for the actual nuts-and-bolts engineering and execution of the Fourier 1, the speaker would never have happened without our initiative and our conviction that it was feasible; therefore, since **The Audio Critic** is in the business of making impartial and commercially disinterested evaluations of audio equipment (including other 3-way dynamic floor-standing speakers on occasion), we want to disclose here the full background of the project so you can judge for yourself the exact degree of our involvement and our consequent partiality, if any.

A laboratory exercise in credibility.

It all started with subscriber response to our insistent assertions, repeated in issue after issue, that manufacturers of conventional dynamic speakers weren't doing their homework, since their designs were almost invariably riddled with primitive engineering errors that could have been avoided at little or no extra cost, with only a modicum of extra knowledge. "Come on," these subscribers would say, "do you mean to tell us that Acoustic Research, James B. Lansing, KLH, Cerwin-Vega and all those other highly successful speaker companies don't know what they're doing?" It became a full-fledged credibility problem, compounded by the fact that not even the smaller audiophile-oriented "boutique" manufacturers (whose products were quite a bit superior

because at least they *listened* to them) had ever made a simple dynamic speaker we could point to as being entirely free from important goofs, in order to prove our point. Slowly it began to look as if there were something wrong with our attitude and criteria, not with the speakers we were putting down. After all, thousands of audiophiles *liked* those speakers. We decided we had to come up with more than just academic arguments if we wanted to settle the matter once and for all. We had to come up with a speaker.

What we had in mind was a single pair of speakers, constructed strictly as a laboratory exercise, incorporating all the specific design points we had been clamoring about and found lacking in others. We began by establishing some very strict rules for the exercise to make the demonstration of our thesis as convincing and comprehensive as possible. First we ruled out exotic or excessively costly technologies that might not be available to all speaker companies. No ionized-air (plasma) drivers, not even electrostatics, nor even super special dynamic drivers that a speaker manufacturer might have to custom build for his system. Nothing but plain-vanilla dynamic drivers of good quality, available to anyone from the standard trade sources. We also ruled out giant enclosures that could be expected to elicit an "over my dead body" reaction from wives defending the hearth from unreasonable encroachment. It had to be a practical, widely usable but still full-range speaker. The crossover had to be passive, electronic crossovers being beyond the manufacturing capability of the typical small speaker firm. These requirements automatically kept the hypothetical price of such a speaker to a reasonable figure. So much for the anyone-could-have-made-it-if-he-knew-how criterion.

We then set down what we thought were stringent but achievable specifications for such a speaker. It had to be *much* more efficient than typical audiophile speakers, approaching rock speakers like the Cerwin-Vega in efficiency without any of the sonic colorations of the latter. Also (a seemingly conflicting but not unrealistic requirement), it had to have deep bass, flat down to 30 Hz or so, and not just on a small-signal basis. Really loud and clean in the bottom octave, without going to pieces on organ music with powerful pedal passages, and with impact and proper damping on bass drums. In other words, the subwoofer sound without a subwoofer. At the other end of the spectrum, it had to be *much* faster than typical dynamic speakers using 1" dome tweeters, with better power handling on cymbal crashes and such. Needless to say, all drivers had to be in phase, producing a multiple wave launch with at least a half-decent chance of coalescing into a coherent wave front and yielding a reason-

able facsimile of a square pulse. Ringing in response to tone bursts of any frequency and pulse stretching of any significant magnitude were not to be tolerated. Implicit in these requirements was the need for a crossover network free from all the usual time-domain disturbances, yet with steep enough slopes to restrict each driver to its most comfortable band of frequencies.

A tall order, that one, but not beyond the powers of educated and experienced engineering minds. It happens to be one of our professional assets to know just where to look for such minds, and the team of consultants that succeeded in designing precisely such a speaker to our specifications eventually ended up as the founders of Fourier Systems. Because once a pair of the finished speakers was put together and listened to, it became quite obvious that we couldn't just publish an article saying "see, we told you so" and let it go at that. The how-can-I-get-just-one-pair-for-myself letters would have inundated our office to waist level. The speaker audibly demanded to become a purchasable product. And that's how the Fourier 1 was born.

The design and what went into it.

It was decided very early in the course of the project that the speaker would have to be a 3-way system. A conventional, straightforward 2-way system can't be made to reach down into the subwoofer range and at the same time be fast on top. A 4-way system, on the other hand, requires an elaborate and costly crossover network if it is to work properly and thus begins to approach the exotic category we wished to avoid.

Once the 3-way format was agreed on, it became fairly obvious that the woofer would have to be a 10" unit. The mass-reactance roll-off of a 12" woofer dictates a midrange crossover generally too low in frequency for the best dynamic midrange drivers, which can be expected to be almost invariably on the small side. Our requirements in efficiency, maximum tolerable size and large-signal bass response then suggested very strongly the use of a vented enclosure, specifically of 4th-order Butterworth tuning, with an internal volume somewhere in the neighborhood of 3 cubic feet (85 liters). Since multiple drivers in clusters or pseudo-line-source configurations had been ruled out from the start on account of their miserable wave-launch characteristics, the driver complement was thus established as one 10" woofer with a Q of approximately 0.4 (for B₄ alignment), one mid-range driver and one tweeter.

As our readers know, one of our most insistent objections to typical dynamic drivers has been their excessive energy storage. They ring; many of them ring vigorously and long. To find one with reasonably flat response in its operating range is easy; even good dispersion can be had without too much difficulty; but only a very few drivers will shut up after the input signal has been cut off. When we launched this laboratory project, we had already been testing commercially available drivers for a good many months to help us with our regular speaker evaluations, and we immediately turned all the accumulated data over to our consultants.

Among the raw tweeters we had looked at, our favorite was a Japanese flat-diaphragm design with etched voice coil (the kind that's usually promoted as a ribbon but isn't really); this particular one measured and sounded amazingly like the Pyramid T-1, at a tiny fraction of the cost. The vertical dispersion of this unit is far from sensational, and it also exhibits

a slight peculiarity (shared by the T-1) in its differentiation of a square pulse, but it's dead flat on axis to 43 kHz, very efficient and free from appreciable ringing at all frequencies. It's faster, louder and just plain better than 1" domes. Our favorite midrange driver, on the other hand, out of a very limited group worthy of consideration, happened to be a large soft-dome unit made in Europe. (We're not mentioning any brands and models lest some home constructor should attempt a half-baked version of the Fourier 1 that would only parody the design.)

For the woofer we had no suitable candidate. As most makers of vented-box speakers have found out, it's well-nigh impossible to find an off-the-shelf woofer whose free-air resonant frequency and Q fit right in with the preconceived parameters and performance specifications of a new design. The way around that problem is to tell the raw-speaker supplier exactly what parts to put together: what kind of magnet, pole piece, front plate, back plate, voice coil, cone, surround, spider, basket, etc. If the parts specified are available from stock, the supplier will accommodate you, even if he doesn't understand your exact rationale for the recipe. That's how our consultants obtained the unique 10" woofer of the Fourier 1 (it has a 54-oz. ceramic magnet, an exceptionally dissipative cone and a suspension that's almost impossible to bottom), and since the same route is open to even the smallest speaker manufacturer if he knows what he is doing, our ground rules weren't violated.

The biggest difference between competently and incompetently designed speaker systems, however, is usually in the crossover network. Here again our consultants came up with a relatively simple solution, an elegant little constant-voltage network that any C+ student in a graduate course on filter theory would consider a piece of cake but one that would never enter the mind of the typical self-taught designer found in most small speaker companies. The network allows the drivers to play very loud without unduly exciting them outside their optimum passband, and on the lab bench as well as on the Hewlett Packard HP-85A computer both the amplitude and phase response of the network look virtually textbook-perfect. Enough said.

Fourier 1

Fourier Systems, Inc., One North Broadway, Suite 620, White Plains, NY 10601. Fourier 1 floor-standing 3-way dynamic speaker system, \$1190 the pair. Three-year warranty.

The finished product in its veneered cabinet stands just a few inches over 3 feet tall and takes up just a little more than one square foot of floor space. It has no controls and no fuses in the back because it doesn't need any. Its price is based on its physical contents and should not be interpreted as an indication of the category it aims to compete in.

In view of our role as godfather to the Fourier 1, even though we didn't actually design it, we've decided not to review it here in the subjective sense. The objectively verifiable design data presented above should be sufficient. Its large-signal bass response alone, not mention its time-domain characteristics, make the usual comparisons unnecessary. We're currently using it as one of our top reference speakers, alternating with the Quad and the Quad/Janis W-1 combination to double-check our perceptions and evaluations. That should tell you where we stand; the rest you'll be able to hear for yourself very soon when the speaker begins to arrive in showrooms.

More Speakers, Ordinary and Extraordinary

By the Staff of
The Audio Critic

The interest this time focuses on electrostatics, especially since the dynamic systems under consideration fall mostly into the pretty-good-but-unexciting category.

In this issue we got all our philosophical generalizations about speakers off our chest in the separate feature article on the **Fourier 1**, the first speaker system designed to the specifications of **The Audio Critic**. Here we shall proceed without further introduction to the reviews, where any theoretical issue raised by a particular speaker design will be discussed in that context only.

Audio Pro B2-50

3D Gruppen, Stockholm, Sweden; distributed in the U.S.A. by Intersearch Inc., 4720-Q Boston Way, Lanham, MD 20801. Audio Pro ACE-Bass Subwoofer B2-50, \$995 (single unit for summed left and right channels, with built-in amplifier and electronic crossover). Five-year warranty. Tested #94B2J1850S, on loan from distributor.

No one can cheat the laws of physics, but this slick little amplified subwoofer manages to cop a plea. Those laws demand a penalty for compact size in a low-frequency speaker—loss of the deepest bass or loss of efficiency or a combination of both. The Audio Pro B2-50, by using every dodge and stratagem in the book, squeezes a fair amount of flat-to-20-Hz bass out of two 6½" Philips drivers in a 50-liter vented enclosure, which is small enough to fit into a 1½-foot cube that also contains the rather sizable electronics. The tricks employed include 6th-order Butterworth alignment, negative output resistance in the amplifier, plus a few other little tweaks and massages, the sum total of which is called ACE-Bass (Amplifier Controlled Euphonic Bass) and has been found sufficiently different by the patent examiner to carry a patent.

Our measurements confirmed the 6th-order Butterworth tuning and the claimed f_3 (–3 dB frequency) of 20 Hz; on the other hand, we measured THD in the range of 4% to 12%, depending on frequency and output level, instead of the 0.6% to 4% range indicated as "typical" in the spec sheet. We don't want to make too much of this discrepancy; differences in methodology may be the whole explanation.

The response to a step function (dynamic Q) was found to be typical of a properly damped vented system of this type.

The bottom line in woofer performance, however, is large-signal capability, which is totally independent of how the system Q and the f_3 are obtained. Piston area and linear excursion are the name of the game when it comes to moving air, and from that standpoint the two 6½" drivers are barely equivalent to a single 8" unit and significantly less capable than one good 10-incher. Yes, the B2-50 will produce a sound pressure level of 100 dB at 1 meter as specified, but don't forget that 100 dB at 20 Hz is *subjectively* only as loud as 60 dB at 1 kHz—it's very far from real-world peak SPL's. Even at 40 Hz, 100 dB corresponds to only 84 dB at 1 kHz, which is still not a symphonic level. To gain the upper hand against the inexorable mathematics of the Thiele/Small vented-box alignments, the large-signal considerations and the Robinson-Dadson equal-loudness curves, it's preferable to opt for a somewhat higher f_3 (say 34 or 35 Hz) and to start with as large a driver as possible (probably with a 10" unit in a system of this size). It's our impression that the extra design flexibility added by the ACE-bass concept turned the B2-50 into a virtuoso exercise in numbers (20 Hz, 100 dB, 2 times 6½", 50 liters, etc.—see, it can be done!) rather than an optimum trade-off between size, price and useful bass.

Which brings us to the nub of the matter—how the B2-50 sounds. Despite the remarkable ability of that itty-bitty cube to reproduce the lowest organ and double-bass fundamentals with good definition at moderate levels, the really big passages with deep bass are lacking in authority. The feeling of unstrained power is missing. We hear distortions when the bottom octave gets really busy that aren't even explained by our higher THD readings. Air turbulence in the vent may be one of the contributing factors, but the main problem is undoubtedly the limited air-moving capability of those two little drivers. They just run out of breath at some point. We feel that the relatively high price of the B2-50 is justifiable only in installations where space saving has top priority, over and above performance per dollar.

We must add that an earlier sample we looked at had a horrendous electronic crossover which completely messed up the sound of the high-pass channels. The more recent sample with the serial number noted above had a revised crossover that sounded quite transparent. Make sure you consider the revised version only.

* * *

Editor's Note: The follow-up report on the **Beveridge System 3** should have appeared here, as promised in the last issue. Unfortunately, our "improved" samples arrived much too late and then were further modified *in situ* by a factory representative at the end of October (new woofers were substituted), so that at press time we're barely familiar with the capabilities of the revised system. A detailed second review appears to be in order and will be included in one of the earliest issues of our forthcoming biweekly Bulletins.

* * *

Dalco SW-3

Dalco Speaker Works, Second and Westmoreland Streets, Philadelphia, PA 19140. SW-3 3-Way 10" System, \$398 the pair. Tested #4197 and #4292, on loan from manufacturer.

This company once had a tie-in with Dynaco, and it's actually Dynaco's former head of speaker design who is responsible for engineering the relatively new Dalco line, of which this model is a representative sample. In other words, Dalco does have some credentials in the audiophile market.

This medium-sized 3-way acoustic suspension system sounds reasonably musical (or shall we say inoffensive?), but the midrange has an ever-present signature—a hollow and somewhat nasal quality that gives it an unmistakably false coloration. The explanation is readily at hand, since the midrange driver is out of phase with the woofer and the tweeter. We've never seen a case of that (woofer plus, midrange minus, tweeter plus) without precisely the same sonic problems. The speaker is by definition incapable of replicating a pulse, regardless of width, and tone bursts show bizarre interference patterns created by the incoherent multiple wave launch. Furthermore, the woofer is somewhat underdamped (dynamic Q approximately 1.3, with 3 dB ripple in bass response), although the overall amplitude response profile is very smooth (± 3 dB from 40 Hz to 20 kHz).

On the whole, the SW-3 is far from the hopeless-sounding mess most speakers are in this price range; its top end is quite decent, the bass fairly good but not great, the midrange wrong but tolerable. More than that we can't say for it.

Dayton Wright XG-10

Leigh Instruments Limited, Audio and Power Division, 350 Weber Street North, Waterloo, Ont., Canada N2J 4E3. North American distribution by Odin Studios Limited, 7321 Victoria Park Avenue, Unit 2, Markham, Ont., Canada L3R 2Z8. Dayton Wright XG-10 Electrostatic Loudspeaker System, \$3499 the pair (complete with

IM10 matching transformer and bias supply, speaker stands, transformer stand). Three-year warranty. Tested #9I09A/B, with 9H05C transformer, on loan from distributor.

Editor's Note: This review barely missed our last issue; had the speakers arrived just six or seven weeks earlier, we could have completed the tests in time. As a result, the information that follows is a number of months old as of press time, but no less true than it was when new. Meanwhile the XG-10 appears to have been discontinued after a very short life span; however, there must still be quite a few of them in the stores and more in the always active audiophile secondhand market.

* * *

The XG-10 was supposed to be the model in which Leigh Instruments would get its Dayton Wright act together and put to corrective use all the lessons learned from the XG-8 Mk 3 fiasco. Well, it didn't quite turn out that way. This is still a highly inaccurate speaker, riddled with engineering errors.

One thing that has been improved to some extent is the frequency response. After the electrostatic cells had been allowed to charge up over a period of more than two months, a Dayton Wright dealer set up and trimmed in the speakers in our listening room, exactly as they would have been in the case of a regular customer. The trimming-in process involves some fiddling with a variable resistor in each channel of the transformer/bias unit; moderate changes in the spectral balance of the system can be effected that way. Afterwards our own measurements showed that the dealer had done a good job, considering the general orneriness of the XG-10. Overall amplitude response was flat within ± 5 dB from 90 Hz to 36 kHz, with the piezoelectric tweeter switched in. The electrostatic cells alone, because of the inherent peculiarities of the Dayton Wright design, roll off rapidly above 8 kHz. The peak that used to be at 700 Hz in the XG-8 Mk 3 is now at approximately 600 Hz (so what else is new?); its amplitude is still 7 dB with respect to the trough that follows it. Bass response is worse than before, with a 12 dB peak at 50 Hz and a bottomless dive below that frequency, reaching the -3 dB point at 40 Hz on its way to nowhere. Even granting the mysteries of the dipole/room interface, that's an unacceptable profile.

But the frequency domain provides only very small clues to the essential perversity of the XG-10. Time domain tests with pulses and tone bursts reveal energy-storage problems to make your hair stand on end. This speaker rings endlessly at just about every frequency. There appears to be simply no control to shut off the acoustical output after the electrical input stops. The bass is especially uncontrolled, with an almost infinite series of ripples in response to a step function. Pulses of shorter duration are reproduced coherently, as one would expect of in-phase electrostatic cells, but the trailing garbage after pulse turnoff is gross beyond all expectations. Furthermore, the piezoelectric tweeter is in the wrong acoustic plane with respect to the electrostatic cells—the coherence is destroyed when the tweeter is switched in. Even the small amplitude response squiggles look totally different in the tweeter's range than in the electrostatic passband; they show an abrupt change in signature. This is the worst case of tweeter mismatch we've seen in the course of our laboratory tests so far.

The sound? Little or no bass and inaccurate what there is of it; highs quite unpleasant with the piezoelectric unit switched in. Used as a midrange panel in a triamped system (6-dB-per-octave roll-off above 3 kHz provided by special switch position), the XG-10 at least has the attack and large-source wave launch that give any electrostatic a certain authority, but the lack of focus and the unmistakably colored tonality make it a poor choice overall, especially at the price. Quite frankly, we find the cult following of Dayton Wright speakers utterly incomprehensible. Even if it's our own irredeemable aural turpitude that prevents us from yielding to a higher truth, the spectrum analyzer, oscilloscope and B&K microphones are too dumb to lie.

DCM QED

DCM Corporation, 670 Airport Boulevard, Ann Arbor, MI 48104. QED floor-standing loudspeaker, \$480 the pair. Five-year warranty. Tested #4742 and #4743, on loan from manufacturer.

Historically, this neat little 3-foot high column speaker preceded the Time Window as a finished design, but DCM never really pushed it and it ended up as their junior product. That status isn't entirely deserved, as the QED is in some ways a more neutral and therefore more accurate speaker than the Time Window, although it doesn't have the latter's dispersion characteristics or power-handling capability. That's mainly because the QED has only one woofer and one tweeter, against the Time Window's two and two. On the other hand, the QED is considerably less colored in the lower midrange, where even the best version of the Time Window exhibits a certain thickness. In fact, the QED approaches the Vandersteen IIA in overall neutrality and transparency, though we still prefer the latter on all counts.

Our measurements showed very smooth amplitude response all the way up to 20 kHz, with the midrange particularly flat; the -3 dB frequency on the bottom end is 48 Hz. The tweeter cuts in at about 1.7 kHz and appears to be at full passband level at 1.8 kHz—that's pushing a 1" dome to the limit, we'd say. Above 20 kHz the tweeter response drops like a brick. The vented box is tuned to 40 Hz and the maximum output from the vent is at approximately 50 Hz, constituting a surprisingly Thiele/Small-ish alignment for DCM, whose other enclosure designs march to a different drummer.

As in the Time Window, the tweeter is connected out of phase, and again DCM *almost* gets away with it, owing to the driver spacing and the nature of the crossover network. Thus, despite the polarity reversal, pulse replication is good down to a width of 0.2 msec, but with the inevitable opposite-going preshoot also observable in the Time Window. Tone bursts are quite accurately reproduced, indicating freedom from significant ringing throughout the speaker's frequency range. The response to a step function (dynamic Q) shows essentially correct damping in the bass.

We're very favorably impressed with the clean, musical, relatively uncolored and nicely balanced sound of the QED, although you can't play it as loud as the Time Window. Since a pair of QED's costs \$180 less, and since we have some reasons to suspect a slight decline in the sonic

quality of recently produced Time Windows, we now consider the QED to be the best per-dollar value in inexpensive audiophile-oriented speakers.

DCM 'Time Bass'

DCM Corporation, 670 Airport Boulevard, Ann Arbor, MI 48104. 'Time Bass' woofer system, \$770 the pair. Five-year warranty. Tested #500 and #501, on loan from manufacturer.

Imagine a slightly less tall and *very* much fatter Time Window, and you have a fair idea of what the Time Bass looks like. It's far from a small woofer, so you expect it to have really deep and powerful bass. It doesn't quite meet that expectation.

This is one of those vented designs in which the vent is so small that it doesn't seem to make much sense. The loading conditions are such that with a large input voltage the vent is unable to handle the required output and, as a result, modulates the bass. The response to a step function clearly shows that the dynamic Q varies all over the place, depending on drive level. The box is tuned to 12 Hz, an impossibly low frequency by any criterion, and the f_L (frequency of the lower of the two impedance peaks characteristic of vented designs, i.e., the point of maximum sensitivity to subsonic excitation) is an incredible 7 Hz. That's living dangerously. Under small-signal conditions the frequency response is reasonably flat, with the f_3 (-3 dB point) at 32 Hz, but on organ music and other high-energy program material containing powerful low-frequency fundamentals the Time Bass lacks the authority and visceral impact of a really good 32-Hz system. It just doesn't *audibly* play low enough, clean enough and tight enough.

Of course, if you ask DCM, they'll tell you that the Time Bass, with its highly versatile adjustable passive crossover, was designed primarily for flexibility of placement and proper blending with satellite speakers. Nothing wrong with that, but what good is a perfect blender if your eggnog doesn't have enough rum in it?

Genesis 2+

Genesis Physics Corporation, Newington Park, Newington, NH 03801. G2+ floor-standing 2-way speaker system, \$598 the pair. Lifetime warranty (to original owner). Tested #12562 and #12568, on loan from manufacturer.

For the money, this is quite a well-built speaker, made with parts of good quality. It consists of a 1" inverted-dome phenolic tweeter (a Winslow Burhoe design we don't particularly care for), an 8" woofer and a 10" passive radiator, in a fairly compact cabinet that stands a little under three feet tall. The tweeter is wired out of phase with the woofer, cuts in at approximately 2 kHz, and exhibits a relative rise of 6 dB (as referenced to the midband) as it goes up to 20 kHz and then plummets like a stone. This treble-boosted response, which persists even with the tweeter switch in the "decrease" position, is the worst feature of the G2+, resulting in an overly aggressive, fatiguing top end. Too bad, since otherwise the speaker has some outstanding qualities.

The midrange is exceptionally transparent and uncolored, more so than the Vandersteen's or either DCM model's. The bass is also the deepest and best-controlled of that crowd, thanks to the *almost* perfect 4th-order Butterworth alignment (box tuned to 31 Hz, -3 dB response at 32 Hz). In fact, below the 8" woofer's natural roll-off at approximately 1.8 kHz, this is as good a "cheap" speaker as we've tested so far—very nice indeed. Whatever we don't like about it is all in the tweeter's range.

In the time domain, tone bursts reveal no serious ringing anywhere; pulse replication is necessarily quite imperfect as a consequence of the polarity reversal between the two drivers, although a fudged pulse a la DCM is obtainable down to a width of 0.15 msec. The dynamic Q of the woofer/radiator system is in the ball park for a 4th-order Butterworth and remains stable with increasing drive.

Overall, if we hadn't found the top end objectionable, the Genesis 2+ would have come out on top in our search for the best speaker per dollar in the middle hundreds, but under the circumstances we can't make that recommendation.

Mariah LS-1

Mariah Acoustics, Route 28, Arkville, NY 12406. LS-1 floor-standing speaker system, \$1395 the pair. Three-year warranty. Tested #155 and #156, on loan from manufacturer.

This 44-inch high truncated pyramid looks like an Ohm F but is actually more like a Snell Type A in concept, with a 10" downward-facing woofer in a sealed enclosure, 4" midrange and 1" dome tweeter. The polarity of these three drivers in the system is plus/minus/plus respectively, the worst possible phase relationship as we've had occasion to explain before. The inevitable midrange hollowness that results is one of the immediately audible signatures of the speaker.

Another is the rather hard and fatiguing treble range, perhaps not to be blamed entirely on the known shortcomings of the Peerless tweeter used, since the measured amplitude response happened to be dead flat to 17 kHz and -3 dB at 20 kHz. The problem may very well be in the upper midrange, where we had reason to suspect some FM riding on the sine wave test signal in the vicinity of 2 kHz. Our suspicion was strengthened by the audibly "dirty" character of the sine wave output. This is just conjecture, but the unpleasantly nasal and cutting quality of the speaker on musical program material is not.

The bass seems strangely weak, even though the measured response shows the -3 dB point to be at 38 Hz, a reasonably low frequency. It's possible that, with the woofer facing the floor, the loading conditions are optimum only when the speaker is pushed all the way against the back wall, an inconvenient position in our listening setup. Of course, a 10" driver without the aid of a vent necessarily has somewhat limited air-moving capability. Our dynamic Q test shows the sealed system to be slightly underdamped; the Q appears to be just a little over 1 but at least stays there regardless of drive level.

Pulse replication is once again out of the question with the midrange pulling when the woofer and tweeter are pushing; in addition there seems to be an appreciable

amount of time smear when the speaker is pulsed, stretching the original transient event to more than 10 times its length. Tone bursts evoke no egregious ring patterns, but some very odd waveform outputs are observable as a result of the tweeter/midrange wave-launch peculiarities.

We also have some serious doubts about the use of very light fuses to protect each driver in the LS-1 (woofer 1½ amps, midrange ¾, tweeter ½). Some of the audible effects discussed above may be at least partly due to the nonlinearities of such fuses under dynamic conditions. All in all, our conclusion is that the Mariah needs considerable reengineering before it can become a serious contender in its price category.

Mordaunt-Short 'Pageant Series 2'

Mordaunt-Short Inc., 1919 Middle Country Road, Centereach, NY 11720. Pageant Series 2 loudspeaker system, \$545 the pair. Five-year warranty. Tested #15235, on loan from manufacturer.

Made in England and imported as well as distributed by a U.S. company of the same name formed for that purpose alone, this is a 2-way system built around an excellent 8" bass/midrange driver and a somewhat questionable 1" dome tweeter. The vented box is of approximately one cubic foot internal volume.

To start on the bottom end, the box is tuned to 34 Hz and maximum vent output is at 54 Hz—not exactly a textbook-perfect alignment. The f_3 (-3 dB frequency) is 40 Hz, but there's some confusion as to the 0 dB reference level in the speaker's response because of a "valley" that centers on 500 Hz and dips to -7 dB there. The vent is once again so small that under increasing drive it starts to crepitate (to put it politely) within its own passband, namely at 40 Hz. Stuffing up the vent actually gives this particular system better power handling and raises the f_3 to only 44 Hz, while lowering the dynamic Q to a very respectable 0.9 or so. We must admit, however, that in the kilohertz range the 8" unit has beautifully peak-free response right up to its mass-reactance roll-off.

The tweeter is another story. Crossed over at a nominal 3.5 kHz, it reaches full passband level at 4 kHz and then does a strange rising number all the way up to 10 kHz, where the response is $+10$ dB as referenced to passband level. After that it just dies; at 15 kHz it's already down to -3 dB. This top-end characteristic is undoubtedly responsible for the rather nasty edge imparted to strings, sopranos and other program material in the treble range, which constitutes the speaker's principal fault.

On top of it, the tweeter is (you guessed it) out of phase with the woofer; however, because of the rather high crossover, the spacing of the drivers and the topology of the network, pulse shape retention is surprisingly excellent down to a width of 0.15 msec. Tone bursts reveal some mild ringing in the woofer, nothing to get excited about, and virtually none in the tweeter.

Aside from the distinctly edgy highs, we found the sound of the Pageant quite coherent, satisfactorily smooth in the midrange, perhaps a bit bass-shy in spectral balance. Score another one for the good-but-zippy side.

Mordaunt-Short 'Signifer'

Mordaunt-Short Inc., 1919 Middle Country Road, Centereach, NY 11720. Signifer 3-way speaker system, \$1740 the pair (with stands). Five-year warranty. Tested #25449, on loan from manufacturer.

This is the top of the Mordaunt-Short line, a 3-way system with 12" woofer in a vented box of a little over 2½ cubic feet internal volume. The midrange driver is a 5" unit, the tweeter a 1" dome. Let's state it right up front that this far from inexpensive speaker is not our cup of English tea.

The clubfoot of the Signifer is the midrange driver, an utterly wrongheaded design in our judgment. Its paper cone has virtually zero excursion, operating almost exclusively in the transmission mode instead. The termination is totally inadequate, resulting in inevitable peaks and dips in the unit's passband from 500 Hz to 4 kHz, as well as severe energy hangover when pulsed and peculiarly deformed output patterns in response to tone bursts. Ugh. The woofer and midrange are in phase; the tweeter is out of phase (i.e., the polarity is plus/plus/minus). In this case, pulse shape replication happens to be absolutely zilch—no pulse. The tweeter in its own way is even more disturbed by a pulse input than the midrange, possibly as a result of destructive crossover interaction. What's more, it rolls off to -6 dB at 20 kHz.

The bass characteristics are also unimpressive. The vented-box alignment appears to be totally unrelated to the Thiele/Small filter models. In fact, the vent serves virtually no purpose. The -3 dB response (f_3) is at approximately 40 Hz; 0 dB level is reached only at 50 Hz. The response to a step function (dynamic Q) is quite good, however. As for the overall spectral balance of the 3-way system, it exhibits a definite rising trend up to the point where the tweeter roll-off starts.

The sonic consequence of all this is raucous, edgy, unpleasant highs, plus a lack of coherence in the overall stereo presentation. Listening fatigue sets in quickly and decisively. Not a very positive experience, we're sorry to say.

Pyramid 'Metronome 3'

Pyramid Loudspeaker Corporation, 131-15 Fowler Avenue, Flushing, NY 11355. Metronome 3 speaker system, \$2500 the pair (including stands). Three-year warranty. Tested #1230 and #1231, on loan from manufacturer.

Any review of a Dick Sequerra product must be prefaced with a disclaimer of up-to-dateness. By the time the review goes through the editorial and publishing processes, Dick is very likely to have changed the product, at least slightly. For that very reason, we killed our review of an early (Oct. 1979) version of the Metronome 3, which had been scheduled to appear in the last issue. The version discussed here dates from mid-1980.

This is supposed to be the definitive Sequerra statement on a practical, high-priced but still affordable, heavy but still transportable, one-piece dynamic speaker system that can also play *very* loud. It incorporates two 8" cone woofers in a sealed box, one 4½" cone midrange driver and

a special "economy" version of the Pyramid ribbon tweeter. The pyramid-shaped cabinet is not quite 3 feet tall and comes with an open-frame metal stand to raise it off the floor.

The ribbon tweeter is so vastly superior to just about anything used in conventional dynamic speakers that the listener is immediately disarmed by the smoothness of the Met 3's top end and is inclined to declare, "This is it!" Unfortunately, after further exposure, it isn't it. Not quite. The main problem is the lower midrange, which has a definite thickish coloration, incompatible with true transparency. We're thoroughly familiar with the Peerless midrange driver used and have never considered it a particularly accurate unit. Dick Sequerra puts it through some extensive modifications, but they don't help very much. Furthermore, the woofer/midrange/tweeter polarity is plus/plus/minus, which doesn't contribute to coherence. The Met 3 is unable to reproduce a pulse with any degree of integrity. (Interestingly enough, the Oct. 1979 version had all drivers in phase. Can't leave well enough alone?)

The bass constitutes a further shortcoming. The -3 dB point (f_3) in the low-frequency response is at 55 Hz, which is utterly ridiculous in a costly and ambitious speaker of this type. (We're quite aware of Dick Sequerra rationalization, which puts the burden of infrasonic filtering on the speaker, but believe it's just that—a rationalization after the fact, contradicted by any number of existing woofer designs.) The sealed-box system is in addition slightly overdamped, with a dynamic Q that looks like 0.6 in our step-function test. The end result is an unarguably bass-shy quality on organ music, bull fiddles, large bass drum, etc. It's possible that the very latest modification is improved in this respect; we can't be sure, though.

There's little else to report. The ribbon tweeter is dead flat up to 16 kHz and rolls off very gently (6 dB per octave) above that frequency. The radiation characteristics of the total system are such that it's difficult to find a "sweet spot" where the overall amplitude response is truly flat. The vertical dispersion of the ribbon is quite poor, but it still sounds better than dome tweeters. We also found two ring points in our tone burst tests: at 5 kHz in the midrange (outside the driver's passband) and 8.1 kHz in the tweeter (not evident in listening).

Our overall reaction to the Met 3 is one of "yes but." Yes, we're impressed with the top-end smoothness and the dynamic range, but no, we wouldn't spend \$2500 for a speaker that's more colored in the midrange than the Vandersteen IIA, Genesis 2+ or DCM QED and has little or no bass to boot.

Quad Electrostatic Loudspeaker

Acoustical Manufacturing Co. Ltd., Huntingdon, England. Quad Electrostatic Loudspeaker, \$1780 the pair. One-year warranty. Tested #51073 and #51090, owned by The Audio Critic.

This all-time classic needs no introduction to any audiophile who knows enough to read equipment reviews at all. It has survived virtually unchanged for a quarter of

a century (the manufacturer claims there have been no changes whatsoever, large or small, but we take that with a grain of salt); we, too, keep invoking its name all the time, and yet we never reviewed it. The reason for that was a warp in our perspective: after all, more "modern" electrostatics were clamoring for attention all the time and, besides, everybody knows that the Quad has no bass and no top end (right?), even if it's fabulously transparent in the midrange. So we kept putting the Quad on a back burner of our critical range, concentrating on the Beveridges, Acoustats, Kosses, Dayton Wrights, Sound-Labs and other headline makers of the electrostatic sector. At the 1980 Summer CES in Chicago, however, we picked up certain clues indicating that a full test of the Quad might turn out to be more interesting than we had believed possible. We purchased a pair (for the fourth time in our audio career!) and now have the following to report.

With the two panels six to seven feet apart (center to center) and angled slightly inward, and with a *single* auditioner sitting perfectly centered about six to eight feet back from the speakers, nothing—repeat, nothing!—we know of equals the transparency and definition of the Quads. Nothing. The speakers seem to disappear; only the music is left. All other speakers are slightly colored by comparison. (You've got to watch your absolute phase, though; the Quad inverts the polarity of the signal.)

There's very little deep bass, to be sure. We measured a bump of 6 dB or so at 48 Hz, below which the response rolls off—and that's the way it sounds, too. The highs are perfect, however, in that one listening position; an add-on tweeter could only ruin them. We measured flat amplitude response on axis up to 30 kHz; off axis the response holds up quite nicely to about 20 kHz. The vertical dispersion and overall power response aren't very good, though; hence the widely assumed need for an extra tweeter such as the Decca or Pyramid ribbon. As for the midrange, it measures flatter than anything we've ever seen in our laboratory. And that's not all. Pulses are reproduced with steep sides and reasonably flat tops down to a width of 60 microseconds, an absolute record measurement in our experience. Ringing? Nowhere, sir, up or down the line, certainly nothing beyond the tiniest anomalies. This is some 1955 speaker. As a matter of fact, we refuse to believe that the current production version isn't considerably improved over the Quads of even the mid-1960's. This is not the sound we remember, but then again we weren't driving them with the Bedini 25/25 and using perfectly aligned MC cartridges with line-contact styli in those days.

Of course, the Quad still isn't the speaker for everybody. If you insist on deep bass, forget it, unless you're willing to add subwoofers. If you usually listen with several other people, only one of you will be exposed to the proper sound field. And if you like to play your music at discotheque levels, you won't be happy. The Quad is a rapier, not a broadsword. But, wow, what a blade!

Sound-Lab R-1 (follow-up)

Sound-Lab Electronics, 5226 South 300 West, Suite 2, Salt Lake City, UT 84107. 'Renaissance Series' R-1 electrostatic loudspeaker.

er, \$2795 the pair (without woofers). Tested samples on loan from manufacturer.

Dr. Roger West was kind enough to replace our original samples with a later and slightly improved pair, having somewhat higher output, a marginally lower resonant frequency on the bottom end, and correctly marked input polarity. We haven't changed our high opinion of the sound of the speaker; if anything, the later samples sound even better, more firmly controlled, more buttoned-down.

The new experience, however, was to hear how much the R-1 resembles the Quad in overall tonality, but of course with greater dynamic range, better dispersion, and an audibly larger radiating area. On the other hand, the Quad doesn't suffer from the lobyness caused by the segmentation of the Sound-Lab's active surface, and you can both measure this and hear it. Pulses from the Quad always look clean, whereas from the R-1 they're either clean or covered with spiky wriggles, depending on the position of the measuring microphone. Move the latter half an inch and the picture changes. The slight hardness we faulted in the R-1's sound is unquestionably due to this anomaly; the Quad sounds just as unquestionably cleaner and more natural. And that leaves the purist no choice—he must go with the Quad for critical applications (such as equipment reviewing), even though the Sound-Lab is a more practical, less fragile and also very fine speaker.

We understand that Dr. West (who, incidentally, is one of the most knowledgeable audio practitioners we've ever had a dialogue with) is working on a "seamless" version of his design, without any latticework. Should this ever become a commercially available model, we have a feeling that all the best electrostatics had better look to their laurels. There's not much else wrong with the Sound-Lab R-1.

Recommendations

The more we learn about speakers and the more speakers we learn about, the less easy it becomes to make unqualified recommendations. We apologize, therefore, for the slight hedging of absolutes in our presentation of these consumer options.

Most transparent and neutral speaker tested so far, regardless of price: Quad (to be biamped with Janis W-1 subwoofer, at your option, for more extended bass).

Alternate to the above, with greater dynamic range: Sound Lab R-1, biamped with Janis W-1 subwoofer.

Best full-range speaker of practical size for the audio purist: Fourier 1 (but see article in this issue to judge our impartiality).

Best value per dollar in a low-priced speaker: DCM QED.

Best tweeter: Pyramid Model T-1.

Best subwoofer: Janis W-1 with Interphase 1A.

The News in Power Amplifiers: Mostly Very Good

By the Staff of
The Audio Critic

There are some exciting new developments in high-priced power amplifiers. In the under-\$500 category, however, we have no new recommendations to make.

Since our last issue, nothing has come up to change our mind about the severe limitations of "black box" bench tests (THD, IM, phase shift, slew rate, input/output nulling, square waves into complex loads, etc., etc.) when it comes to determining the ultimate quality of a power amplifier. A recent invitation to a Brüel & Kjaer seminar on advanced measurement techniques referred to "the concept of measurement used as an indication of good or bad performance rather than as an absolute measure." Now they tell us, after we spent every cent of the kids' college money on our lab bench! What manufacturer in his right mind would send us an amplifier with downright "bad performance," anyway? For the unconscionable price of B & K test instruments, we want absolute measures indeed, not just the ability to tell a Mark Levinson from a kitchen radio. . . .

Seriously, though, it still makes very good sense to put power amplifiers through our routine series of measurements, just to back up and elucidate our listening perceptions. We don't believe that the purely subjective underground reviewers (the ones who intone with mystically closed eyes that the highs are whitish and the upper midrange insufficiently liquid, but don't know an ampere from a volt) would have been able to identify, for example, the gain-control peculiarities of the Denon and JVC amplifiers reviewed below. Signal generators and oscilloscopes do have their use.

Otala's last stand.

Dr. Matti Otala, quite possibly the world's foremost researcher on subjects having to do with power amplifier design, is back in his native Finland and turning his attention

to technologies other than audio, at least for the moment. His last act on behalf of audiophiles before he left the United States was to finish the design of the **Citation XX**, a 260/260-watt class AB stereo power amplifier that represents, we're told, the sum total of his expertise. Harman/Kardon will begin to manufacture the amplifier in Japan as soon as certain production and marketing decisions about it are final. We have seen but not heard the prototype; it certainly creates the impression of a supreme engineering effort, inside and out. We only hope that Harman/Kardon will be able to maintain a no-compromise attitude in all phases of Citation XX production, even though the company's new Japanese owners come from an unabashedly commercial school of manufacturing.

Until we can actually listen to a Citation XX, the most exciting thing about it from our point of view is the large number of new ideas on amplifier performance that went into its design concept. Among these are the recognition of distortion-producing mechanisms such as the modulation of the output impedance (in class AB amplifiers) by the momentary signal amplitude; feedback-induced phase modulation of the higher frequencies by the amplitude of the audio signal (see also Vol. 2, No. 2, p. 37); and the modulation of transistor junction temperatures by low-frequency audio signals at high amplitude. A full discussion of these phenomena is beyond the scope of this article, but the power amplifier chapter in **The Audio Critic Handbook** (see announcement on page 2 of this issue) will take them into consideration, and eventually we hope to modify our power amplifier measurement routine accordingly. Dr. Otala already claims to have a workable phase modulation test using signals of 200 Hz and

20 kHz, but has not published it so far.

Look for new horizons, then, in the not-too-distant future.

Amber Series 70

(follow-up)

Amber Electronics, Inc., 500 Henry Avenue, Charlottesville, VA 22901. Series 70 Power Amplifier, \$499. Three-year warranty. Tested (and retested) #700100, on loan from manufacturer.

In the course of our follow-up tests it became quite apparent that the Amber doesn't just barely nose out other power amplifiers in its class (PS Model One, Hafler DH-200, Audionics CC-2, etc.), as we had reported in the last issue, but handily excels them in overall listening quality. This is now definitely our favorite "cheap" power amplifier. It has a nice, solid bottom; a midrange that lacks the ultimate transparency obtainable at much higher prices but is open and musical nonetheless; and a clearly etched top end that doesn't harden or smear even when the program material has a wide dynamic range and is rich in high-frequency energy (e.g., 30-IPS master tapes of band music). This last virtue is probably the result of judicious filtering at the input. All in all, the Amber sounds more like a high-end power amplifier than any other under-\$500 unit we're aware of.

As we go to press, some minor circuit modifications are about to go into production. We plan to follow up on these as soon as we can get our hands on a sample; meanwhile we have no reason to believe that the revised version of the Amber Series 70 won't sound even better than the original. These people obviously know how to listen.

* * *

Editor's Note: A follow-up review of the **Audire DM 700** "monster amplifier" was supposed to appear in this space, to report on the promised modification mentioned at the end of the original review in the last issue. The modification turned out to be something of a disaster; meanwhile, however, the DM 700 has been discontinued, so that the matter is now largely academic.

* * *

Bedini Models 25/25 and 45/45

(follow-up)

Bedini Electronics, 13000 San Fernando Road, #9, Sylmar, CA 91342. Model 25/25 Class A Power Amplifier, \$845. Model 45/45 Class A Power Amplifier, \$1300. Tested samples (final production versions) on loan from manufacturer.

Since our original review in the last issue, the marvelous little Model 25/25 had undergone a \$195 price increase and some major changes in its internal physical layout, eliminating virtually all wiring other than the circuit boards themselves. The sound is, if anything, even better; the silkiness of the highs and the transparency of the midrange are

unsurpassed in our experience, except possibly by some—not all—versions of the Futterman tube amplifier and one or two experimental solid-state prototypes. The bottom end of the Bedini is very impressive for a 25/25-watt stereo amplifier with a single power supply, but of course there are many large amplifiers with all-out dual power supplies that will give you firmer and subjectively deeper bass. (John Bedini has been experimenting with a heavily beefed-up power supply for a variant version of the 25/25; we have looked at a slightly miscalculated sample and found it quite promising, but for the moment this is not a commercially available product and would have to sell at a much higher price if it were marketed.)

We want to state again that the Bedini Model 25/25 appears to be just about the ideal amplifier for driving the Quad electrostatic loudspeaker; the combination provides the utmost clarity, very satisfactory SPL capability and complete safety, since the largest voltage swing the 25/25 can deliver into a load of any impedance is considerably short of whatever could damage the Quad, even on a long-term basis. And that \$845 price tag seems a little more tolerable in a low-powered amplifier when you can tell yourself that you're buying a Quad accessory.

We also wish to withdraw our recommendation of the Cotter NFB-2 noise filter/buffer for use at the input of the 25/25. That was our initial lab bench determination; several months of listening experience have convinced us that real-world input signals, even the fastest, are unable to get the Bedini into any kind of audible trouble.

As for the Model 45/45, we tested an improved version that was considerably better than the original, very nice in fact, but still without the extraordinary qualities of the 25/25. At \$455 additional cost, the 2½ dB increase in power and somewhat fuller bass are insufficient to offset the slightly less pellucid midrange, shallower spatial perspective and not quite edgeless top end. The 25/25 is a classic, whereas the 45/45 remains just another good (and very expensive) amplifier.

We're still waiting for the Model 200/200; meanwhile we must register at least a temporary vote in favor of John Bedini's argument (and Andy Rappaport's, for that matter) that pure class A and no negative feedback loop are the way to go.

Denon POA-3000

Denon America, Inc., 27 Law Drive, Fairfield, NJ 07006. Model POA-3000 Stereo Power Amplifier, \$2300. Tested #1110021, on loan from manufacturer.

This is a "sliding" class A (i.e., dynamic-bias, not-quite-pure class A) Tokyo superspectacular, with huge peak-reading meters, lacquered rosewood sides and 180 watts rated output per channel. Very appetizing indeed. That \$2300 price tag invites a hard-nosed critical attitude, however; so it should be stated right up front that we much prefer a pair of Leach Superamps (\$1598 total)—and that's basically the whole story. The Denon is a very nice amplifier, but the big Leach is better. Once again, the best is the enemy of the good.

As a matter of fact, had the POA-3000 come in for

testing at the same time as the JVC M-7050 we reviewed so favorably in the last issue, we would have rated the two as approximately equal in quality, with the nod going possibly to the Denon for perhaps a slightly better trade-off between brute power and sweet transparency, especially with the aid of the Cotter NFB-2 filter at the input. The arrival of the less costly, much more powerful and sonically much more neutral Leach Superamp, however, makes such a judgmental balancing act unnecessary.

The sound of the POA-3000 is almost, but not quite, free from the hardness or edginess we object to in so many amplifiers, and our investigation of this phenomenon (both with and without the Cotter filter at the input) revealed a rather startling error in design. The input level control of the amplifier acts as a variable low-pass filter, instead of merely controlling the input sensitivity for biamping and other applications that require level setting. With the control fully clockwise (“max”), the measured rise time through the amplifier is approximately 1 microsecond, which agrees quite neatly with the 350 kHz bandwidth spec. With the control turned back counterclockwise to a still perfectly reasonable level, the rise time slows down to as much as 15 microseconds, which is definitely slower than the human ear. What happens is that the amplifier has a perceptibly different sound in each position of the level control, edgier in some positions than in others and benefiting from the additional slowdown effect of the Cotter filter only in the edgier positions. Weird, isn’t it? The location of the level control in the circuit is obviously incorrect; perhaps it was an afterthought.

Otherwise the amplifier measures beautifully; you’ll have the best Japanese specs on your block if you own one. And you’ll also be satisfied with the sound—big, plush, clean, detailed, and only subtly flawed by the peculiarities discussed above—unless somebody else on your block already owns a pair of Leach Superamps.

JVC M-7050

(follow-up)

US JVC Corp., 58-75 Queens Midtown Expressway, Maspeth, NY 11378. M-7050 Stereo Power Amplifier, \$1500. Two-year warranty. Tested #13400021, on loan from manufacturer.

Now that we’ve had time to put the M-7050 on the lab bench, we can report that its behavior is quite exemplary on all standard tests, in the expected manner of a Japanese high-end product. It amazed us, however, to discover exactly the same input level control anomalies as we found in the Denon POA-3000 review above. In the JVC, the slowing down of leading edges isn’t quite as drastic (about 7.5 microseconds was the slowest rise time we measured), probably accounting for our initial insensitivity to the problem. There are distinct differences in sound, nonetheless, as you turn down the level control, although the need for an external filter such as the Cotter isn’t as obvious even in the relatively edgy “norm” (fully clockwise) position as in the case of the Denon. With their essentially similar sliding class A circuit concepts, huge illuminated front-panel meters and almost identical level control peculiarities, the two Tokyo heavyweights appear to be virtual twins; nor are they far apart

sonically, as we have already indicated. Luckily the new Leach Superamp (see review below) resolves the potential dilemma of ranking either of the two above the other.

The Leach Amp and The Leach Superamp

LSR&D, Inc., 481 Buckingham Circle, Marietta, GA 30066. Sales: 100 Hiawatha Drive, Mount Pleasant, MI 48858. The Leach Amp, Model 101 (stereo), \$799. The Leach Superamp, Model 102 (mono), \$799 each, \$1598 the pair. Three-year warranty. Tested Amp #001105 and Superamps #001020/#001021, on loan from manufacturer.

The Leach Amp is a 160/160-watt class AB stereo power amplifier with a single power supply. The Leach Superamp is a rather similarly conceived class AB mono power amplifier capable of more than 300 watts output. The two look physically identical (low-profile matte black boxes with 19-inch rack panels, small rack handles, huge rearward heat sinks and removable walnut side panels) and their construction reeks of quality without high-end cultist excess. Everything about them is buttoned down, functional and well made, inside and out.

The designer of the amplifiers is one of the very few genuine authorities on the subject to turn manufacturer, namely Prof. W. Marshall Leach, Jr., who teaches electrical engineering at the Georgia Institute of Technology in Atlanta. Prof. Leach is well known to readers of learned journals, as well as of more popular technical magazines such as *Audio*, for his numerous papers and articles on amplifier circuitry, TIM, phase distortion and assorted other subjects having to do with high-quality sound reproduction. As a matter of fact, Prof. Leach has saved us the trouble of explaining his latest design philosophy with his own two-part article “Build a Double-Barreled Amplifier” in the April and May 1980 issues of *Audio*. The amplifier presented in great detail in this do-it-yourself article is the immediate ancestor of the Superamp, although the latter incorporates certain refinements and is considerably more sophisticated in packaging. Since just about every subscriber to **The Audio Critic** also reads *Audio* (or so it appears from our correspondence), we shall confine ourselves to a few general remarks about design features and then go on record with our evaluation.

The Superamp, which is definitely the more impressive of the two Leach units, even on a per-dollar or per-watt basis, has a stupendous power supply (130 joules energy storage—that’s enough energy to lift an adult male Doberman pinscher one foot off the ground, or two Dobermans in stereo) and is therefore capable of meeting almost any current demand made by the load. The Superamp is also the first class AB monster amplifier we’ve run across whose “AB-ishness” isn’t obvious even after prolonged listening; the circuit design minimizes all class AB compromises so cleverly that you can almost pretend you’re listening to the world’s largest class A amplifier. (Think what a 300-watt class A job would cost.) As far as minimizing all conventional, old-fashioned distortions is concerned, not to mention the new and fashionable ones (TIM, SID, DIM and all those gents), not many people in the world know more about the subject

than Marshall Leach, so we weren't surprised to find out that the amplifier performs exactly as he specifies. On the other hand, we firmly believe that the real reason for the amplifier's superior sound qualities lies outside these tests, since sonically inferior units are sometimes also capable of passing them with flying colors.

Just how good does The Leach Superamp sound? Super. Perhaps we're letting the stupendous dynamic range influence our judgment (for the first time, we're hearing our 30-IPS piano master tapes without any amplifier clipping, even at front-row concert levels), but we also find the bass rock-solid, the midrange totally transparent and the highs superbly detailed. Perhaps there is just a smidgen more hardness to the upper midrange and lower treble than in one or two pure class A amplifiers of much lower power, but then comes a huge orchestral climax with the high-frequency textures truly unsmearred for the first time, and we're disarmed. Except for fussy limited-power applications such as driving the Quad electrostatics, a pair of Leach Superamps is now our reference. And, we might add, at a fraction of the cost of some of the more absurd high-end amplifiers, whose superiority remains to be proved to our ears.

As for the Leach Amp, with its mere 160 watts per channel at half the price, we find it beautifully transparent in the midrange, very well controlled on the bottom end, but a bit overbright and glassy on top. (Our bench tests won't tell us why.) Not that it doesn't sound extremely impressive on first hearing; the highs aren't so aggressive that the clarity and dynamic range of the amplifier are lost on the listener. For example, the Sound-Lab R-1 electrostatic panels are extremely happy with The Leach Amp driving them; the Superamps are capable of swinging just a bit too much voltage for our peace of mind in this particular case. At \$2.50 per watt per channel, we don't know of a better power amplifier than The Leach Amp, but for our Reference B choice it would have to cost less and for Reference A it would have to sound better. For example, the little Bedini Model 25/25, at \$845, sounds unquestionably smoother, less fatiguing and more musical.

As a total engineering, packaging and marketing effort, however, the two Leach power amplifiers are impres-

sive beyond anything we've seen from other sources for the past few years. At its debut, LSR&D looks to us like our idea of a high-end audio company, combining superior technical knowledge with a commitment to practicality and value, apparently striving to help the consumer, not to impress or one-up him.

Sonotron PA-2000

(follow-up)

Sonotron A/S, PO Box 2114, N-7001 Trondheim, Norway. PA-2000 stereo power amplifier, approx. \$1500 (estimated U.S. retail price if and when available). Tested #12228 (second sample), on loan from owner.

We are pleased to report that the sample we had reviewed so unfavorably in the last issue must have been defective in some way, or at least quite untypical, since our second sample didn't even resemble it sonically. Not that the newer unit was totally free from the hard, overbright quality that bothers us in all class AB amplifiers except a very few, but overall the sound was quite respectable by any standard. Again, the availability of The Leach Superamp in roughly the same price category makes a fine-tuned evaluation unnecessary. The Sonotron isn't even close.

Recommendations

Once more, we must preface these with a disclaimer of omniscience. We haven't tested every power amplifier in the world that might be of interest to our readers. Nor has anyone else.

Best-sounding low-powered amplifier tested so far, regardless of price: Bedini Model 25/25.

Best-sounding high-powered amplifier tested so far, regardless of price: The Leach Superamp.

Best-sounding power amplifier at a much lower price than the above: Amber Series 70.

Help Stop the Digital Epidemic!

***I**t has become a mindlessly parroted truism in the world of commercial audio that digital recording is the state of the art and the wave of the future. At the same time, there isn't a single audiophile-oriented equipment reviewer, record producer or music critic who finds the treble range of current digital recordings musically natural and enjoyable. The present technology of 50,000 samples per second with 16-bit encoding/decoding is simply inadequate and mustn't be allowed to become the world standard. If you agree with us, start writing letters to the record companies and commercial magazines before it's too late.*

The Ever-Changing Preamplifier Scene

By the Staff of
The Audio Critic

Now what? A \$650 full-control preamplifier that sounds as good as, or possibly even a little better than, *any* other at *any* price. That's what. Plus a number of other goodies.

Nothing has happened since the last issue to change our views from the ones stated there in the introduction to the preamp reviews (Vol. 2, No. 2, p. 53). We still believe that bench tests are of very limited value in separating good, better and best, even though they are very useful for identifying obvious design errors and isolating actual defects. We also continue to perceive a steady convergence toward the same kind of sound, which is ostensibly the uncontaminated sound of the program material itself, by the very best preamps. (Not all preamps, nor even all preamps having correct amplitude response, as wrongheadedly trumpeted by certain populist pundits.)

A word about bypass tests.

Since fanatically careful listening tests, performed by insertion into a thoroughly familiar chain of components of the highest possible resolution, are the only way to ascertain audible differences between *good* preamps, it may be helpful to point out once again the pitfalls of one particular type of listening test, which is especially favored by its advocates for evaluating preamps. This is the straight-wire bypass (sometimes called SWB by those who regard alphabet soup as a gourmet dish). The sound of the device under test (the "black box") is compared with that of a straight wire that bypasses it, leaving it out of the chain. In other words, it's an A-in/A-out test, rather than the usual A/B test. The line amplifier of a preamp is especially easy to bypass, since it incorporates no equalization, and what little gain it provides can be easily obtained elsewhere in the chain, if at all necessary. But even a phono stage can be preequalized to be flat, fed from another signal source, and then switched in or out. In fact, any purely electronic signal path can be bypassed as long as the gain of

the total chain is controllable in some way.

So far so good; we've done it ourselves many times and it does provide useful information. The great fallacy of the faithful straight-wire bypass tester, however, is the claim of infallible objectivity. He brags, "Look, Ma, no value judgments! I don't need to decide which sounds *better*, the straight wire or the device under test; if they sound *different* I know the device is inaccurate, since the straight-wire sound is by definition the correct sound, right?" Wrong. And, what's worse, scientifically naive.

Let's take an extreme case in order to make our point swiftly. Suppose the black box being bypassed incorporates all the RFI filtering for the signal path. And suppose the straight-wire sound is consequently full of crackles, hash, CB interruptions ("Breaker two, breaker two!") and assorted other garbage. With the black box switched in, presto, there's only music. Since they sound different, obviously the straight wire is right and the black box is wrong. . . hey, wait a minute. . . Okay, we know that's an absurd example, but it states the basic philosophical issue. Certain stages of the signal path aren't supposed to be straight-wire-like.

The typical SWB blunder is a bit less obvious. Let's assume that the tester's reference system incorporates a DC-to-light type of power amplifier without any bandwidth-limiting filter at its input. (Guys like that are inclined to choose amplifiers like that.) And let's further assume that the device under test is the line amplifier of a preamp (from "aux" to "main output") and that the rise time of this line amplifier is a fairly slow 3 microseconds. With the line amplifier switched in, the power amp is well protected against out-of-band spikes of energy that might cause the TIM/SID/DIM type of distortion so many ultrawideband amplifiers are prone to. Very little above 120 kHz or so can get in.

With the straight-wire bypass switched in, the power amp is at the mercy of the program source. The door is open to out-of-band excitations over the unlimited passband of the straight wire. If the power amplifier can't take these, the result is that zingy quality on top so often mistaken for "detail" by those who were raised on amplified sound instead of live concerts. The line amplifier may quite possibly pass *audio* information with total accuracy, but of course it will make the power amp sound smoother than the straight-wire connection did and therefore create an audible "difference." Our tester will then, with full confidence in his objectivity, conclude that the line amplifier is at least slightly inaccurate or "veiled." *Sancta simplicitas!*

The moral of all this is not that straight-wire bypass tests are useless. They happen to be highly revealing if you know how to interpret them. But there's no way on earth to eliminate value judgments in listening tests. Regardless of your methodology, you can't escape from judging subjectively which one of two sounds appears to sound more like music. Or at least more like what you *believe* to be the true sound of the input. And such a belief can be formed only by listening first to the output of a familiar reference system driven by that input.

Which is where we came in.

Audio Research SP-6B

(interim report)

Audio Research Corp., 6801 Shingle Creek Parkway, Minneapolis, MN 55430. Model SP-6B vacuum-tube preamplifier, \$1495. Tested samples on loan from owners.

The "B" modification represents several updates since the original SP-6 tube preamp we reviewed in Vol. 1, No. 6, but close to press time comes word that this version, too, is about to be succeeded by a further improved one; whether it's a lightly revised B or sufficiently new to be a C, we don't know. This is, of course, the Audio Research way of doing business, but we aren't going to get too deeply involved in the whole thing, anyway, since our exposure to two different SP-6B samples was relatively brief and inconclusive. When we can get our hands on the "final" version, assuming it stays put long enough, we shall analyze it at greater length.

Of the two samples we looked at, one (which happened to be right out of the sealed factory carton) didn't sound very good; it had a hard, pinched, irritating quality that took a minute or two to become aware of but was unmistakably there. The other sample sounded gorgeous, possibly superior to the Cotter PSC-2/CU-2 we were trying to A/B it with, but trying was as far as we got. *Both* samples, good and bad, proved to be impossible to audition critically for any meaningful length of time because their automatic muting was being falsely triggered by the tiniest warps and bumps in the record (instead of catastrophic pulses only, as intended), so that the music dropped out and came right back again several times per minute, creating a kind of hiccupping effect. This automatic muting feature cannot be regulated nor defeated externally; furthermore, a third and a fourth sample were also reported to us by their owners as suffering from the same defect. Conclusion: the SP-6B, at this particular stage of its

evolution, is somewhat unpredictable in (1) sonic performance and (2) operating reliability. There exists enough variability in vacuum tubes, even the premium kind, to account at least partially for the first uncertainty; the second is inexcusable. (Remember—one of our original SP-6 samples in 1978 was also defective.)

We also have some unalloyed good news to report, however: the RIAA equalization is vastly improved in the B version of the SP-6; in fact it's very close to being right on the button. Little by little, using the consumer and the equipment reviewer as its free R & D and burn-in facility, Audio Research may be getting its act together. For all we know, there could already be one or two samples of the SP-6B out there that will equal or surpass any other preamp. At this point, we find ourselves unable to get terribly excited by that possibility.

Beveridge RM-1a/2a

Harold Beveridge, Inc., 505 East Montecito Street, Santa Barbara, CA 93103. RM-1a Preamplifier with RM-2a Power Supply, \$3500. Five-year warranty (excluding tubes). Tested RM-1 #127, RM-2 #071, preproduction RM-1a and RM-2a, all on loan from manufacturer.

This is the all-out, damn-the-expenses tube preamplifier designed by Roger Modjeski (who made sure his name would be etched right on the circuit board) and manufactured by Harold Beveridge. It started out in the RM-1/RM-2 version at \$2150, went up to \$2500, and now with "a" suffix is going right through the roof at \$3500. We find that last figure totally alienated from reality, regardless of all the costly features, which include a complement of 12 noise-selected E88CC/6DJ8 tubes in an extremely complicated circuit on an incredible *single* board, gobs of military-grade parts, and above all a separate solid-state power supply, as big as a full-fledged power amplifier, for individually regulating 6 stages in the preamp. Even so, the mechanical engineering of the chassis left us unimpressed, with sloppy screw holes, misaligned metalwork, cheap hardware, indifferent finish and optional plastic glue-on feet supplied on a strip (no, we aren't kidding); furthermore, the volume control is several grades below the heavy-duty broadcast-type step attenuator that belongs in equipment at this price. We could go on and on, and the manufacturer could on the other hand also rationalize each little imperfect detail; the point is, though, that no manufacturer ever had a gun held to his head to make a \$3500 preamp in the first place, so if he does make one we expect it to be of ineffable perfection both sonically and physically. After all, it's still only a phono amplifier plus a line amplifier with control facilities.

Well, what about that sonic perfection? To take it chronologically, we never had a chance to test the original \$2150 version, which was made with Mylar capacitors. We were sent the next version (still without the "a" suffix but now \$2500), in which polypropylene capacitors were used instead of Mylar. This version, of which there may still be a few left on dealers' shelves, sounded absolutely dreadful—hard, strident, with peculiarly "angry" highs and a spatially confused midrange. Bench tests offered no clue to these distortions, except for a very small and probably irrelevant

overshoot on square waves through the line amplifier under certain conditions. Polypropylene capacitors, unless distastefully defective, couldn't have been the cause either, and yet we kept hearing from other users in the field whose ears we respect that this new version was a big comedown from the original. The mystery remains unsolved to this day; just remember that in the polypropylene version you see mostly yellow capacitors on the circuit board, whereas in the Mylar version a bright orange predominates. Our efforts to determine how and why a golden-ear oriented company released this product for sale failed to produce a satisfactory answer.

Finally the company yielded to the pressure of discriminating listeners and went back to the Mylar version, adding some minor refinements along the way and raising the price to \$3500. This latest modification is now called the RM-1a/RM-2a, of which we tested a preproduction sample. What a difference! Beautifully open sound, tremendous definition and dynamics, smooth and airy highs without a trace of stridency, fatigue-free listening for hours. In comparison with the Cotter PSC-2/CU-2 combination, the Beveridge sounded definitely smoother on top without any sacrifice of detail (but see also the Cotter reappraisal below), more buoyant and alive in overall musical impact, at least equal and possibly superior in transparency, but perhaps less tightly controlled and unshakable under the impact of violent transients. The latter quality may or may not have had something to do with the way we had left the adjustable gain controls for the various stages on the circuit board of the Beveridge; with everything adjusted for minimum gain instead of "normal," there might have been even more dynamic headroom. Unfortunately, one channel went completely noisy on us before we could conclude this part of the test; since the defect wasn't due to a tube, we had no time to troubleshoot it and repair it before going to press. In any event, a \$3500 preamp should be immune to that kind of failure, and besides we ended up preferring the sound of the incomparably less expensive Robert Grodinsky preamp (see review below) to that of either the Beveridge or the Cotter.

On the lab bench, the RM-1a/RM-2a delivers all the promises of the spec sheet, including highly accurate RIAA equalization. Roger Modjeski is a perfectionist when it comes to measurable performance characteristics, and his design shows it. We aren't satisfied, however, with (1) tube preamps as a predictable and permanently viable species in general (see also the Audio Research SP-6B review above), (2) the professionalism evidenced by Harold Beveridge, Inc., in the course of this product's brief but checkered history, and (3) the marketing philosophy that no price is too high if somebody out there can be enticed to pay it. As a laboratory exercise by an adventurous designer, the Beveridge preamp fascinates us intellectually and aurally. As a product for sale to the consumer, it leaves us with serious doubts.

Cotter System 2

(reappraisal)

Mitchell A. Cotter Co., Inc., 35 Beechwood Avenue, Mount Vernon, NY 10553. System 2, complete "front end" consisting of: MK-2 Moving Coil Pickup Transformer, \$550 or \$650 (depending on type); PSC-2 Phono Signal Conditioner, \$550; CU-2 Control Unit,

\$1750 (projected price of future production version); NFB-2 Noise Filter/Buffer, \$500; PW-2 Master Power Supply, \$450. Five-year warranty. Tested samples owned by The Audio Critic, including limited-production "engineering model" of the CU-2.

The five modules of this complete "front end" are now priced at a total of \$3800 or \$3900 (depending on your choice of transformer type); out of that the PSC-2/CU-2/PW-2 combination, which is functionally equivalent to the other preamplifiers reviewed here, comes to \$2750 instead of the originally projected \$1800; it would seem, therefore, that a reappraisal is in order, especially since the Cotter units have been our unequivocal reference standard for more than a year and a half. After considerable soul-searching, we have concluded that the Cotter System 2, as a total entity, can no longer be recommended to the audio purist as the ultimate front end for a stereo system and should therefore be "delisted." Here are the particulars of this conclusion:

1. Our opinion of the Cotter transformers remains as high as ever (see also the section on MC step-up devices in this issue). In fact, the Cotter-designed Verion MK-1 transformer, still advertised in the back pages of *Audio* at the special liquidation price of \$350, looks like a major bargain to us—if you can get a properly quality-controlled unit.

2. The CU-2 control center, which is what makes the System 2 a system, still exists only in the form of the ugly and rather sloppily assembled "engineering model," of which only a very few were made. After a year and a half, the production model is nowhere in sight; as we go to press we possess absolutely no evidence that even a mock-up of it exists, let alone finished units.

3. The other components of the Cotter system, although officially in production, are being produced so slowly, in such minute quantities, that consumers may find it difficult if not impossible to obtain them. This company has been beset by more than ordinary problems, and we have no way of predicting how future demand will be met.

4. The sound of the PSC-2/CU-2/PW-2 combination is no longer in a class by itself. Several preamplifiers we recently tested gave comparable or even somewhat superior results. (See the Audio Research SP-6B and the Beveridge RM-1a/2a above, the Mark Levinson ML-7 and the Robert Grodinsky Research Model Four below.) The possibility exists that an extremely gradual deterioration of one or more of the Cotter units has taken place, in such tiny daily steps that we were at no time aware of it. Looking back, we do recall what seemed like a smoother, sweeter, more perfectly edgeless sound at first; however, memory is a notoriously unreliable witness and the preamp today still sounds and measures outstandingly fine, so we can't really tell whether progress or decay got the better of it. The latter possibility may be more palatable to the theorist who conceived the circuit; to the consumer the end result is exactly the same either way. A \$2750 preamp isn't supposed to change.

5. The NFB-2 filter/buffer is gradually becoming obsolete as more and more power amplifier designers realize that their input circuits *must* incorporate some kind of judicious ultrasonic filtering. Subsonic filtering is also coming into much wider use, especially as a bypassable preamp control but in many cases also at the input of power amps. Needless to say, two bandpass filters in tandem would be excessive. It could be argued that the filter networks in the

NFB-2 are more sophisticated than what others use, especially the elegant high-order filter in the low-pass section, but in practice we have found that a correctly deployed single-pole filter as used by the new generation of TIM/SID-conscious power amp designers will do the job. Certainly, the era in which 9 out of 10 power amplifiers sounded better with the NFB-2 is rapidly coming to an end. As a matter of fact, our latest listening tests with program sources that preserve the utmost detail (direct-to-disc records, line-contact styli, etc.) and through high-resolution speakers (ribbons, electrostatics, etc.) indicate that the NFB-2 will in some cases remove that very last degree of definition and spatial information. In other words, a little bit of the baby is thrown out with the bath. As long as the bath water was really filthy that was okay, but not anymore.

6. The physical inconvenience of a five-module front end, with its unavoidable tangle of cables and unusual traffic problems on the equipment shelf, can be justified only by overwhelming sonic superiority, which appears to be no longer the case.

Mark Levinson ML-7

(interim report)

Mark Levinson Audio Systems, Ltd., 131 Leeder Hill Drive, Building 261, Hamden, CT 06517 (or PO Box 6183, Hamden, CT 06517). ML-7 Preamplifier, \$4000 to \$5000 (depending on phono options chosen). Five-year warranty. Tested sample on loan from dealer.

We had a chance to spend just a few hours in our laboratory and listening room with "Mark Levinson's definitive statement on preamplifiers" (Bert Whyte's words) and can only report the following:

The physical construction of the preamp, which looks like a slightly deeper ML-1, appears to be of jewel-like perfection; most high-end preamps look slightly unappetizing next to it. That has nothing to do with the quality of circuit components, where several other units may be on a par, but with the loving care shown in the planning of all external and internal details.

We liked the sound of the L2 (low-gain) phono module better than that of the L3 (high-gain), which eliminates the need for MC step-up devices. With the L2's inserted, the ML-7 sounded smoother, more at ease and even less fatiguing than the Cotter PSC-2/CU-2, although the difference wasn't devastating; we would have needed more time to evaluate which had the better focus and detail. That was the only A/B comparison we were able to make.

On the lab bench, we had time to verify only that the RIAA equalization was accurate; this had been a point of laxness at MLAS in the past. All in all, a SOTA contender—and at \$4000 it had better be. We're hoping to obtain another sample for more thorough testing in the near future.

* * *

Now that the ML-1 is being gradually phased out to be replaced by the ML-7, it may be almost irrelevant to report that we came across a sample of the ML-1 that was *much* better than the one we had owned and reviewed. This was also a fairly old unit, with the older PLS-150 power supply,

but it had been completely refurbished at the factory in mid-1980, with all the latest tweaks. This, too, sounded somewhat smoother and more "musical" than the Cotter, without any trade-off in inner detail; how it would have fared against the ML-7 we have no idea. Thought you'd like to know.

Precision Fidelity C7A

Precision Fidelity, 1238 Green Street, San Francisco, CA 94109. C7A cascode preamplifier, \$549.95. One-year warranty (tubes 90 days). Tested #80501, on loan from manufacturer.

This is a very lightly revised version of the C7 tube preamp reviewed in the last issue; the differences are trivial. The sound still has that pleasantly thick, dark, cushioned quality, with excellent dynamics, that we found in the C7; if anything, the C7A exhibits the same traits to an even greater extent, with perhaps slightly more control and solidity. True transparency it ain't, however, as an A/B switch to the Robert Grodinsky preamp (\$100 more) will prove in about three seconds. (See review below.) As we said before, if it weren't for the top solid-state preamps, we could grow very fond of this neat little vacuum-tube unit.

The RIAA equalization is still off by -0.5 dB in the lower midrange (dip centering on 175 Hz); in one channel there has also appeared a new and unexpected boost of 0.7 dB at 20 Hz. From 1 kHz on up, everything is still perfect. We also find the tolerances in the "low filter" response a little on the sloppy side. Overall, though, the C7A illustrates perfectly the old French saying: "The more it changes, the more it's the same thing."

Robert Grodinsky Research Model Four

Robert Grodinsky Research, a division of RG Dynamics, Inc., 4448 West Howard Street, Skokie, IL 60076. Model Four Stereo Control Preamplifier, \$650. Two-year warranty. Tested preproduction sample, on loan from manufacturer.

Once in a blue moon, routine testing can turn into a major event for the equipment reviewer. This is one such case, but first a word of warning:

Physically, the Model Four looks almost identical to the older RG Dimension 3 preamp, which is by now a known quantity in the marketplace. (*Audio*, for example, reviewed it in its May 1980 issue.) Electrically, however, the Model Four is more sophisticated. Among other things, a cascode circuit has replaced the previous configuration at the input of each amplifier stage. The power supply has also been beefed up, right up to the point where a larger chassis would have been needed to go any further. Thus the two preamps are *not* the same. Although the now discontinued RG D3 was an excellent unit (we tested it but see no reason to review it anymore), the Model Four is considerably better, so much so that RG Dynamics has decided to market it under the new Robert Grodinsky Research name.

Now for the mindblower. In direct A/B listening comparisons with the best preamplifiers, solid-state or tube, regardless of price, the Model Four came out on top every time, at least by a small margin. Some of our listening panelists went only so far as to find it "just as good" as any other; the majority said "better"—and at \$650 that's coming out on top in our book. The principal reason for sonic superiority is nearly always superior circuit design, and good thinking costs no more than bad thinking (one of our dogmatic tenets), so the whole thing isn't necessarily a miracle. Good parts do cost more than run-of-the-mill parts, however, and the Robert Grodinsky preamp is no Mark Levinson in that respect. It's very decently made, with the money spent in the right places, but we wouldn't put it in the Voyager spacecraft. On the other hand, this is unlikely to be still our reference preamplifier (or yours) in 1990, so why worry now? The fact remains that it sounds as transparent and spacious in the midrange, as rock-solid on the bottom, and as clean, smooth and detailed on top as any preamplifier known to us and then some, from phono input to main output. Phono noise may be a smidgen higher in level than would be ideal, but not high enough to be bothersome. The dynamic qualities of the Model Four are especially remarkable; it never seems to protest under the impact of heavy transients but remains pleasant and unruffled at all times.

As a matter of fact, the chief performance claim made by Bob Grodinsky for his circuit is the ability to handle extreme peaks in the phono stage without overload. He has even devised a special torture test, which we may also phase into our bench routine, to prove his point. His test signal is an RIAA preemphasized 500 Hz square wave, passed through a single-pole filter (-3 dB at 60 kHz) and ending up with a rise

time of 1 microsecond. He feeds this spiky waveform into his phono stage at 3750 millivolts peak-to-peak, to simulate a crest factor and speed well beyond that of real-world pickup outputs. We aren't saying that no other preamp will pass this signal without distress, but his certainly does. We also found conventionally measured square-wave response to be close to perfection through both the phono stage and the line amplifier. As for the RIAA equalization, the error is possibly the lowest we have ever measured, very close to ± 0.0 dB. Incidentally, the RIAA deemphasis in the Model Four is passive at the higher frequencies and active at the lower, an interesting solution that has some distinct advantages. So even for techno-one-upmanship you don't absolutely have to buy a \$2000 or \$3000 preamp.

What's more, your \$650 doesn't just buy a stripped-down, straight-through, minimal preamp in this case. The Model Four has every conceivable switch, control and facility, including bypassed tone controls, subsonic filter and two buffered tape loops. About the only thing we miss is an absolute phase switch, a la Beveridge or Cotter. That would be very useful in our Reference A system, which is where we have the Robert Grodinsky preamp as we go to press.

Recommendations

We're fully aware of the credibility problem we may be creating here, but we've got to call them as we see them.

Best-sounding preamplifier tested so far, regardless of price: Robert Grodinsky Research Model Four.

Best preamplifier per dollar: Robert Grodinsky Research Model Four.

'Reference A' Update

As our regular readers know by now, the "A" designation stands for the sonically most revealing and musically most believable stereo system we're able to assemble at any given time, out of the components tested and reviewed up to that time. Price as such is no object, although frantic overspending for nonmusical reasons is emphatically not our style. Insertion into Reference A is always our first step in the comparative listening evaluation of new components that come in for testing. These updates will be a permanent feature of our forthcoming biweekly Bulletins.

Speaker System

From 100 Hz on up, the Quad electrostatic loudspeaker (\$1780 the pair). Below 100 Hz, the Janis W-1 subwoofer (\$1450 the pair). For greater flexibility (though not necessarily better sound at the "sweet spot" of the Quads), the Pyramid T-1 ribbon tweeter (\$1175 the pair) is an add-on option.

* * *

As an alternative system at a huge saving, the new Fourier 1 full-range speaker (\$1190 the pair) comes surprisingly close to the above in overall performance characteristics.

Power Amps and Crossovers

To drive the Quads, the Bedini Model 25/25 (\$845); to drive the Janis subwoofers, a pair of Janis Interphase 1A

bass amplifiers with built-in 100 Hz electronic crossovers (\$1130 the pair); to drive the optional Pyramid tweeters, another Bedini Model 25/25 (\$845). The Pyramid incorporates a passive high-pass filter; an electronic crossover would be greatly preferable, but we're still experimenting to finalize our choice.

* * *

To drive the Fourier 1 full-range speakers, a pair of The Leach Superamp mono units (\$1598 the pair).

Preamplifier and MC Step-Up

Robert Grodinsky Research Model Four (\$650), with Cotter MK-2L transformer (\$650).

Phono Cartridge

Fidelity Research MC-201 (\$325).

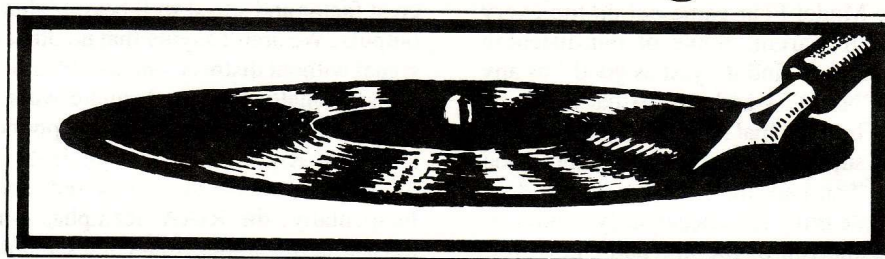
Turntable and Arm

Win Laboratories SDC-10 (\$2925) and SDA-10 (\$1000).

* * *

The base price of Reference A is now down to \$10,755, as a result of some elegant simplification without sonic compromises. The ribbon tweeter option with the extra power amp (but without electronic crossover) brings the price up to \$12,775. The "economy" version with monolithic speakers costs only \$8338.

Records & Recording



Editor's Note: This column will survive our change to a biweekly newsletter format, but there will be only one record reviewed in each of the new Bulletins. We don't expect to run into more than 24 superbly recorded and carefully manufactured albums per year, anyway. The theory and practice of making good records will be covered in some detail in our forthcoming Handbook.

A Few More for the Demo Shelf

We don't want to call this "A Discography for the Audio Purist" anymore. That was beginning to sound too much like The 25 Great Records we believe discriminating audiophiles should take to their desert island retreat. Our idea was merely to provide some examples of what we consider excellent material for putting a stereo system through its paces. There's nothing unique about our choices; all we claim is that they actually deliver the audio quality that so many other audiophile-oriented records possess only by reputation or in their jacket blurbs. Unfortunately, great music performed by great artists seldom gets the kind of technical treatment we admire, but that's another subject altogether. Our current selections below happen to be quite negligible musically.

You will also note that we still have nothing to recommend that has been digitally recorded; we're unaware of any such recordings that sound like music to our ears in the upper registers, stupendous bass and dynamic range notwithstanding. Again, we must repeat that it is *not* the theory but the present-day implementation of digital recording that we keep complaining about.

Incidentally, if you've seen the article in the November 1980 *High Fidelity* about the digital vs. analog listening tests in which your Editor participated, you should be aware of an important consideration that was glossed over by the authors. Neither the digital nor the analog recordings chosen for the tests were outstanding examples of their respective technologies. From our point of view, the comparisons were between various degrees of inadequacy in the equipment and techniques used to make the recordings, not between the digital and analog concepts.

Crystal Clear Records

Carlos Montoya: Flamenco Direct, Volume I and Volume II. Carlos Montoya, guitar. Crystal Clear Records CCS-6004 and CCS-6005 (made in 1980).

Carlos Montoya isn't quite our idea of the ultimate flamenco guitarist, but he certainly knows the idiom. The direct-to-disc recording is indeed "crystal clear" and extremely dynamic; through a truly accurate chain of components you can hear a rather small but well-defined space around the guitarist, which collapses into an up-front, no-space kind of presentation when a less accurate component is substituted somewhere along the signal path. When everything in the system is properly trimmed in, you can close your eyes and obtain a fairly decent you-are-there illusion. It's difficult to ask for more realism than that, although we can imagine a lovelier, less metallic guitar sound—but then we weren't there and maybe that's how it sounded live.

An offbeat selection that attracted our attention is the *Saeta* on the first side of Volume II; it's a veritable tone poem, complete with percussive and other quasi-orchestral effects. But there's enough pure flamenco here, also, to meet all expectations.

M & K RealTime

"Encore"—Roger Wagner Chorale (live in concert). George Gershwin: Porgy and Bess Medley; Negro spirituals; other encores. Arranged by Roger Wagner for soloists, chorus and piano. M & K RealTime RT-110 (made in 1978).

This is a live, on-location recording in a small college theater, with the microphones quite close and only a moderate amount of ambience pickup. The immediacy, impact and dynamic range of voices, piano and occasional percussive effects are quite stunning, though. The direct-to-disc cut is super clean; if you hear any distortion on this record, it's coming from your stereo system.

The Roger Wagner Chorale is, of course, a thoroughly professional and musicianly group, and they have great fun with *Porgy and Bess* and other staples. We can't imagine anyone not getting at least a small kick out of this well-made album.

Mobile Fidelity Sound Lab

Eric Clapton: Slowhand (originally recorded in 1977). Mobile Fidelity Sound Lab MFSL 1-030 (made in 1979).

Most rock-pop stars make us wince with their lack of musicianship and inability to play their chosen instrument with any degree of skill, but Eric Clapton is definitely an exception. He does what he does with a casual flair that's very appealing, and the rather conservative country-flavored rock he plays here is just about our speed.

What's more, the original RSO tracks were laid down with a surprising respect for clarity, and the processing is one of the early examples of Mobile Fidelity's "second phase," utilizing a considerably cleaned-up system with Ortofon cutter and other new goodies. The resulting sound is as clean, transparent and believable as we've ever heard on a rock record. We're almost tempted to say "natural." Why can't they all do it?

Opus 3

Test Record 1—Depth of image. A sampler of Opus 3 albums. Opus 3 No. 79-00. (Imported by Scandinavian Sounds, PO Box 3656, San Clemente, CA 92672.)

Why should they know more in Sweden about making good tape-to-disc analog records than they do elsewhere? This is the second small Swedish label—the first was Proprius—to make us ask that question. The Opus 3 sound is quite different but in its own way just as impressive.

Opus 3 isn't absolutely committed to the purist technique of just two B & K omnis directly into the tape recorder and then hands off, à la Proprius, nor do they believe in unnecessary electronic processing, on the other hand. They'll do anything they know how in order to get what they consider a genuinely musical sound with "depth of image" and a believable presence, and it seems that they succeed most of the time. Certainly their channels are much cleaner than those of Proprius, although we still prefer the utterly natural spatial perspective achieved by the latter.

This sampler presents 16 selections from as many albums, ranging from jazz to folk to classical. Particularly impressive are the Bach and Telemann transcriptions for guitar quartet and quintet, some of the jazz cuts, the symphonic band, and the large South American bamboo pipes. The performances range from so-so to pretty good, never great. A James Taylor copycat by the name of Bert Deivert is hilarious, probably unintentionally. But the sound is all very transparent, very clearly defined, wide in dynamic range, low in distortion and quite persuasive overall. Since this one album will introduce you to 16, why not give it a try?

'Reference B' Update

As we go to press, this is our best-sound-per-dollar, rock-bottom stereo system for the serious audiophile, to be updated (like Reference A) in each of our forthcoming biweekly Bulletins. It's still a fairly expensive system, of course, since even the bare-bones requirements of the audio purist are well beyond the sonic capabilities of cheap components. As a matter of fact, Reference B overlaps with our price-no-object Reference A at several points where the best possible choice, regardless of price, isn't overly costly.

Speaker System

The new Fourier 1 full-range speaker (\$1190 the pair).

Power Amplifier

Amber Series 70 (\$499).

Preamplifier and MC Step-Up

Robert Grodinsky Research Model Four (\$650), with PS Audio pre-preamp (\$180); the latter subject to retest of actual production model (see interim report in this issue).

Phono Cartridge

Fidelity Research MC-201 (\$325).

Turntable with Tone Arm

Kenwood KD-650 (\$400). We've done relatively little investigation of turntables and arms in this price range, so there may be others available that are as good or even better; watch the Bulletins for follow-up information. The Platter Matter turntable mat (\$34.95) and the Cotter B-2 isolation platform (\$225) are highly desirable add-on options.

* * *

Inflation and our own steadily rising expectations have pushed the price of Reference B over the \$3000 mark (\$3244 minimum or \$3504 with all turntable options); needless to say, judicious substitutions based on some of our favorable reviews and best-buy recommendations could lower those figures by quite a few hundred dollars. This new Reference B as it stands, however, sounds considerably more like Reference A than was the case last time; the improvement in listening quality is much greater than the increase in cost.

The Cartridge/Arm/Turntable Scene: Credible Improvements at Incredible Prices

You can plug a complete, matched and at least partly SOTA phono system into your power amplifier for \$4915, or you can have a truly excellent moving-coil cartridge (probably the best) for “only” \$325.

First, an admission of temporary bafflement. We're stymied. Having postponed our comparative test report of mechanical resonances and acoustical breakthrough in turntables and tone arms for two issues in a row (and far-apart issues at that), we were absolutely certain we could publish meaningful results in this issue. We were wrong. What we had thought was the right track, leading to a satisfactory correlation between measurable and audible characteristics, turned out to be booby-trapped. We ran into some major surprises.

A brief explanation is in order, although it may not satisfy those who, for their \$30 subscription, expect us to know and do what nobody else has ever known or done. As we've said a number of times before, we try to do our homework a little better than other audio reviewers, but creating new knowledge that simply wasn't there before is another matter. You can't schedule it to happen.

How the resonance tests lost their relevance.

Those who do their homework at least don't end up sweating over problems already solved by others, so we studied carefully the best investigative efforts that had preceded our own. The most germane of these seemed to be the work of Poul Ladegaard, one of the top audio researchers at the Brüel & Kjaer instrument company (his 1977 Audio Engineering Society paper, “Audible Effects of Mechanical Resonances in Turntables”, while indirectly promoting B&K instruments, is an excellent analytical survey of the subject) and of Martin Colloms (in the English *Hi-Fi Choice* series, where he was responsible for the “Turntables & Tonearms” volumes both in 1978 and 1980). These gentlemen had done such a competent and complete job that we felt we could make a further contribution in only two major respects: applying their tests to considerably more exotic and costly turntables than they had measured, such as the Cotter B-1 system and the Win SDC-10, and using an acoustical excitation signal more closely modeled on the spectral energy of music than the pink noise they had relied on. With the aid of a complex waveform synthesizer, we experimented with signals in which all the low-frequency energy was concentrated at only a limited number of amplitude peaks per octave, as in the bass octaves of actual music, and we made an attempt to contour these signals to correspond to the Robinson-Dadson

equal-loudness curves. Such a “musically” structured sound field creates vastly more severe conditions of mechanical and airborne excitation than pink noise and can be expected to show greater differences in acoustical activity between various turntable designs.

We were getting some interesting results with these experiments when two separate and unrelated observations shook us up to the extent that we began to doubt our basic assumption—namely that the resonances we were testing constituted the main difference in audible quality among turntables that were otherwise subthreshold in rumble, wow, flutter and other traditional specifications. The first surprise was the Platter Matter turntable mat (see review below), which for \$35 could effect a greater sonic improvement in some cases than switching to a more sophisticated turntable/arm design. Apparently the isolation and damping of the vinyl disc can under certain circumstances be more important than all the other elaborate and costly isolations and dampings put together. The second and even bigger surprise was the *much* more transparent and uncolored sound we got out of our reference MC cartridge (the Fidelity Research MC-201) when we installed it in the Win SDA-10 arm mounted on the Win SDC-10 turntable, after having listened to it for many weeks in our superisolated and superdamped Cotter B-1 reference table with Technics SP-10 Mk II motor, FR-66s arm and Platter Matter! Obviously, it wasn't *still better* isolation and *still better* damping in the Win system that made the difference. As a matter of fact, we ended up actually measuring what might have been at least one genuinely relevant difference, a strange once-per-revolution peak of approximately 10 dB amplitude in the left-to-right channel crosstalk of *every* cartridge measured in the Cotter system but not the Win—always with the same test record, same sample of each cartridge, same B&K measurement setup, same everything! That did it. We decided to reconsider the entire project and to withhold our conclusions, whatever they might turn out to be, until the publication of **The Audio Critic Handbook**. That doesn't mean we won't be auditioning and measuring turntables, arms and cartridges. On the contrary, we're up to our neck in them just now. But we'll be going easy on the theory for a while. To quote the Ladegaard paper, “here is an area which, at present, has rather poor correlation between the measurement methods available and the impact on the sound quality.” You said it, fella.

Our phono cartridge tests.

We've begun what we hope will turn out to be an exhaustive survey of high-quality moving-coil cartridges, encompassing all their measurable and audible characteristics. We're using the complete set of B&K test instruments designed for this purpose, along with test records of many different makes, plus of course our Reference A system for listening. When the survey is complete, our summarized findings will be published in the form of a large foldout chart in one of our forthcoming biweekly Bulletins.

So far we've screened and have at least a qualitative opinion on the following cartridges, out of which those that stood out unequivocally in our initial tests are being fully reviewed below. That doesn't mean the others are unworthy of consideration; on the contrary, this is on the whole a very superior group:

Denon DL-303 (\$385), **Dynavector DV/Karat Ruby** (\$275), **Dynavector DV/Karat Diamond** (\$1000), **Fidelity Research FR-1 Mk 3F** (\$230), **Fidelity Research MC-201** (\$325), **JMAS MIT-1** (\$550), **JVC MC-1** (\$300), **Koetsu** (\$750), **Ortofon MC30** (\$650), **Signet MK111E** (\$300), **Supex SDX-1000** (\$500).

Unfortunately, that \$350 super cartridge with all-new technology, the possible 1980 debut of which we had somewhat imprudently projected in the last issue, just hasn't happened. It may very well end up as a drawing-board exercise, as far as we can tell at this point. The experimental hybrid we discussed in the same context can now be revealed to have been a Coral 777 from Japan with aluminum cantilever, modified to incorporate an early version of the remarkable Van den Hul stylus. The JMAS cartridge reviewed below is a rather similar design, with beryllium cantilever and the latest Van den Hul diamond.

EON POD Disc Clamp

EON Research & Development Corporation, 285 West 39th Avenue, Vancouver, BC, Canada V5Y 2P4. POD Disc Clamping Device, price NA.

This simple little three-legged plastic clamp slips on your turntable spindle, grabs it tight and applies pressure to the label area of the record at three points. This immobilizes the record and welds it to the platter/mat mass just as successfully as heavy turntable weights (like the Pyramid RW-1 we reviewed two issues ago), without putting an extra load on the turntable bearing. Of course, the additional mechanical grounding provided by the extra mass of a turntable weight isn't available with the featherweight POD, but in combination with a sticky and highly dissipative mat like the Platter Matter the POD works like a charm, creating a vacuum under the record with a very strong hold-down grip and helping the mat do its job of damping acoustical activity in the vinyl. Highly recommended.

Fidelity Research MC-201

Fidelity Research of America, PO Box 5242, Ventura, CA 93003. MC-201 moving-coil cartridge, \$325. Tested #1A, on loan from distributor.

This stubby little blue cartridge became our absolute

favorite after about 20 seconds of listening. Its totally sweet, smooth, edgeless quality, combined with delicacy of detail and fast response to transients, plus transparency of the most natural, believable sort, all help to disarm the most hard-nosed critic. Perhaps the JMAS MIT-1 cartridge reviewed below extracts even more information from the groove with even greater resolution (probably because of the difference in styli—Van den Hul in the MIT-1, a somewhat more moderate line-contact tip in the MC-201) but it sounds a little harder, zingier and ultimately less musical than the Fidelity Research.

The distinguishing features of the MC-201 are the avoidance of iron or other magnetic material in the coil core and the very short, light cantilever, which is made (at least as far as we can tell) of mundane aluminum. In our experience, aluminum cantilevers are acoustically dead and therefore more neutral in sound than those made of stiffer "high-tech" metals. Our measurements showed that the characteristic HF peak of the MC-201 is at 30 kHz, a much higher frequency than is typical, and that its response is especially flat in the critical 100 Hz to 6 kHz range. The impedance of the cartridge is approximately 10 ohms; its voltage output is relatively low, requiring the use of a fairly high-ratio step-up transformer. (We're using the Cotter MK-2L.)

Just in case you desire a second opinion confirming our own, the Mobile Fidelity Sound Lab people have told us that they had screened an even larger number of moving-coil cartridges than we did and came up with the MC-201 as their top choice for monitoring the quality of their "original master recordings." And their phono cartridge budget isn't limited to \$325, as you can well imagine. We rest our case.

JMAS MIT-1

John Marovskis Audio Systems, Inc., 2889 Roebling Avenue, Bronx, NY 10461. Mirror Image Transducer MIT-1 moving-coil cartridge, \$550. Two-year warranty (excluding mishandling). Tested #1008, on loan from manufacturer.

The first high-end production cartridge to incorporate the widely acclaimed Van den Hul stylus, the MIT-1 quickly became part of our reference system on its sonic merits, only to be ultimately replaced by the Fidelity Research MC-201. The MIT-1 possesses the highest transparency and definition of inner detail among the cartridges known to us, but it also has a harder and brighter character in the treble range than we consider desirable, though far worse examples of the same problem could be cited at equally high prices. The sad fact is, however, that we've never encountered a cartridge with a beryllium cantilever such as this one that didn't have pretty much the same signature. If it weren't for that one shortcoming, the MIT-1 would still be our reference cartridge. It appears to extract more information from the groove than any other.

That capability is almost certainly due to the Van den Hul stylus profile, which corresponds more closely to the geometry of the cutter stylus itself than any other configuration available so far. The stylus actually touches about 80% of the groove wall with its extremely tall and narrow areas of contact. This makes all alignments unusually critical, both in the manufacturing process and in the installation of the cartridge in the tone arm. Stylus orientation in the cantilever, azimuth angle and tracking angles must all be right on the

button. When everything is trimmed in to the nth degree, the maximum benefits in tracing, groove noise reduction, dynamic range and separation will be realized—and they're quite spectacular. Only a single firm in Switzerland makes the Van den Hul stylus, which is named after its Dutch inventor; the unique profile magnifies all the usual manufacturing problems, such as crystallographic orientation of the diamond, symmetry, finish, etc., and the rejection rate is therefore higher than usual. An improperly made and/or mounted Van den Hul tip will recut the groove; there's no margin for error. But when it works, it really works.

Our measurements showed that the rising characteristic of the MIT-1 starts at about 11 kHz, up to which point the response is dead flat. The high-frequency peak of 4 to 5 dB is at approximately 22 kHz. Channel separation is quite excellent. In fact, everything about the cartridge looks good on the lab bench. This is a design which is still in the evolutionary stage; right now the innards of the cartridge come from Coral, as did the GAS Sleeping Beauty's, but the concept isn't restricted to that particular system, and we have a feeling that an even finer design will emerge from this auspicious beginning.

Platter Matter

Platter Matter Inc., 792 Millwood Road, Toronto, Ont., Canada M4G 1W2. 'Platter Matter' turntable mat, \$34.95. Tested sample on loan from manufacturer.

This isn't the first high-priced, super special turntable mat to cross our path, as you can undoubtedly surmise, but it's the first one we've found interesting enough to review. Not that we intend to open the whole can of worms about the theory and correct design of turntable mats. That belongs with our discussion of mechanical resonances and acoustical breakthrough in turntables and arms, which as we've already said is under reconsideration until the publication of our Handbook. Meanwhile every available opinion on the subject contradicts every other: Martin Colloms in *Hi-Fi Choice No. 18* comes out in favor of glass mats (but uses a comparative measurement technique we find less than impeccable); the Trio-Kenwood engineers in Japan point out the inadequacies of glass and opt for sintered alumina ceramic impregnated with silicone rubber; the French and the Canadians are gung ho for soft and sticky mats made with zinc oxide—shall we go on? We don't know of a single analytical study that covers all bases and coordinates the multiple causes with the multiple effects. (Don't look at us, buster.)

That said, we must state that the Platter Matter really works. It's of the soft and slightly tacky zinc-oxide treated variety, designed to weld itself to the record, especially when the latter is pressed down into it with a clamping device like the EON POD. The dissipative composition of the mat isolates the vinyl and terminates standing waves and random vibrations in it very successfully. The result is audibly greater clarity and delicacy of inner detail in the playback, with lowered background hash and a feeling of firmer control overall. We were quite amazed, especially since the difference the Platter Matter made was in some cases greater than switching to a turntable of more advanced design. It seems to be the aspirin for assorted audio headaches, available without a prescription.

About the only fault we can find with the Platter Matter (other than its not particularly attractive greenish-blue looks) is actually a virtue: it sticks to the record too well. The vacuum it creates is hard to break and the mat comes off the turntable along with the record. You literally have to peel it off. The life of the dedicated audiophile is not an easy one.

Win Laboratories SDC-10, SDA-10, SDT-10-2 and SPG-10

Win Laboratories, Inc., PO Box 332, Goleta, CA 93017. SDC-10 Reference Transcription Turntable, \$2925. SDA-10 Servo Dynamic Arm, \$1000. SDT-10-2 Semiconductor Disc Transducer with Power Source, \$595. SPG-10 Switching Passive Gain Control, \$395. Tested samples on loan from manufacturer.

This is it—the complete Win front end, a matched system for phono playback (plus passive switching of other program sources), ready to plug into any power amplifier at line level, without the need for a preamplifier. All you pay is \$4915; absolutely nothing else to buy. And it looks like nothing else in the whole world: thick transparent plastic and sculptured metal with a high polish, sexy-looking little rods and levers, even a padded satin coverlet to keep it comfy when it sleeps—everything it takes to trigger the I've-Got-to-Have-It syndrome.

Does it sound as good as it looks? Well, the turntable and tone arm are now in our Reference A system. The phono cartridge is a very special case that has to be discussed separately. Our overall reaction to the system as a complete front end was instant recognition of its superior transparency and sheer you-are-there realism, followed by the realization that part of the transparency was due to the elimination of a multistage voltage amplification chain and that the SDT-10-2 strain-gauge cartridge still had some problems. Let's take each component one by one.

SDC-10 Turntable

The changes incorporated in this "final" version (if, indeed, anything conceived by the restless mind of Sao Win is ever final) as compared with the very early sample we reviewed two issues ago include a slightly revised suspension (lower Q, less jittery), a much finer motor, a new mechanical stop under the main bearing housing to facilitate the tightening of disc clamping devices, and a number of subtle improvements in the already exquisite appearance of the product. The basic concept remains the same: seismic platform with self-correcting three-point suspension, relatively low-torque DC motor with high inertia, belt drive, heavy platter with high moment of inertia, three concentric "wave trap" rings (so called by Dr. Win) embedded in the platter in lieu of a mat, fanatical attention to materials, friction and tolerances.

Does the SDC-10 offer the same degree of isolation from extraneous mechanical excitations as the Cotter B-1? Obviously not (although our initial exploratory measurements were somewhat inconclusive). A truck and a sports car, even if their suspensions were tuned to the same frequency with the same Q, wouldn't be equally isolated from potholes in the road, either. A larger mass, having higher inertia, is always more immune to outside shocks, all other things being equal. Furthermore, the metal-and-plastic laminations of the Cotter

base and arm pad are definitely more dissipative (i.e., deader) than the leaded plexiglas used in the Win. The question is, how much isolation and damping do you need? Under the most severe conditions of actual use in a music system, the SDC-10 appears to be impeccable in those respects. It does the job, as well as the job needs to be done, without the penalties of overkill (such as unmanageable weight and the agricultural machinery look). Dr. Win is the only turntable designer known to us who has access to a government laboratory facility where a shaker table and a whole bank of simultaneously operating spectrum analyzers are available. Accelerometers attached at many points to the turntable, each with its own spectrum analyzer readout, can be used to determine the vibrational characteristics of a design under development. Tools like that made it possible to design the SDC-10 as a balanced system with correctly matched working parts, of which the SDA-10 arm was also calculated to be one. The whole effort reflects a systems approach to the realization of a desired level of performance, rather than just a let's fix-it job to swamp all possible resonances with a mechanical sink.

What do we now think of belt drive vs. direct drive? We suspect that the superiority of the Win system isn't so much due to the way the drive happens to be applied to the platter but rather to the flawless dynamic characteristics of all the rotating parts: platter, main bearing, motor, pulley. A direct-drive system made with the same fanatical care would provide the only fair comparison. (See also our Win vs. Cotter/Technics/FR discussion in the preamble to these reviews.)

SDA-10 Arm

This is entirely new and entirely delightful. It combines in a single design everything we liked about the Breuer Dynamic and the FR-64s/66s, our last two reference tone arms, and a great deal more.

The outstanding design feature of the SDA-10 is the use of two opposed ring magnets of repellent polarity to suspend the entire weight of the arm, permitting the use of relatively fragile sapphire jeweled bearings in the gimbals to achieve virtually frictionless vertical and horizontal movement. In addition, the magnetic suspension creates a mechanical servo effect that stabilizes and damps the arm. Vertical tracking force is applied by means of an exceptionally high-quality spring mechanism, the arm being dynamically balanced (as are the Breuer and the FR). The excellent outrigger antiskating device can be disengaged by means of a clutch for easier nulling of the static balance. Best of all, the vertical tracking angle (VTA) is continuously adjustable over a range that, for once, we find sufficient for just about all modern LP's. Yes, the SDA-10 is a joy to use.

The headshell of the arm is not of the universal plug-in type; Dr. Win doesn't trust the mechanical integrity of that arrangement, which has the further disadvantage of not permitting even the slightest rotation for azimuth adjustment. The fixed headshell of the SDA-10 can be loosened with a small screwdriver and turned (or even moved longitudinally), although this is not recommended to heavy-handed owners. The cartridge mounting holes are drilled only for the Win SDT-10-2, since the arm was designed primarily to work with that cartridge, but a more universally adaptable shell is supposed to be coming out soon. Meanwhile we've found it possible to mount other cartridges in the arm by using smaller

screws that allow some play in the holes.

In fact it was our experiments with other cartridges, especially the Fidelity Research MC-201, that made us come to our conclusion about the superior transparency, definition and freedom from thickish colorations of the total Win system versus the Cotter/Technics/FR combination (our previous Reference A record player). We have a hunch that the SDA-10 arm contributed more to that difference than the SDC-10 turntable, although the measured anomalies in the Cotter system that we discussed above probably came from the Technics motor.

SDT-10-2 Cartridge with SPG-10 Control

The conceptual beauties of the Win strain-gauge design have already been dwelt on at some length in Vol. 1, No. 6 and Vol. 2, No. 1; here we intend merely to give a progress report on this constantly evolving product. Its latest avatar incorporates a sapphire cantilever with Vital stylus (made by Ogura). We tested two samples, which were quite similar but not identical in measurable and audible characteristics. Their power source modules were also slightly different; the second module had the newer IC chips currently used in the production version. Both cartridges exhibited a bass boost: 6 to 7 dB at 20 Hz in the first sample, 4 dB at 20 Hz in the second sample. (The fundamental resonance of the arm/cartridge combination was at about 16 or 17 Hz.) Both samples had a 5 to 6 dB treble peak at a surprisingly low frequency: 9 kHz in the first, 7 kHz in the second. The first sample came back to full passband level after the dip that followed the peak, staying there up to 27 kHz; the second only came back within -3 dB of the passband. The first sample had incredibly poor separation (9 dB to 13 dB); the second was a little better (14 dB to 19 dB).

These are somewhat disturbing, indeed discouraging measurements, indicating still unsolved problems in the transducer structure and the internal (mechanical) RIAA equalization. The sound, however, turned out to be startlingly transparent, detailed and focused, with a reach-out-and-touch-it kind of immediacy. Part of that was undoubtedly due to the elimination of the preamp from the audio chain (the SPG-10 control unit is entirely passive), but the speed and signal-path simplicity of the strain-gauge transducer must have had something to do with it. Only after several minutes of listening did the coloration introduced by that top-end peak become annoying and, eventually, unacceptable. The first sample actually sounded more musical, with airier highs, but the poor separation resulted in a quasi-mono effect. The rising bass in both samples was audible but not annoying. And that's about the size of it—until the next modification. The ultimate refinement of this remarkable device should be worth waiting for.

Recommendations

This time it's a whole new ball game.

Best phono cartridge, regardless of price: Fidelity Research MC-201.

Best phono cartridge per dollar: Fidelity Research MC-201.

Best tone arm, regardless of price: Win Laboratories SDA-10.

Best turntable, regardless of price: Win Laboratories SDC-10.

Best turntable/arm per dollar: Kenwood KD-650.

Moving-Coil Step-Up Roundup

By the Staff of
The Audio Critic

We're unable to report any major breakthroughs in either transformers or pre-preamps, but the average quality seems to be getting a little better.

We keep hearing and reading more muddleheaded misinformation on the subject of moving-coil pickup transformers and pre-preamps than anything else in audio, with the possible exception of loudspeakers. We're hoping that the applicable chapter in our forthcoming Handbook will systematically cleanse impressionable minds of all that pollution; meanwhile we wish to state a few basic points here for the sake of at least temporary decontamination.

Transformers vs. pre-preamplifiers.

A moving-coil phono cartridge in most cases has higher *energy* output than moving-magnet, moving-iron or other moving-field designs. The trouble is that the energy is in the form of relatively high current at relatively low voltage, whereas the typical phono preamplifier stage in an audio amplification chain needs somewhat higher voltage to drive it. The logical thing, therefore, would be to perform an impedance transformation by means of a transformer and change the current into voltage without significant losses, rather than to throw away the current and boost the voltage by introducing outside energy from the power supply or battery of an added pre-preamplifier stage. Remember, other things being equal, a passive signal path is cleaner than an active one. The question is, are other things really equal?

A transformer, in addition to effecting an impedance transformation, also acts as a bandpass filter. Bandpass filters whose low-frequency and high-frequency "corners" are correctly located and contoured for audio purposes are inaudible in a signal path, as long as they also possess sufficient dynamic range so that the filter characteristics remain unchanged regardless of signal amplitude. A lot of MC pickup transformers, even some fairly expensive ones, have insufficient bandwidth and/or funny group delay characteristics on account of the order and Q of their filter equivalents and/or poor dynamic range accompanied by hysteresis distortion as a result of core saturation and kindred causes. None of this is *inherent* in the transformer concept; it's the implementations that are usually inadequate. A truly excellent transformer is necessarily costly, whereas a fairly decent pre-preamp can be built quite cheaply. Cultists will then conclude that the latter sounds better because its bandwidth extends from 0.1 Hz to 1 MHz, when the truth is that it sounds better because the transformer it's being compared against is a piece of junk. Never trust a DC-to-light freak on any audio

subject.

A further advantage of a transformer is that the DC resistance of the primary can be made sufficiently low so that it's the cartridge impedance (10 ohms or less nowadays) that dominates the total noise level of the system. It would require cryogenic techniques or similarly heroic measures to duplicate that condition with an electronic circuit.

None of this means, of course, that the very finest pre-preamp available at a given moment may not be superior to whatever exists in transformers at the same moment. All we claim is that Mother Nature's deck is stacked in favor of the transformer.

Watch your input stage acceptance level.

One thing that can easily confuse the reviewer of MC step-up devices is the inability of so many preamplifier phono stages to handle high-speed RIAA-preemphasized signal peaks of large amplitude. For example, the Koetsu cartridge through the Cotter MK-2L transformer can generate fast-rising waveforms at sufficient energy levels to make a lot of preamps go "crunch." The reviewer might then blame the unsatisfactory results on the transformer, when it's really the phono input stage acceptance level that's inadequate, and the cartridge/transformer combination is actually providing the most advantageous energy transfer and signal-to-noise conditions imaginable. The same can also happen with pre-preamps; peak overloads can occur almost anywhere along the signal path, up to and including the main pre-amp's phono stage.

This may be one reason for the obnoxious but widespread practice of loading a moving-coil cartridge down with a low-value resistor. The signal-to-noise ratio is shot to hell as a result, but by shunting off a significant amount of energy the resistor brings the signal peaks within the acceptance range of the circuitry. The damping effect of the resistor may conceivably be of significance in certain specific cases (again, the Handbook will go into greater detail on this), but by and large we don't believe that could be an important influence on the behavior of typical moving-coil mechanisms. Choose a correctly damped cantilever/generator design in the first place and a preamp input stage with high acceptance level, connect the best step-up device you can afford (preferably a good transformer) without any cockamamie resistors, and let her rip. That's our philosophy.

The step-up devices reviewed below were all tested in the manner described on p. 43 of the last issue (Vol. 2, No. 2).

Audire 'Poco'

Audire, Inc., 9576 El Tambor Avenue, Fountain Valley, CA 92708. Poco pre-preamp for moving-coil cartridges, \$175. Three-year warranty. Tested #8098, on loan from dealer.

Here's another relatively inexpensive battery-powered pre-preamp a la Marcof, and it's another good one. In some ways we like it more, in some ways less.

The Poco comes in two versions, each with a different choice of input impedances; the one we tested was the so-called low-impedance version. Compared with the Marcof PPA-1 (not the *very* latest modification, which we didn't have, but the "improved" one reviewed in the last issue), the Poco sounded distinctly more transparent (i.e., less veiled) but also more aggressive in the upper spectrum and ultimately more fatiguing.

This was a frustrating test, resulting in a general lack of enthusiasm for our previous Reference B choice (namely the PPA-1), since it appeared to be no longer the undisputed winner in its category, and a no less halfhearted feeling about the new challenger, the Poco, since it didn't turn out to be clearly better, either. Luckily the PS Audio pre-preamp (see review below) managed to extricate us from that impasse. Of course, the "late late" PPA-1 may turn the situation around once more. We shall see.

Fidelity Research FRT-3G

Fidelity Research of America, PO Box 5242, Ventura, CA 93003. Model FRT-3G Toroidal Step-Up Transformer, \$250. Tested #067007, on loan from distributor.

It would have been nice to find a really good, clean transformer for only \$250, especially since the FR cartridges have always been among our favorites and this transformer was obviously designed to mate with them. Unfortunately, even though the FRT-3G has the open sound quality one can immediately discern when a reasonably good transformer is being used in a system of high resolution, it doesn't quite satisfy us with its reproduction of the treble range. There's something strained, metallic and unpleasant about it up there that makes us want to stop listening. And that's not the purpose of sophisticated audio equipment, regardless of price.

Obviously, toroidal construction isn't nearly as important as the criteria discussed in the preamble to these reviews above.

Nagatron Ag 9200

Nagatronics Corporation, 2280 Grand Avenue, Baldwin, NY 11510. Nagatron Model Ag 9200 'Z Coupler', \$325. Tested #4086, on loan from owner.

Originally designed for the 3-ohm Nagatron ribbon cartridge, this transformer works very nicely with a variety of

low-impedance moving-coil cartridges. Smoothness and euphony are its chief sonic virtues; we heard none of the hard, edgy, overbright quality that bothers us in so many other step-up devices. On the other hand, the Nagatron introduces a certain amount of veiling or opacity, which eliminates it from consideration as a reference transformer. Both the Cotter MK-2 and the RWR Audio MCT-1 sound distinctly more transparent.

The "Ag" in the model designation of the Nagatron is the chemical symbol for silver, to alert you that this is the transformer with coil windings of "chemically pure silver (purity better than 99.99%)." The quotation comes right from the blurb printed on the bottom of the unit. We're still waiting for the silver cultists of the audio world to present us their scientific rationale (or even a scientifically controlled demonstration of the superiority of silver wire); meanwhile we notice that the cores of the Nagatron transformer coils are pitifully small. Wouldn't it have been better to spend the money on that instead?

PS Audio (interim report)

PS Audio, 3130 Skyway Drive, #301, Santa Maria, CA 93454. Moving-coil pre-preamp, \$180. Tested prototype, on loan from manufacturer.

We can't make a definitive evaluation here, since the production model that PS Audio ended up selling to the public is different in some details, though not in basic design, from the very early version they had sent to us for testing. What's more, consistency in production doesn't look to us like PS Audio's long suit, even if their circuitry always shows considerable insight into what makes audio electronics sound good. So—be prepared for possible surprises and/or disappointments.

That said, we can unequivocally state that the AC-powered unit we tested was sonically superior to the competition (moderately priced pre-preamps such as the Marcof PPA-1 and Audire 'Poco') in every way. PS Audio's one-transistor class A circuit without feedback sounded cleaner, smoother and more transparent than the others; it made a good showing even in comparison with the better transformers, though by no means surpassing them. This is the kind of sound you can accept at face value without any complaints, until a step-up device with even better resolution and focus comes along, making you realize that a little something was still missing.

We're therefore making the PS pre-preamp our tentative Reference B recommendation, pending a final test of the actual production model and reliability reports from the field.

RWR Audio MCT-1 (follow-up)

RWR Audio Ltd., Box 3080, Station D, 340 Laurier Avenue, Ottawa, Ont., Canada K1P 6H6. MCT-1 Moving-Coil Transformer, \$450 (direct from factory) or \$600 (suggested list price in U.S. stores, if and when available). Five-year warranty. Tested #18006038, on loan from manufacturer.

Now that we've tested a production sample of the RWR transformer, we can report that the ranking established in our last issue on the basis of two preproduction units still stands. This is a very fine transformer indeed, but it's still audibly second to the Cotter MK-2 (or to the Cotter-designed Verion MK-1, for that matter) in the various ways discussed in our original review. As a matter of fact, the differences have become more distinct with the improved MC cartridges of recent months.

The production version also exhibited slight anomalies in its square wave response, but somewhat different in appearance from those we had observed in the earlier samples. We measured a rise time of 2¼ microseconds, 5% overshoot (but with the second ripple of larger amplitude than the first) and a total ring pattern of approximately 12 microseconds before complete damping. Is this audible? We can't be sure. Again, the two channels weren't absolutely identical; no two RWR channels seem to be, at least so far.

On top of it, the price has gone up 50%, but you didn't really expect it to remain at the original bargain level, did you?

Recommendations

We aren't too happy with the following two choices, since the first is extremely costly and constantly rising in price, the second somewhat different in production from what we tested. On the other hand, these are the best we've found so far in their respective categories, and we can't in good conscience recommend second best.

Best step-up device for moving-coil cartridges, regardless of price: Cotter MK-2 transformer (see also Cotter System 2 in this issue, under preamps).

Best MC step-up device per dollar: PS Audio preamp (tentative rating—see review).

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COTTER NFB-2 NOISE FILTER/BUFFER, PSC-2 Phono Signal Conditioner, PW-2 Master Power Supply. \$1050. (219) 362-2635.

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BEVERIDGE 2SW-1 IMPROVED, Hegeman Hapi 1, Thorens 126B with Grace 707 Mk II, Nakamichi 700, Accuphase T-100, Stax "Sigma" with Futterman amp. Barry after 5:30 pm. (518) 463-3654.

VERION MK1 TRANSFORMER, \$250. FR-64s tone arm, \$450. (402) 779-2531 evenings.

COTTER PSC-2, PW-2, new, perfect condition. Best offer. Russell Laudon, 562 Eastbrooke Lane, Rochester, NY 14618. (716) 454-3910 days.

FIDELITY RESEARCH FR-64s TONE ARM. With B-60 stabilizer, optional counterweight, extra headshell, silver wire. \$725. Ask for Al, (612) 388-4683.

GRACE G-707 TONE ARM. (713) 644-2067 evenings. Keep trying.

CROWN DISTINCTION SERIES DL2, EQ2, PSAIL, FMI, \$4000. Beveridge 2SW-1 speakers, \$5,500. Approx. 30 hours use on all equipment. (303) 934-2421.

COTTER TRANSFORMER, the improved Hapi One preamp, Stax SR-5 headphones, Hafler DH-200 power amp. Must sell. Kevin Williamson, (802) 295-7629 evenings.

JVC UA-7045 TONE ARM. R.P., 4431 Vision, #3, San Diego, CA 92121.

FUTTERMAN MODIFIED LUX 3045's, \$950. DB 1, 2, 4, \$295. (914) 961-6549.

THRESHOLD 400A Cascade, \$1000. Dayton Wright XG-8 (latest) speakers, mint, \$1600. (317) 463-4457.

DUNLOP-CLARKE DREADNAUGHT 1000, \$900. Grace 704 tone arm, \$125. Kenwood KD-500 (modified), \$300. Ortofon MC-10 (new), \$90. Canada. (819) 827-1418.

HAFLER DH-101 PREAMPLIFIER, Dynaco Stereo 120 amplifier, Heath digital tuner AD-1504 (all assembled, factory-calibrated). Dynaco PAT-5 preamplifier, SCA-50 integrated amplifier (kits). All 50% off regular price. McKay-Dymek AM tuner, antenna, \$250. All brand new, new warranties. Also Ortofon LM30-H and Empire EDR .9 pickups, 50% off. Kits, Apt. 6M, 45-10 Kissena Blvd., Flushing, NY 11355.

MARANTZ 2325 RECEIVER, as new, with case, \$500 plus shipping. SME 3009, black pipe, needs pin, \$50. 330 Independence Bldg., Colorado Springs, CO 80903. (303) 633-9492.

Wanted

WANTED or FOR SALE: BRAUN LV1020 speakers, \$600/pair, shipping not included. Nearly perfect condition. 330 Independence Bldg., Colorado Springs, CO 80903. (303) 633-9492.

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1/13/81

The Audio Critic

In the coming biweekly Bulletins:

Reviews and more reviews, plus all our regular columns, too, just more concisely and much more often. The following are scheduled for early issues.

Speakers: Beveridge 3 follow-up (including Oct. 1980 woofer change), B&W 802, Genesis 410 (top of the line), 3D Acoustics (with Oct. 1980 cone change).

Power amps: Octave Research, Carver M-400, Bedini Model 200/200, Futterman (latest changes).

Preamps: Carver C-4000, Counterpoint SA-1 (tubes).

Electronic Crossover: Beveridge RM-3 (solid state).

Turntables: Win Laboratories 'Catherine', Oracle.

Tape recorder: Tandberg TD 20A (with special EQ).

Headphones: Stax SR-Sigma and SR-Lambda.
