stereophile

EQUIPMENT REPORT

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Audio Research

Reference 3

LINE PREAMPLIFIER

Paul Bolin

DESCRIPTION Tubed, remote-controlled line preamplifier with full sets of balanced and unbalanced inputs and outputs, and Processor Loop. Tube complement: four 6H30P dual triodes, plus one 6550C and one 6H30P for power-supply regulation.
Maximum voltage gain: main output (single-ended or balanced input), 11.6dB; balanced output, 5.6dB single-ended output. Frequency response: 0.2Hz–200kHz , +0/–3dB, at rated output (balanced, 200k ohms load). Distortion: <0.01% at 2V RMS balanced output. Input impedance: 120k ohms balanced, 60k ohms single-ended. Output impedance: 600 ohms balanced, 300 ohms single-ended main (2), 20k ohms minimum load and 2000pF maximum capacitance. Output polarity: noninverting. Maximum input: 20V RMS maximum balanced, 10V RMS single-ended. Rated output: 2V RMS (1V RMS single-ended) into 200k ohm balanced load (maximum balanced output capability is 30V RMS at <0.5% THD at 1kHz). Noise: 2.7µV RMS residual IHF-weighted balanced noise output with volume at 1 (106dB below 2V RMS output).
DIMENSIONS 19" (485mm) W by 7" (178mm) H by 15.5" (394mm) D. Handles extend 1.5" (38mm) forward of front panel. Weight: 29.6 lbs (13.5kg) net, 43 lbs (19.5kg) shipping.
SERIAL NUMBER OF UNIT REVIEWED 15303114.
PRICE $9995. Approximate number of dealers: 50.
MANUFACTURER Audio Research Corporation, 3900 Annapolis Lane North, Plymouth, MN 55447-5447. Tel: (763) 577-9700. Fax: (763) 577-0323. Web: www.audioresearch.com.

Audio Research Reference 3

In any category of product or service, there is a gold standard—one company that epitomizes the best in its field of endeavor. Consider the Rolex watch, the Ferrari sports car, the Steinway piano, the Dunhill pipe. All of these artisanal manufacturers have spent decades, even centuries, earning their names' cachet with their histories of consistent excellence. While high-end audio boasts no names with a 60-year pedigree, such as Ferrari's—much less Steinway & Sons' +150 years—there is one firm whose storied past stretches back to the very emergence of the concept of high-end audio itself: Audio Research Corporation.

William Z. Johnson was building amplifiers long before he founded Audio Research. Should you be lucky enough to stumble on an Electronic Industries amplifier from the 1960s, consider yourself extremely fortunate. Electronic Industries was Bill Johnson's first nameplate, and in 1970 that enterprise evolved into Audio Research. Through the 1970s, when the transistor loomed monolithically over audio, it was Johnson and ARC that bravely, and at times solely, continued to fly the flag for the vacuum tube as a superior reproducer of sound. During those years, Johnson and ARC created a series of legendary preamplifiers and power amplifiers. Veteran audiophiles still recall with fondness the SP-3, SP-10, and SP-14 preamplifiers, and the D-79, D-150, and D-250 power amplifiers, to mention only a few of ARC's landmark components. A surprisingly large per-

centage of those units are still in service today, and ARC will still service every one.

When a marque is as storied as Rolex, Dunhill, or Audio Research, the introduction of a new top-line product is something of a double-edged sword. Any new "statement" design is eagerly anticipated by a large and loyal coterie of enthusiasts, but with that comes the expectation that it will not only live up to but surpass the legacy of excellence established by its many illustrious predecessors and thus set a new standard of performance. The burden of history can weigh heavily, but the design team at ARC remains unintimidated by the weight of expectations.

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Remake, remodel

The Reference 3 line-stage preamplifier ($9995) was introduced at the 2005 Consumer Electronics Show, replacing the long-running Reference 2 Mk.II. The Ref.3 is not an update or a minor revision; the Reference preamp has been redesigned from the ground up, and Ref.2 Mk.IIs cannot be updated or retrofitted to Ref.3 status. On the outside, the obvious change is a major evolution in front-panel design. From time immemorial, ARC has favored, to put it gently, plain-Jane cosmetics. The Ref.3 breaks new ground and is a leap into a graceful, almost Goldmund-like 21st-century minimalist aesthetic. The preamp's few controls and large vacuum-fluorescent display, easily readable from a considerable distance, make a striking impression. The soft green display can be adjusted to eight levels of brightness or turned off entirely, in which case it briefly illuminates when a control input is received from the front panel or the remote. (Turning off the display does result in marginally better sound.) At last, an ARC preamp can actually be described as "beautiful."

Inside, everything is new—pop the top and you see nothing but beefy construction and beautiful craftsmanship. Bill Johnson

MEASUREMENTS

The Audio Research Reference 3's maximum voltage gain, with its volume control set to "103," was 11.8dB from balanced input to balanced output and 5.75dB from unbalanced input to unbalanced output. These figures are sensibly suitable for use in practical systems. The preamp was noninverting; *ie*, it preserved absolute polarity in both conditions. The input impedance was to specification at low and midrange frequencies, at 58k ohms single-ended and 116k ohms balanced, these dropping slightly and inconsequentially to 48k ohms and 106k ohms, respectively, at 20kHz.

The output impedance was also to spec., at 635 ohms balanced and 326 ohms unbalanced in the treble and midrange, but rose to 1437 ohms and 625 ohms, respectively, at 20Hz. This rise in source impedance rolled off low frequencies a little early into the punishing 600 ohm load (fig.1, bottom pair of traces), with a –3dB frequency of 17Hz. As this is a relatively low frequency and the preamplifier will never be used with a power

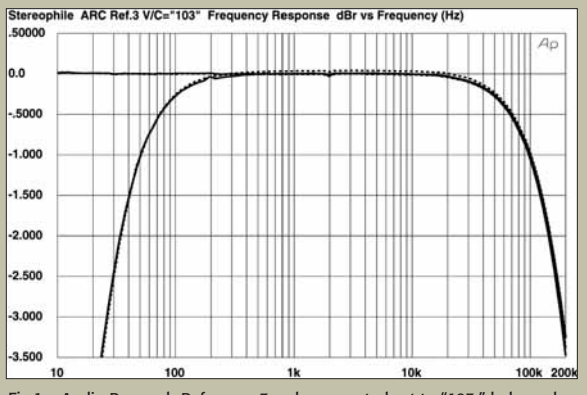

Fig.1 Audio Research Reference 3, volume control set to "103," balanced frequency response at 1V into (from top to bottom at 2kHz): 100k, 600 ohms (0.5dB/vertical div., right channel dashed).

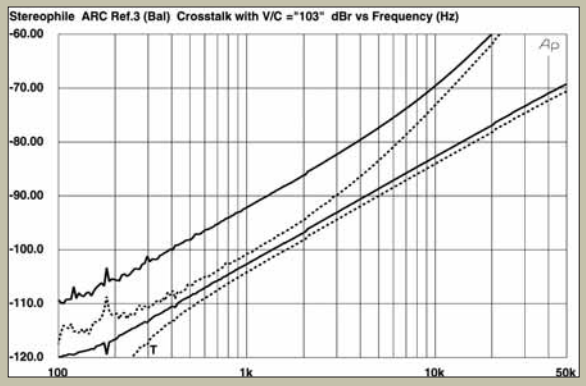

Fig.2 Audio Research Reference 3, channel separation, from bottom to top: L–R balanced, L–R unbalanced (R–L dashed, 10dB/vertical div.).

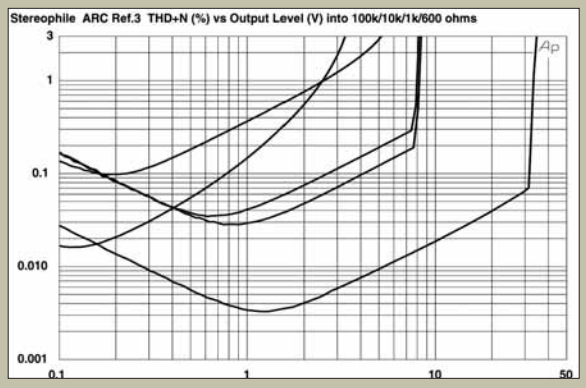

Fig.3 Audio Research Reference 3, THD+noise (%) *vs* 1kHz output voltage into (from bottom to top at 1% THD): balanced into 100k ohms, unbalanced into 100k, unbalanced into 10k, balanced into 600, unbalanced into 600 ohms.

himself designed the power supply and all of the audio circuits. Four new circuit boards and two new transformers replace those used in the Ref.2 Mk.II. The audio circuit is all tube, fully differential, pure class-A, wholly free of negative feedback. As in previous ARC Reference preamps, two pairs of 6H30 twin-triode tubes provide gain, and the power supply is fully tube-regulated. Outside the signal path, FETs are used for constant current sources, and ARC states that the long-tailed pair used in the Ref.3's input stage provides identical performance (save for the amount of gain) using either the balanced or the single-ended inputs. ARC's chief listener, Warren Gehl, informed me that the storage capacity of the Ref.3's power supply is 50% greater than that of ARC's 55Wpc VS55 *power* amplifier. And, unusually for a preamplifier, the Ref.3 is fitted with a 20-amp IEC connector.

The full-function remote control offers a number of features not present on the sleek front panel, including mono summing and absolute-polarity inversion. While not overly fancy or weighty, the remote worked like a charm and was easy to use. It also gives access to a rare feature—the user can at any time check the number of hours the tubes have operated. ARC predicts a tube life of about 5000 hours, so this is more fun than strictly practical, but it did let me know with some accuracy that the lion's share of break-in was complete by 100 hours, and that the Ref.3 had entirely settled in by 200 hours. About the only luxe feature the Ref.3 doesn't offer is a way to offset and memorize each input's level.

After a bit of twiddling around, the Ref.3 ended up sitting on my Ultra Resolution Technologies Bedrock stand, perched atop three Shun Mook IsoQubes. I can't be absolutely sure, but things seemed consistently just a shade purer and more relaxed with the IsoQubes. During my many months with the Ref.3, it behaved perfectly.

Ssssh!

I had a suspicion that I was in for a special experience when I had a profound reaction to the Ref.3 before it had played even one note of music. The first time I turned it on and unmuted its CD input, I ran the volume control up about halfway and heard nothing—utter silence. Were I a cartoon character (quit snickering), thought balloons full of question marks and exclamation points would have appeared over my head.

I cranked the thing wide open. Again—total, textureless silence at my listening seat. Only when I got within a foot or so of the tweeter of one of my Wilson Audio MAXX 2 loudspeakers did I hear a very faint, strik-

amplifier having an input impedance as low as 600 ohms, this rise in source impedance will not be a factor in practical use.

At the other end of the spectrum, the Reference 3 offered a wide bandwidth, with a –3dB point at 200kHz into 100k ohms with the volume control set to its maximum (fig.1, top traces). There was a slight decrease in ultrasonic extension into 600 ohms, and with the volume control set to unity gain or below, but the effect on the preamplifier's audioband response was negligible. Fig.1 shows the balanced response; the unbalanced response (not shown) was effectively identical. The unity-gain setting of the volume control, by the way, was "79" balanced, "92" unbalanced.

Balanced channel separation, assessed with the undriven channel's input shorted and the volume control set to its maximum, was excellent—better than 100dB below 1kHz—but less good for unbalanced operation (fig.2). You can also see in this graph that separation decreases with increasing frequency due to the usual capacitive coupling, but is still excellent at 20kHz for balanced operation. Unbalanced separation is 60dB at 20kHz, which is good rather than great. The unweighted, wideband signal/noise ratio for balanced operation, again taken with the input shorted and the volume control set to its maximum, was excellent at 80.3dB (ref. 1V output). Unbalanced operation reduced this to 70.2dB, but both figures improved significantly when A-weighted, to 94.7dB balanced and 88.4dB unbalanced.

The Audio Research Reference 3 could swing very high voltages with very low distortion into loads greater than 10k ohms. This is shown graphically in fig.3, which plots the THD+noise percentage in the preamp's output against balanced and unbalanced output voltage into loads ranging from 100k ohms down to 600 ohms. The actual clipping voltage (1% THD) into 100k ohms was 33V balanced but 8.2V unbalanced. Both figures are significantly higher than the maximum voltage the Referen-

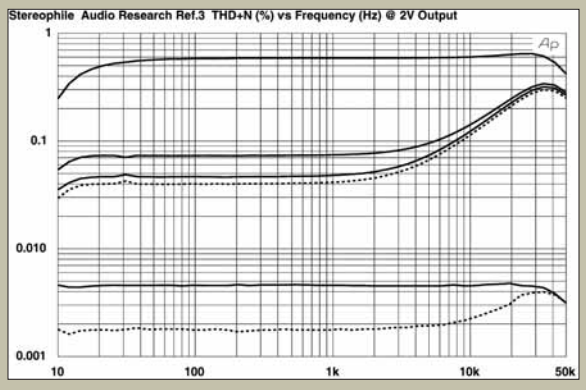

Fig.4 Audio Research Reference 3, THD+N (%) *vs* frequency at 2V into (from bottom to top): balanced into 100k ohms; unbalanced into 100k, 10k, 1k ohms (right channel dashed).

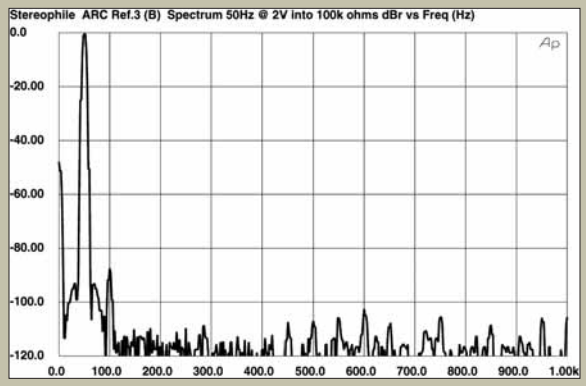

Fig.5 Audio Research Reference 3, balanced spectrum of 50Hz sinewave, DC–1kHz, at 2V into 100k ohms (linear frequency scale).

ingly fine-grained hiss. I can't wait to see what John Atkinson's measurements reveal, but subjectively, the ARC Ref.3 was the quietest tube preamp I've heard, and by a large measure. The *nature* of that silence was also intriguing. Like the Halcro dm10, the Ref.3 presented a *live*-sounding silence, not some dead, airless, deep-space void. This odd little tableau was but a precursor of what was to come.

Eschewing obfuscations

The truly great components I've experienced have grabbed me immediately, and from the first note I heard through the ARC Reference 3 it was evident that, like the Halcro dm58 amplifier, it would prove to be a paradigm-shifting component. From the get-go, the Ref.3 presented unprecedented amounts of information organized in a way previously unknown to me. With the first CD I played, there seemed to be so much going on, and in such a deep and richly detailed sonic picture, that I wanted to "look everywhere" at once. It took a while before I was able to focus on specifics.

Following Audio Research tradition, the input and output jacks for the two channels are mounted in two rows.

The most immediately obvious quality of the Ref.3 was its way with spaces. Anatole Fistoulari and the Concertgebouw Orchestra's recording of scenes from Tchaikovsky's *Swan Lake* (UK LP, London CS 6218 blueback) is one of the all-time great recordings of the sound of an orchestra *and* concert hall. The sound billowed out into my room with lush multidimensionality and majestic sweep, the way live music does, and I had an inescapable sense of not just space, but of a *particular* space. Similarly, the epic soundstage Bert Whyte captured on John Antill's *Corroboree* (LP, Everest/Classic SBDR-3003) was confoundingly lifelike and forcibly imposed on my room.

After my first reaction of pleased shock, I noticed that the widths of these LPs' soundstages did not diminish at all with the apparent increase in depth. Full upstage width was retained to the furthest corners at the stage's rear. The results were equally stunning with rock and electronic music. Pink Floyd's "Marooned," from *The Division Bell*

measurements, *continued*

ce 3 will be asked to deliver in practical use. However, fig.3 suggests that the preamp not be used with loads below 10k ohms. This is confirmed by the plot of the THD+N percentage against frequency at 2V output (fig.4), where the distortion percentage stays low into loads of 10k ohms or higher. Note, however, that the single-ended output performs significantly less well than the balanced, with a rise of THD at the top of the audioband.

The Reference 3's distortion may be very low at practical levels into sensible loads, but is also almost entirely second-order in content (fig.5), which will reduce its audibility. Into impedances much lower than 10k ohms, not only does the second harmonic rise in level, it is joined by the third harmonic, again suggesting that the power amplifier with which the preamp is used have an input impedance above 10k ohms. (Audio Research's own power amplifiers all have balanced input impedances of between 200k and 300k ohms, and the company recommends the Reference 3 not be used with amplifiers having an input impedance of less than 20k ohms.)

Fig.5 was taken from the Reference 3's balanced output. When I repeated this test from the unbalanced output using a different test set, the Miller Audio Research QC Suite, I got a similar result (fig.6): the distortion is low and almost entirely second-harmonic in nature, and the noise floor is also low. The spectrum of the Reference 3's output while it drove an unbalanced mix of 19kHz and 20kHz tones into 8k ohms (fig.7) is also very clean, though the second-order difference product at 1kHz lies at –72.5dB (0.024%), this correlating with the decreasing linearity seen at high frequencies in unbalanced mode in fig.4.

Overall, the Reference 3's measured performance is excellent, but it does suggest that it works best in full balanced mode, and into higher impedances.

—John Atkinson

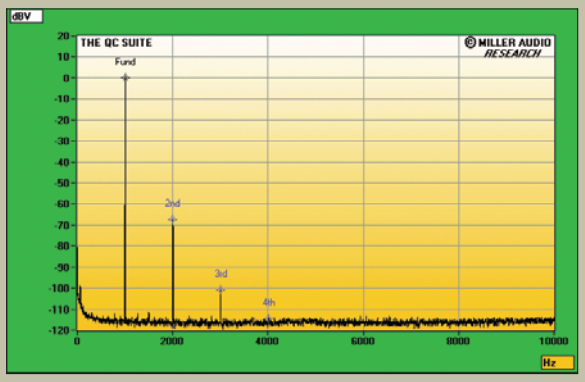

Fig.6 Audio Research Reference 3, unbalanced spectrum of 1kHz sinewave, DC–10kHz, at 1V into 8k ohms (linear frequency scale).

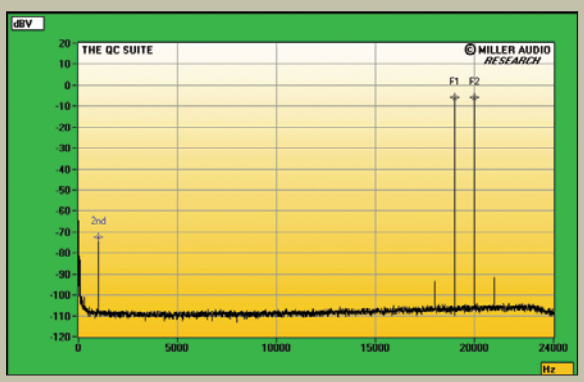

Fig.7 Audio Research Reference 3, unbalanced HF intermodulation spectrum, DC–24kHz, 19+20kHz at 1V into 8k ohms (linear frequency scale).

(LP, Columbia C 64200), and "Prodemium," from Armin van Buuren's *76* (CD, Ultra L 1168-2), showed bogglingly wide and deep soundfields that sounded every bit as internally coherent as the gorgeous sound of the Amsterdam Concertgebouw.

Second, I noticed that the spatial relationships between instruments and voices in those soundfields were explicated in unusual and surprising ways. Every recording I played through the Reference 3 allocated more elbow room to each voice and instrument than any line stage I had previously heard. The distances between sound sources were defined with much more precision than I was used to hearing. Complex music of all kinds made more spatial sense through the Ref.3, and this clarified both the sonic and musical pictures to striking degrees.

I found nothing to even quibble about, and much to be awed by, in the Ref.3's dynamic presentation. *Corroboree* is a piece of explosive dynamic contrasts and percussive climaxes. The ARC delivered them all in full force, effortlessly and invisibly. In the first movement of György Ligeti's *Apparitions*, in a reading by Jonathan Nott and the Berlin Philharmonic (CD, Teldec 88261-2), there is a thunderous percussion outburst that emerges from complete silence. Even though I knew it was coming, I almost literally jumped out of my chair in shock when I heard it through the Ref.3. It wasn't just a big moment in the music–it was startling on the subconscious level.

The big ARC had the fast-twitch reflexes of an Olympic athlete, and its monster tube-regulated power supply was almost certainly the main reason why. I've always found there to be something special about components with big tube-regulated supplies. Their dynamics seem more fluidly continuous and less "stepped" from one level to the next. The Ref.3 certainly advances that tradition to lofty new heights.

Remember that silence I mentioned a few paragraphs back? It's the principal reason the Reference 3 had a resolution floor that had to be heard to be believed. Listening to the Quartetto Italiano's performances of Beethoven's "Rasumovsky" string quartets (Italian LP, Philips 6998 017), I realized that the Ref.3 seems to increase the music's complexity–music's *natural* complexity–by paring away a layer of distortions and limitations that I had taken for granted. Attacks and decays had a special clarity and individuality even when notes were softly played.

Timbrally, the Reference 3 was a clear advance over its predecessors. The Ref.2 Mk.II tended to be overgenerous in the bass and a little loosey-goosey in terms of low-frequency definition. The Ref.3 may not have had the last bit of iron-fisted bass control that characterizes the very finest solid-state line stages, but it combined the best of both in beautiful proportion. "Marakech" and "Henry," from Peter Kruder's *Peace Orchestra* (CD, G-Stone G-CD 004), had impressive weight and depth with no slop or overhang, only poised authority. Down in the depths, the ARC preamp exhibited excellent control without sacrificing its ability to let each instrument project sound into space in its own unique way. It did not sacrifice bloom on the altar of restraint. In the mid- and upper-bass ranges, the Ref.3 was exceptionally well balanced and authoritative with all manner of music.

The midrange has been a traditional Audio Research strength, and the Ref.3 represents its finest achievement in that area. Its fundamental neutrality was complemented by the sort of intensely saturated tonal colors heard almost exclusively from live music. It did so not by actively *adding* anything that wasn't on the recording–it didn't–but by *allowing* a higher level of completeness to at last be heard. In short, what the Ref.3 seemed to "add" was an extra level of clarity and resolution. Instruments and voices projected from my Wilson MAXX 2s into the room with a shivery sense of solidity and realness. Claudio Arrau's performance of Liszt's *Transcendental Etudes* (Dutch LP, Philips 6598 490) had a real presence and grandeur that the music demands. Voices were a constant joy through the Ref.3. Whether Ian Dury's Cockney growl, Julee Cruise's wispy soprano, or anything in between, the ARC stood out for the unvarnished naturalness of its presentation. In the top octaves, the Ref.3 had an exceedingly open and detailed sound that was free of highlighting, grain, or artifacts.

The almost witchily organic sensuality of the Ref.3's sound derived primarily from its seamlessness across the board. Music flowed through the big ARC unimpeded by any audible distortion or subtraction with which I am acquainted–it simply happened, with no sense of "re-presentation." The Ref.3 is one of the tiny handful of components of my experience that presented recordings as contemporaneous musical events rather than as museum exhibits. It sounded as if the "frame" of traditional hi-fi colorations had been removed because it had.

THE **REF.3** SEEMS TO INCREASE THE MUSIC'S COMPLEXITY–MUSIC'S ***NATURAL*** COMPLEXITY–BY PARING AWAY A LAYER OF DISTORTIONS AND LIMITATIONS THAT I HAD TAKEN FOR **GRANTED**.

What was endlessly fascinating was the Ref.3's ability to capture the character and intent of all the music I put through it. From the intense paranoia and angst of Van Der Graaf Generator and the majesty of Arrau's Liszt to the gossamer textures of Enya's "Caribbean Blue," from *Shepherd Moons* (CD, Reprise 26775-2), the Ref.3 always caught the inexplicable intangibles that bring music to life. Any component that can bring me to the edge of my chair with something as familiar and pedestrian-sounding as Linda Ronstadt's cover of "You're No Good" is doing something remarkable indeed. I'm not sure any word or phrase in the current audiophile vocabulary precisely describes it.

"I'd rather know than believe."
–Carl Sagan

Audio reviewers are regularly excoriated for saying that the Cosmic Kaboom Z-1 is "the best," only to say a few months later that the Planetsmasher Egomania 5000 is now the best of the best and the new state of the art. This is not evidence of conspiracy or caprice or bribery, but the inevitable result of the last decade's advances in all aspects of audio design and manufacturing. Today's finest audio gear is so good that ever-smaller or previously unheard differences are now much more apparent and important.

One factor in this is the boggling increase in broadband resolution available from modern cutting-edge speakers. Higher-ups at both Wilson Audio Specialties and Audio Research Corporation have told me that the reason each of their companies' current products are so good is because of what the *other* company's latest products are now able to reveal to them about their own efforts. Such symbiosis breeds improvement all around in an evolutionary loop of constantly increasing knowledge. Differences that would have been virtually inaudible with the best gear of only 10 to 15 years ago are now impossible not to hear.

Damkroger observer in his August 2006 review of the Halcro dm88 power amplifier, when the playing field is fundamentally changed, new things emerge as critical, and we struggle to precisely define and describe these new, nontraditional, qualities.

ASSOCIATED EQUIPMENT

ANALOG SOURCE SOTA Cosmos Series III turntable, Graham 2.2 tonearm, Dynavector XV-1S cartridge.
DIGITAL SOURCES Plinius CD-101 CD player, Classé Omega SACD/CD player.
PREAMPLIFICATION Manley Labs Steelhead, Audio Research PH7 phono stages.
POWER AMPLIFIERS Lamm M1.2 Reference, Classé CAM-350 monoblocks.
LOUDSPEAKERS Wilson Audio Specialties MAXX 2 & Sophia, Legacy Audio Whisper.
CABLES Phono: Hovland Music Groove 2. Interconnect: Acoustic Zen Silver Reference & Silver Reference II, Cardas Golden Reference line level. Speaker: Cardas Golden Reference, Nordost Valhalla, Shunyata Research Orion. AC: Shunyata Research Anaconda Alpha, Anaconda Alpha Helix, Anaconda vX, Python Helix; Wireworld Silver Electra III+.
ACCESSORIES Shunyata Research Hydra 8 (front end) & Hydra 2 (power amps) power distribution/conditioning; Grand Prix Audio Monaco stands, Ultra Resolution Technologies Bedrock stand; Ganymede isolation footers, Nordost Titanium Pulsar Points, Shun Mook Iso-Qubes; Caig Labs Pro Gold, Walker Audio SST silver contact enhancers; Disc Doctor, LAST Labs record-care products; Ayre/Cardas IBE system-enhancement CD, Cardas *Frequency Sweep/Burn-In* LP; Argent Room Lenses. *—Paul Bolin*

THE **AUDIO RESEARCH REFERENCE 3** IS THE SINGLE MOST **IMPRESSIVE** AND THOUGHT-PROVOKING PIECE OF **ELECTRONICS** I HAVE HEARD SINCE THE HALCRO DM58.

Occasionally one hears a piece of gear that flat-out transcends its preexisting competition in one or more areas, whether it be reducing colorations or providing higher and deeper resolution or more lifelike dynamics. It provides performance not previously available and, in turn, will reveal relative weaknesses in components previously (and properly) thought to be the state of the art. One can't recognize that the previous standard-setter has been bested until it is bested, and it doesn't mean that owners of the "old" best now need moan and wring their hands. The images produced by the Keck telescopes are still spectacular, even though the Hubbell telescope's are even better.

In his classic *The Structure of Scientific Revolutions*, Thomas Kuhn observed that a dominant paradigm holds sway until enough irregularities and inconsistencies emerge to require the old paradigm's adaptation to or replacement by a new theoretical framework or paradigm. So it is in audio. Issues that were struggled with for decades have been resolved, and as a result, the next wave of improvements in music reproduction depends on getting correct a range of subtleties that were once irrelevant or, at most, peripheral. As Brian

That said, the Audio Research Reference 3 is the single most impressive and thought-provoking piece of electronics I have heard since the Halcro dm58 (see my review in *Stereophile*, October 2002, Vol.25 No.10). Like the dm58, the Ref.3 has radically changed my expectations of what is possible in the electronic arts. The Ref.3 sets new standards for quietness in the realm of tube line stages, and in that respect is competitive with any solid-state design I have heard. In terms of resolution, timbral generosity and accuracy, soundstaging, dynamics, and the presentation of music as a whole thing, it is the best I have heard.[1]

As I wrote about the Halcro, discovering the weaknesses of the Reference 3 will be possible only when it has been bettered. That it *will* inevitably be surpassed is the nature of a constantly evolving industry such as high-end audio. I do not envy those who will attempt to do so, for they have a steep and brutally challenging mountain to scale. *That* much—and that Audio Research's well-earned reputation for excellence continues—I *do* know.

1 So far I have heard the updated version of the VTL TL-7.5, my prior top-dog line stage, only at hi-fi shows, but will seek out a sample for review in the near future.