

THE BAS SPEAKER

THE PUBLICATION OF THE BOSTON AUDIO SOCIETY

This is the second issue of volume 22.

***Please pass along the membership form,
on the inside back cover,
to interested music-loving friends.***

ABOUT THE BOSTON AUDIO SOCIETY

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The Boston Audio Society (BAS) is an independent non-profit organization promoting the highest quality of music reproduction in the home and high standards in recording and transmission.

Founded in 1972 and now in its 27th year, the BAS meets monthly to hear and discuss developments in audio. Guest speakers have included engineers, designers, researchers, editors and reviewers, musicians and critics, and broadcasters and recording producers. On occasion we hold joint meetings with the Boston chapters of the AES (Audio Engineering Society), SMPTE (the Society of Motion Picture and Television Engineers), and the ASA (Acoustical Society of America). Our non-commercial newsletter, the *BAS Speaker* (BASS), includes coverage of these meetings as well as reviews, news columns, features, letters and other articles on a variety of audio and video topics.

Membership ranges from the novice enthusiast to the technically sophisticated. Consumers and producers of audio equipment are both represented. Members include freelance journalists, reviewers, and editors at the major audio magazines, as well as design engineers, consultants, and researchers who influence product development and therefore the course of the industry. Some members work for manufacturers (as technician, engineer, or marketing manager), others for dealers. All are devotees—audiophiles in the best sense of the term—and tend to be technically aware, informed about the marketplace, and keenly interested in scientific method in a field dominated by myth and hyperbole.

For these reasons the BAS and the *Speaker* are a lively forum. As someone involved in audio you likely will find the group an interesting, helpful resource. Our meetings and newsletter may help shape the future of consumer and pro audio while clarifying its past. If you are a manufacturer, for example, you can use the BAS to keep up with trends and developments, or to learn audiophile reactions to products and events. At the least, we attempt to be a clearinghouse for ideas, helping the various parts of the industry keep in touch with one another.

To join, or to obtain more information, please use the form in the back.

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VOL. 22 NO. 2

Publisher: David B. Hadaway

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The *BAS Speaker* (USN 0195-0908) is published by the Boston Audio Society. A subscription is included with membership. Dues in the US are \$35 a year; see the application form for rates outside the US. \$33 of the US dues are for six issues (one volume) of the *BASS*. For further information and an application form, please write the BAS, PO 211, Boston, MA 02126 USA. Editorial matter should be sent (preferably as text files on diskette) to David J. Weinberg, *BASS*, 10705 E. Nolcrest Drive, Silver Spring, MD 20903-1006 USA.

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From the editor

Thanks to your continued renewals and generous donations, we are able to keep publishing. The BAS officers are most appreciative for your clear demonstration of our value to you.

The BAS has a fledgling Web site — <http://home.att.net/~bostonaudio/>. Check it out, and submit suggestions and comments.

The winter Consumer Electronics Show, in Las Vegas, has added several seminars that further challenge our ability to cover the show. Reports of our success (?) are included in this issue.

As always, your letters and articles are appreciated.

From the president

Thanks to member Bernard Kingsley we now have a BAS Web site — without advertising! One of its many features is a list of vendors that service vintage and discontinued equipment. If you have any recommendations, send them to Kingsley at bkingsley@att.net.

A reminder: to request receipt of the next *BASS* as email, contact David Moran at drmoran@aol.com. [Please do this each time, following each issue for the next one, as email addresses change. I can send the issue to you as a pdf file but it is easier to do so as an MS Word doc (and it actually looks and reads better using Word's Print Preview mode). If you do not have Word, note that Word documents display just fine with WordPad, a text editor included with Windows 95 and 98. Let me know either way — DRM.]

I have started to summarize back issues of the *Speaker*. If anyone is interest in doing a year (about 2-3 hours' work), please let me know at dbsystems@ibm.net.

Finally, the BAS CD project is going forward; please send me any suggestions concerning that as well.

Correction

In the last issue's October 1998 meeting writeup was a reference to Dan Banquer's D/A converter, which should have been to his preamplifier.

To the editor

from R.A. Greiner (Madison, Wisconsin)

Thanks for your note about the continued existence of the BAS. It brings back fond memories. I have been retired for six years now and have not been active in the audio community. I now do gardening, traveling, some astronomy and relaxing.

It is with considerable pleasure that I find the BAS to still be fighting on the side of truth, right and justice. ... I do sincerely wish you all the good will and luck that you surely deserve.

[Greiner is emeritus professor of electrical and computer engineering at UWisc-Madison — Eds.]

On the Web!

by Bernard Kingsley and John S. Allen (Massachusetts)

The BAS Web site,

<http://home.att.net/~bostonaudio/>, is targeted toward informing people about the BAS and attracting new members. It provides a membership form and information on upcoming meetings. There are articles and meeting summaries from past issues of the *Speaker*. The site also includes contents and ordering information for back issues, with ToCs from earlier volumes starting to appear.

The site will grow as interest and time allow. Much of the *BASS*'s material for the past several years is in electronic form, and there is a possibility that much of it may go online with access privileges for members. Another possibility is an Internet BAS membership with new issues of the *Speaker* distributed through the site or as email attachments.

The BAS Web site has some graphics for members that can be copied onto your own home page to help publicize the BAS. In addition, you could place a link to the site on your Web page. For these graphics, and links to other sites, look in the **Members Only** section.

Please visit! Email contacts are listed, and your comments and suggestions are welcome:

BostonAudio@att.net or

BostonAudio@geocities.com.

Open Forum

An Almost 2D Speaker; 99.9999% Pure

by David B. Hadaway (New Hampshire)

- May's *Electronics World* reports that NXT has announced a thin (2mm) speaker that can be fitted over a display and produce stereo sound.
- Application Note 67 from Linear Technology (www.linear-tech.com) details "An ultra-pure oscillator" by Dale Eager. This 10kHz circuit was designed as a test source for calibrating 16-bit A/D converters. Its distortion is said to be beyond available measurement capabilities, probably into the parts per billion range, or much less than 0.0001%.

Four-Channel Laserdisc

by David B. Hadaway

In BASS v21n5/6, John Thompson asked about 4-channel laserdiscs. I have a laserdisc from Japan that is partly what he seeks. The performance is of excerpts from Carl Maria von Weber's *Der Freischütz*. On one side the digital tracks are the orchestra and the analog tracks are the chorus and soloists. The other side is a mix of the four tracks to two. As far as I know, it is the only one of its kind.

Dynamic Range of Recordings

by E. Brad Meyer (Massachusetts)

The BASS v22n1 July 1998 meeting summary included my comments that the quietest recording I have measured has a noise floor of -87dBA. This note clarifies some details.

The point I measured in the Telarc Verdi Requiem was the silence with room sound and musicians during the "Mors Stupebit." I used A weighting and the reference level is digital full-scale.

Noise level in an analog system is generally measured from the 3% distortion point, but that point varies quite a bit with different tapes. In the old days, it was about 0VU, which was about 200 nanowebers/meter of flux. Nowadays, the hotter tapes will probably not reach 3% until 6-8dB or even more above the old reference, and the 0VU point is set correspondingly higher. In any case, a digital system's equivalent point would generally be taken to be about -10dBfs, since both systems can transmit brief peaks of 8-10dB above that level.

Tubes: Pretty Good When Transformed

by David B. Hadaway

In BASS v22n1 October 1998 meeting summary, I wrote that a tube circuit *with matching transformer* can have a dynamic range comparable to that of a transistor circuit. Some readers, inferring that tubes were capable of 24-bit dynamic range, questioned my statement. Here are the numbers, based on *Reference Data for Radio Engineers*, 4th edition:

"Low-noise triode amplifiers have noise [equivalent] input resistances of 200 ohms." Assuming a 10kHz bandwidth, the Johnson noise of that equivalent resistor is 0.18 microvolts. If the amplifier has a gain of 20dB (10x), the output noise is 1.8 microvolts. If the output can reach 30Vrms, the ratio of maximum output to noise gives a dynamic range of 144dB — same as 24 bits. FETs (field-effect transistors) have one-third the noise and one-third the voltage swing, so they have the same dynamic range. BJTs (bipolar-junction transistors) have lower voltage noise than FETs but higher current noise, so they might or might not have higher dynamic range, depending on the circuit design.

[At my request, THAT Corp. Engineering VP Gary Hebert, who I knew had measured tubes, amplifies on this interesting subject:

The 12AX7 triodes that I've looked at have equivalent input noise around 10nV/(root Hz) — equivalent to about 6k-ohms. It's the matching transformer that transforms this to about 1.8nV/(root Hz) (200 ohms noise resistance). The 30V swing is real, though THD levels are not as low as we're used to in modern op amp circuits.

Now, there are FETs with EIN voltages around 1nV/(root Hz) (60 ohms). If you were willing to design an output stage to go with it that would accommodate tubelike output swings ($\pm 45V$ — not that difficult with discrete transistors), you would have something with around 150dB dynamic range, without a transformer.

You can do similar things with transistors with even lower equivalent input noise provided you have a very low-impedance source that will benefit from very low voltage noise but won't cause the higher current noise to be a problem.

However, once you get the output of this 150dB pre-amp, what the hell do you do with it? We've increased dynamic range by boosting up the maximum voltage swing, but to interface this to any power amp (almost all of which will be overdriven at >1-2 volts in) will require a very low-impedance attenuator to avoid compromising the noise floor. This means that our fancy high-voltage output stage needs to be able to drive some pretty hefty current as well. Hmm ... seems like we already have a

power amp here. In other words, this needs to be approached from a system point of view.

By the way, trying to attenuate this wide-dynamic-range output enough to drive an A/D converter that runs off of $\pm 5V$ (or $+5V$ only) without running into thermal noise problems seems close to impossible.

Nonetheless: it seems clear that Hadaway should go ahead and make a tweaks-only, **db Systems 150+dB-dynamic-range preamp** ... for the 21st century ... "way digital-ready ... and beyond." After all, we all know that 24/96 is not enough either — DRM.]

Repairing Headphones

by David B. Hadaway

I needed a pair of sealed-back headphones for location monitoring of concert recordings. I didn't want to subject my expensive headphones to the wear and tear of location travel, so I settled on Radio Shack's best, which were on sale.

After a year, one of the plastic cylindrical earpiece pivots broke where it was hollow for the signal wire to pass through. Not willing to throw anything away, I managed to repair it by finding a metal machine screw of about the same diameter, hacksawing a slot in it for the cable, and epoxying it in place with Devcon Plastic Welder.

This worked fine until the headband broke (it is all plastic). I reinforced it with two pieces of coathanger wire and liberally coated it with epoxy.

The cable had no strain relief where it entered the earpiece, so I coated it with Goop (a rubber adhesive) to forestall a failure. [Coathanger, epoxy, Goop: these Radio Shacks must be lookin' good by now — DRM.]

Another pair of headphones of mine, of B&O manufacture, broke at the headband pivot socket. I drilled a hole, slightly larger than the pivot, in a piece of sheet aluminum and epoxied it in place.

Both phones are now working fine and are strengthened in the vulnerable areas. Of course they should have been built that way to start with.

Struggles and Conflicts:

The Business End of American Audio

by David R. Moran (Massachusetts)

Close by the news a while back of Carver Corp.'s continuing woes (stock flopping between a dime and a quarter and the founder back on board, hopefully à la Apple), and then International Jensen's sudden demise, came a release from Polk Audio announcing that they were going private and buying back their shares for \$12. Polk's reasoning was that, with only 100+ shareholders (below their exchange's minimum),

tiny trading volume within a relatively constant range for many years, and with little prospects of major growth despite decent business, it appears not to be much worthwhile to continue as a public company in such a mature industry. Maybe there's some sort of secret merger or buyout in the works. (In terms of fully participating in the roaring '90s stock market, Boston Acoustics — whose symbol, wonderfully provocative for a successful public loudspeaker company, is BOSA — might agree: the stock has risen over seven years from \$12 to a merely respectable \$18.)

And speaking, albeit obliquely, of the majorly dominant Bose Corp., they're suing a competitor again and are again being countersued, and again it's Cambridge SoundWorks, according to inside sources as well as the *Wall Street Journal*. (Five years ago a similar suit was settled through an agreement; you might think veteran Bose legal watchdog Charles Hieken might get tired of such predictable snarling after 30 years of it, but the obnoxious Bose style remains indefatigable.) At the end of last year Bose claimed Henry Kloss's new model 88 table radio violates two Bose patents; CSW says the patents are old technology and unenforceable. Probably forming yet again is the usual long line of eager audio-engineering experts and historians who want, once and for all, to drive the "prior art" stake through Bose patents.

Bose and CSW also each say the other's ads are false and misleading ("first radio to sound like components" vs. "most highly reviewed radio" yada yada). The May *Boston* magazine places these two eponymous principals, both 69, as among the 100 most powerful people in the area and, breathlessly getting it not really right, notes that between them Kloss and Bose have "invented just about every breakthrough in sound systems." I will be measuring and reviewing these two fancy table radios in a future issue.

Bose has always been such a consistent, odd audio company: steadily and hugely successful, market-driven and hence needlessly low-aiming, paranoid and happily self-sealed off from the open audio engineering community, stuffed with authentic high-level talent many of whose product ideas never see the light of day — and contributing almost nothing to the flow of audio's intellectual life.

Commentary and News

by David J. Weinberg (Maryland)

Convergence!

Hachette Filipacchi Magazines has combined *Stereo Review* and *Video* into *Stereo Review's Sound & Vision*. The 180-page, February/March 1999 double issue was the premier edition. Most of the two staffs remain, serving one editorial master, Bob Ankosko. The general features of both magazines remain intact while recognizing the growing merger of sound with video as a major consumer force.

David Ranada's "Get 6.1 Channels Now" tells how to use your 'old' DPL decoder in combination with your new DD unit to implement Dolby 6.1-channel Surround EX without buying new equipment (requires one more speaker and amplifier channel). As one expects from Ranada, it is a clearly written (with diagram) description of a clever solution.

Ranada also wrote "Dolby Digital Dreamin': Rules of Thumb for Choosing a [DD] Surround Sound Receiver for \$1,000 or Less" that includes a table of 35 units from 13 manufacturers. Ranada recommends features to look for, although the availability of some is not listed in the table.

The integration of A/V with PCs has its own column, "Multimedia Maven," edited by Michael Antonoff. One of the items is "Pocket Music," about Diamond Multimedia Systems' Rio PMP300 portable digital MP3 music player. The unit connects to a PC and can store 30 minutes of "CD-quality" 128kbps music in its flash ROM (no moving parts). Additional memory is available. For active music listeners, this is the solution: small, light and no vibration problems.

Change at Lucasfilm THX

In the February *Stereophile Guide to Home Theater* (SGHT), Lawrence B. Johnson reports that Laurie Fincham is THX's new Technical Director. Fincham is a jazz bassist, an engineer, and has designed speakers for Celestion and KEF for a quarter century. "The Fincham era at THX will be delineated by two radical objectives on the home-theater front. One is to reconsider the THX specs in the new day of discrete surround-sound formats. The other is the formulation of a second tier of performance standards, dubbed THX Select" [for midpriced products aimed at home theaters of less than 2000 cubic feet].

Joe Kane Moves On

Joe Kane, NTSC guru and the prime mover behind *A Video Standard* laserdisc and the *Video Essentials* laserdisc and DVD, has set up the Imaging Science Foundation (ISF) sufficiently well to leave it on its own. He has resigned and will henceforth operate under Joe Kane Productions in his pursuit of the best DTV and HDTV for the consumer through consumer education, industry services, and research/testing.

THX Looks to a Video Future for Movies

The April 1999 *Pro Sound News* reports that "Lucasfilm THX has announced a specification for electronic cinema projectors as part of the THX Theater Program." They clearly anticipate the advent of movie theater video supplementing, potentially supplanting, film.

Calibrate Your Video

In the February 1999 *SGHT*, "Utopia Theater: The Science of Images" by Michael Fremer notes "Spending thousands on a new [TV] set and then saving a few hundred by not having it calibrated is just plain dumb." I agree, having seen the difference in image quality when a set is properly set up. From TVs, rear projectors or front projectors, an image can be exciting and very bright as the set comes from the manufacturer (and most dealers), but the stock settings often strain the capabilities and shorten the life of the tube, as well as compromise image quality. In all of the TV and projector reviews I have read, only a handful of sets have come close to being properly calibrated out of the box.

DVD Player Features List

In the v8n1 (January 1999) *Widescreen Review* is an extensive table of DVD player features of current and forthcoming models. The only important parameter missing is the ability to output 0 IRE to facilitate proper black level adjustment.

DVD Player Feature Table

The May 1999 *Sound & Vision* contains an article by Ken Pohlmann on selecting a DVD player, with a table that summarizes the features of available units, including those that can put out a 0-IRE black level.

DIVX Isn't Dead Yet

In the January 8 *This Week in Consumer Electronics* (TWICE; passed out at CES), Greg Tarr reports that Richard Sharp (chairman of DIVX and Circuit City) claimed that 87,000 DIVX DVD players and 535,000

DIVX discs were sold during Q4 1998, with about 70% of the sales during December. Sharp also claimed that DIVX players represent 1/3 of the DVD players sold during that same period. In the January 9 *TWICE*, Greg Tarr reported that CEMA (Consumer Electronics Manufacturers Association) said a total of 1.4 million DVD players have been sold to dealers, 600,000 of them since September 1. The numbers don't compute.

Also in the January 9 *TWICE*, Michelle Abraham (senior analyst, multimedia, Cahners In-Stat Group) expects DIVX players to be about 15% of units shipped in the US during 1999, and predicts that DIVX player sales will grow to about 24% in 2002.

Film-to-Digital Motion Artifacts

In the January and February 1999 issues of *Electronics World* is John Watkinson's two-part series ("Look Again" and "Image Portrayal") about the difference between static and dynamic resolution in film and in film-to-digital-video transfers, particularly when motion is present in the image. He discusses how the eye tracks motion, how that affects perceived resolution, why interlace scanning "has too many drawbacks to be considered in an advanced imaging system," and how this affects the efficiency of MPEG encoding. This is a very thought-provoking piece that also offers suggestions toward maximizing the transferred image quality.

HDTV Glossary

In the May 1999 *Sound & Vision* is a clearly written glossary by David Ranada.

When Will HDTV Make It?

In the January 1999 *Wideband* is Gary Arlen's "High-Res New Year" about the difficulties of getting HDTV to market.

One positive step is the agreement that Time-Warner Cable will carry "HDTV and other digital programming" from CBS-TV-owned stations. The catch is that T-W Cable "operates in only a handful of markets in which CBS owns TV stations — notably New York City — giving the deal less impact than initially touted."

The National Cable TV Association is against must-carry rules for digital terrestrial local channels.

Forrester Research (a consumer research firm) predicts "that less than one million [HDTV] sets will be sold by 2003" and that "HDTV set prices will not fall below \$2000 for at least 10 years," in contrast to the CEMA prediction that "10 million sets will be in U.S. homes by that date" and that "20 million households

currently have TV investments exceeding that level" (whether the home theater audio and source playback system is included in this number is not stated).

Arlen points out that the IEEE-1394 interface copy-protection agreement between the cable TV industry and CEMA is not yet final, and that "independent analysts expect that it will be November [1999] or later until 1394 technology can be widely installed." The MPAA is also reviewing the copy-protection agreement, as they greatly fear illegal copying.

HBO Goes HD

The February 1999 issue of *Broadcasting & Cable's Digital Television* reports that HBO was to begin distribution of HDTV in March. On the HBO HDTV channel, at least 45% of the movies will be in 1080i, growing to at least 60% by the end of the year. They are using the Kodak/Philips Spirit Datacines (the best currently available) for film-to-video transfers. Their flaw is that the transfers are being monitored on \$40,000 35-inch professional monitors, which still do not show up the flaws visible on 6-foot-wide projection screens. The interview/article by editor Ken Kerschbaumer goes into a lot of interesting technical and management details.

DTV Issues

The December 1998 *AudioVideo International* reports that cable TV companies and TV receiver manufacturers have agreed to use FireWire (IEEE-1394) to transfer signals between cable and TV sets. (They still haven't resolved the copy-protection issues.)

It also reports that Matsushita and Philips have announced plans to sell DTV receiver cards for PCs by the end of 1999, and that the FCC has extended the small-dish rules to allow apartment dwellers to use their balconies, patios and other private outdoor areas for dishes. Common-use areas, such as roofs and shared gardens, are still off-limits, as are window sills and exterior walls.

Renters Can Put Up Small Dishes

In the December 1998 issue of the *Transponder*, David Draty reports in more detail on the FCC's amendment to their rule regarding small-satellite dishes to "prohibit restrictions that impair the use of dishes and antennas in rented apartments, homes or other dwellings and adjacent outside property such as balconies, patios, gardens or yards that are exclusively used by the renter"; this still does not include general-use areas such as gardens, roofs or exterior walls. The Building Owners and Managers Associa-

tion is objecting to the ruling as going too far in giving the tenants this right and for expanding the definitions of "leased premises" and "tenants."

The DTV Station Engineers' View

The February 1999 *Digital Television* included the results of their December 1998 editors' telephone survey of 100 DTV station engineers about their stations' migration to DTV. It is not surprising that the great majority had substantially increased budgets for 1999 due to the transition. It is interesting that: by far the largest group (1/3) were using DVCPRO digital ENG equipment; more than half said their stations hadn't decided what H/DTV format (1080i, 720p or 480p) they would use (22% had selected 1080i, 15% had selected 720p); half expected to be broadcasting through the Internet within three years. The most entertaining result was that 85% disagreed with the HDTV format selected by their parent network.

NIST HDTV Broadcast Technology Program

The February 1999 *SMPTE Journal* includes an overview of this program by Christopher Ward and Ray Lowe. Recognizing the many still-non-standardized processes that are involved in the production and broadcast of HDTV, this National Institute of Standards and Technology program is trying to codify techniques that can facilitate workable interconnection among the processes and between facilities. The article presents an excellent sense of the multi-dimensional complexities program producers and broadcasters (including terrestrial, cable and satellite) have to face to bring this "new age" of TV to the people.

Digital TV Starts Slowly

As reported by Greg Tarr in the January 9 *TWICE*, 42 stations began DTV broadcasting by early November 1998; the cable industry is still trying to limit severely the must-carry responsibility for DTV signals, particularly since a terrestrial DTV station could transmit from one HDTV up to five separate SDTV (S = "standard") signals over their channel. Although CEMA and the National Cable Television Association have agreed to use IEEE-1394 as the basis for the interface between cable set-top boxes and DTV sets, copy protection and control details are still being worked out (four copy-protection proposals are under consideration; the 5C system ["5 company": Sony, Hitachi, Matsushita, Intel, Toshiba] and XCA [Extended Conditional Access: Thomson, Zenith] seem to be leading the pack). Multipath is a problem

in DTV reception, too; the federal government has levied a 5% tax on PPV services transmitted by DTV stations; and GUI design and differentiation among DTV stations, cable TV systems, and DTV set manufacturers are being hotly contested. [Remember, when considering DTV equipment, test reports in video magazines show that almost none of them can actually display full 1920 x 1080 resolution, even with interlace scanning. This is particularly true of current pixelated displays — LCD, DMD/DLP, plasma — DJW.]

DTV Channels Conflict with Wireless-Mike Frequencies

In the March 1999 issue of *Systems Contractor News*, Pete Moe wrote "Frequency Conflicts Spell Wireless Mic Headaches" about the interference problems expected by stage groups using wireless microphones, due to the large increase in the use of channels 60-69 (764-806MHz, which includes the frequency range authorized for wireless mike systems) by DTV stations. The FCC Web site www.fcc.gov/oet/dtv/start/dtv2-69.txt lists the DTV channel allocations for the US.

Where Is HDTV Going?

In *Widescreen Review* (v8n2, March 1999), Dale Cripps (editor/publisher of *HDTV Newsletter*; <http://web-star.com/hdtv/hdtvnews.html>) wrote "HDTV Launched; But to Where? With What?", which covers the HDTV presence at the WCES'99, the state of the industry, and the prospectus for H/DTV from various perspectives. This is a very good overview.

Film/Video Aspect Ratios

In the same issue Richard Travis wrote "Watching Movies in the Era of Widescreen Television, Part 5: Fundamentals," which addresses aspect ratios and letterboxing in a more understandable manner than most of the writing on this subject.

Runco's Digital Dawn

Also in the issue, Dale Cripps interviewed Sam Runco, who as founder of Runco International is a leader and innovator in projection video systems.

Video Image Brightness

In the May 1999 *Home Theater* letters, Joseph Calise (president, Sights-n-Sounds, Farmingdale, NY) writes, after reading an article in the December 1996 issue, "According to the SMPTE standards in the article, Don Stewart (of Stewart Filmscreen) helped come

up with the following equation: The ANSI lumen rating of the projector should be divided by the square footage of the screen, then multiplied by the gain of the screen to come up with the footlamberts (brightness)." He goes on to say that 10 footlamberts or more will provide an acceptably bright picture.

CEMA DTV Guide

CEMA and the Harris Corp's DTV Express (the DTV-studio-in-a-truck that's touring the US) provided several informative documents on the state of and prospects for DTV. The *CEMA DTV Guide* (dated January 1999, it is available from www.CEMAcity.org or 703-907-7600) includes lists of HDTV-integrated TV sets, HDTV-ready displays, set-top boxes and active DTV stations, a DTV faq, and several informative articles.

Harris DTV Booklet

Harris has published the *Media Guide to Digital Television* (54 pages), which includes a discussion of DTV, a DTV faq, industry DTV resource guide, and a glossary. I find the guide a little loose with the truth (HDTV does not "deliver movie theater quality images" and a DTV receiver will not "have the same wide screen as a cinema"), and the glossary fair. The contacts directory of equipment manufacturers, networks and involved federal agencies is the only reason to get this booklet.

Philips DTV Booklet (by dummies)

Philips, through IDG Books, has published *DTV for Dummies*, a 50-page booklet that addresses the DTV system in rudimentary terms and is clearly aimed at encouraging acceptance and purchase of DTV. Two errors are the incorrect definition of bandwidth (given as the range a signal can travel [! — DRM]) and their repeated claim that HDTV will deliver cinema-quality images (even 1080i at 1920 x 1080 will not match the image from 35mm film). Available free by calling 888-747-3138; excerpts are at www.philipsusa.com.

Quantel Digital Fact Book

Quantel (www.quantel.com) offers Edition 9 of the *Digital Fact Book*, a 126-page glossary of DTV and digital video terms and facts; this is a very good reference.

Roll Your Own TV Channel

Two companies, Replay Networks and TiVo, offer systems that you can teach, and they can heuristically learn, your viewing preferences, after which they'll

automatically record programs that you can watch whenever you want, within the limitations of local system memory. You can also pause a live show and pick up where you left off, like a VCR's pause. The services will be differentiated in their interface. Replay's high-end box will cost about \$1000, with the mass-market version due out later this year at around \$600, but no service fee. TiVo's set-top box will retail for under \$500, with a monthly fee of \$10. ReplayTV is at www.replaytv.com or 800-266-1301.

Tapeless VCRs

In the May 1999 *Sound & Vision* is Michael Antoff's exploration of the TiVo and ReplayTV systems.

Recording at Home

In the same issue Rich Warren compares "the four best ways to record at home," although he uses only three: cassette, Minidisc and CD-R. He likes the CD-R best and includes a sidebar on some specific PC hardware that is optimum for the task.

Minidisc Survives

The January 1999 *Wideband* includes Will Safer's "Itty-Bitty MiniDisc," which describes the continuing development and marketing of the format by Sony, Sharp, JVC, Maxell and Aiwa. These companies are making it quite clear they aren't going to let MiniDisc die without a fight.

A New Use for CD Cutters

In the May 1999 "Sound & Vision", Christopher Walsh reports on a NYC-based producer/engineer who cut a CD of the noise made by a new next-door business to try to get the noise reduced. With this evidence, the managing agent of the noisy business is finally paying attention, after more than two years.

CD Recording

The January 1999 *Audio Video Interiors* includes Howard Doctor's review of Fostex's \$2200 CR-200 CD Recorder. The article mentions the occasional difficulties of playing back CD-Rs and CD-RWs on many consumer CD players.

Recordable-CD Price Cuts

Joseph Palenchar (January 8 *TWICE*) reports that due to Philips's price cuts, the street price of 74-minute CD-Rs will drop to \$4 and 74-minute CD-RWs will drop almost 50% to \$15.

MP3 Gets Press

WiredNews.com includes a long thread of articles on MP3 that goes back to May 1997. Recent news from it: The surviving members of the Grateful Dead have put outtakes of their latest album on the Web in MP3 and Liquid Audio; IBM has introduced its Madison project (with backing from BMG, EMI, Sony Music, Universal Music and Warner Music), which is supposed to allow record companies distribute music over the Internet while combatting piracy; the RIAA is jumping on Lycos and others for distributing a search engine that can find MP3 files (RIAA and Lycos are now working together to try to prevent piracy using this search engine); hackers have posted software that will allow users to download MP3 files from the Rio player back into a PC, which was supposed to be blocked by the Rio's design.

How Good Is MP3?

David Ranada addresses this question in the April *Sound & Vision*, concluding that if the higher bit-rate MP3 processing is used, the quality is reasonably close to CD, and good enough to challenge the commercial viability of 24/96 recordings.

Mobile MP3

In the May *Sound & Vision* is an item on the \$1000 empegCar mobile MP3 player designed by British engineer Hugh Fiennes (www.empeg.com).

FireWire Audio Product

In the same issue is a news item that SoftAcoustik has announced its SA 2.5 — a system with all the processing and amplifiers in the speakers, which uses IEEE-1394 technology to connect to a PC. The photo caption claims the single FireWire cable is the only thing not shown; however, the power cords are also not shown.

Audio Piracy, MP3, the Internet and Multichannel Audio

The April 1999 *Pro Sound News* (www.prosoundnews.com) has a number of stories addressing these topics:

- "Pirated Audio Software Decreases" on the Internet. Credit is given to the 24-member Copyright Control Services, which has "implemented a firm 'zero tolerance' stance on Internet-based, audio-software piracy" and "has been promoting the message to audio software users to respect copyright ownership for the long-term benefit of their industry." CCS monitors the internet, finds

sites that infringe on copyright, and works to shut them down.

- CD/DVD Anti-Piracy Program: "The International Recording Media Association (IRMA) has announced plans for the world's first anti-piracy certification/compliance program for manufacturers of compact discs and DVDs." This program, modeled after the ISO 9000 standards, is designed to help pressing plants ensure they are not publishing pirated material.
- "MP3 Remodels Labels?" is a short item on the various ways companies are trying to deal with piracy and copyright protection while making money selling music over the Internet.
- MP3 Use Triggers Lawsuits: MP3 has become sufficiently popular that big companies are investing in the technology and "the lawsuits are flying," including a suit by PlayMedia Systems (an MP3 Internet music-technology firm) against Nullsoft (maker of the Winamp MP3 player) over alleged copyright infringement.
- Tracking Music Downloads: www.mp3.com will use Audiosoft's BackOffice e-commerce system to track music downloads for royalty payment determination.
- "DVD-Audio: Signed, Now Sealed" by Terence P. Keegan proclaims the completion of the final piece of the DVD-Audio puzzle — copy protection. "IBM, Intel, Matsushita and Toshiba announced on March 3 a 'content protection framework' for DVD-Audio that the four companies developed together with Warner Music Group, Universal Music Group, BMG, EMI and Sony Entertainment." They presented their solution to the Copy Protection Technical Working Group, which advises the DVD-Forum. Approval is expected, and product is anticipated this fall. Additionally, Sony's SACD has also been finalized, with equipment and discs expected this year.
- DVD Royalties: Philips has announced its intentions to begin collecting royalties on the DVD technology on behalf of itself, Sony and Pioneer. Disc manufacturers are to pay \$10,000, of which \$5000 gets credited against royalties of 54/disc. The royalty on DVD players is 3.5% of net selling price of each unit sold with a minimum of \$5 per player. Philips also intends to collect 0.3 cents per disc for MPEG-2 audio patents held by Philips, IRT and CCETT (Philips claims these patents are critical to use of the Dolby Digital AC-3

audio coding); Dolby Labs questions Philips' right to collect this royalty.

- "Slow Transition to Multichannel Audio": Christopher Walsh wrote this article about the expense and major technology/infrastructure changes for broadcast stations migrating to HDTV. He includes Dolby's NAB convention announcement of Dolby E, "which allows a more convenient — and superior to AC-3 — distribution of surround audio for DTV broadcasters." He also notes that many stations are choosing to pass only the 2-channel audio feed (which might be in Dolby Surround) instead of the 5.1-channel soundtrack, partially because they are not set up to monitor it, and a lot of people "are making what is probably the false assumption that whatever comes from the network will be just fine."
- Dolby E: A short item states that Dolby E can use an existing AES/EBU (digital) pair, or two tracks of a digital VCR, to transmit up to eight discrete channels, easing the transition complexity and expense. Dolby claims that Dolby E can "survive multiple decode/encode cycles without quality degradation" and that the matching of audio with video frames "enables seamless editing and switching in the digital domain" and allows metadata to be carried by the bitstream through the entire process.
- DTV Info Sources: Web sites listed: www.fcc.gov; www.digitaltelevision.com; www.tvbroadcast.com (the electronic format for *Television Broadcast* magazine); www.vidy.com (the electronic publication of *Videography* magazine).

H.E.A.R

The January 1999 *Pro Sound News* reports that H.E.A.R. (hear@hearnet.com), "a grass-roots, non-profit organization that specializes in hearing-loss prevention for musicians and music fans," has received the largest grant (\$30,000) NARAS (the National Academy of Recording Arts and Sciences) has ever awarded, to begin compiling and analyzing the 10 years' data they have collected. They hope to raise \$178,000 to cover all project costs. The results will be made available to the public.

Practice Safe Sound

The same issue includes an ad for HIP (Hearing Is Priceless), "A Program of the House Ear Institute, Los Angeles" (213-483-4431), with an offer of free ear

filters; write them at 2100 W. Third Street, Los Angeles, California 90057.

News from the *Absolute Sound*

It isn't often I find something in this magazine I want to read or feel is worthy of note; exceptions were found in the issue given out at CES:

- In his "Editorial," editor-in-chief Harry Pearson admits: "Granted a few exceptions, the best systems of the early Seventies would be bested by what we consider a system of relatively modest cost today. . . . We want to make the artistry of the best High End designs more democratically available — remember that, as we first defined High End in the pages of this magazine, we did not intend the phrase to become an economic and marketplace category. Quite the opposite, High End was intended to designate the pursuit of excellence in all categories of audio, including those that were determined by size, space and a reasonable price point." This noble definition contradicts what most people consider "high end." [This is an amazing thing for Pearson to write now, I think; even way back then, tweak books like *TAS* largely formed their identity by taking stances which were markedly anti-Japanese and anti-Dynaco/AR et al., meaning almost kneejerk scorn for such high-value/low-cost products) — DRM.]
- Dan Sweeney's "Multi-Channel Music: Silence at the Top" expounds on the growing field of multi-channel recording: "Many people in the recording industry feel that multi-channel is inevitable, and have begun to invest in the basic technology, infrastructure, and applications research. Their efforts to date provide the foundations for the first all-out attempt to reestablish multi-channel music since the death of quad two decades ago" and ". . . today multi-channel is mainstream if not the norm." Sweeney goes into great length on how the industry has changed and what the studios, musicians and engineers are doing toward the inevitability of multi-channel music recordings.
- Andrew Quint wrote a history and complimentary commentary on Richard Kapp's ESS.A.Y Recordings, a company that has managed to make classical recordings popular and profitable.
- Robert E. Greene explains "Why Recorded Music Sounds Too Aggressive But Doesn't Have To": microphones are often placed simply too close to the instruments.

- In "The Fifth Column," John Marks notes that a pair of Shahinian Obelisks has been included in an evolving home stereo system that is now considered "Provisionally Poetic and Acceptable System No. 1."
- Dan Sweeney also wrote "Audio Shows & the Cost of the High End," about the high cost and politics manufacturers endure to attend shows like CES. He creates the perspective of a small startup high-end amplifier company, and steps through the trials and tribulations encountered.

It Was 32 Years Ago Today

In the April 1999 *Pro Sound News*, "The 'Real' Fifth Beatle Remembers" (by Christopher Walsh) synthesizes Sir George Martin's recent presentation reminiscing about the making of *Sgt. Pepper*.

Music on DVD

In the November 1998 *Audio*, Al Griffin wrote "Making the Scene," in which he describes the making of the *James Taylor Live at the Beach Theatre* concert DVD. Griffin monitored every step in the process, from recording the concert in surround sound, through audio mixing the DD 5.1 soundtrack, the MPEG-2 video-compression process, cutting and monitoring the DVD. This is an informative piece about the creation of a DVD by people who care about their work.

More Music on DVD

As reported in the January 8*TWICE*, Chesky Records has released "DVD Super Audio" 24/96 two-channel recordings. Delos International's three DVD-Video titles are in DD5.1 plus a DPL-encoded PCM track; two of these titles use a 448kbps bitstream, and one (the "1812" Overture) has a hidden track at 640kbps that is readable only by the Sony DVD-1000.

Hi-Def Audio

In the January 1999 *Audio Video Interiors* Mark Fleischman's "High-Definition Audio" is about the impending DVD-Audio format. His errors of fact include claiming that the CD sampling rate is 41.5kHz (44.1kHz is the number) and that one of the DVD-Audio sampling rates is 196kHz (192 is the number). He does note that in at least one comparison, of the 16/44.1 CD and the 24/96 DVD releases of Red Rodney's 1957, he "just might have been imagining things — the differences were very subtle."

DVD-Audio Finally Has a Standard

From the February 9 press release, obtained from the Parson's Audio web site:

The DVD Forum announced today that its Steering Committee has approved Version 1.0 of the DVD-Audio Disc specifications, making it the fifth of the DVD format family after DVD-Video, DVD-ROM, DVD-RAM and DVD-R.

Major Characteristics:

DVD-Audio supports a wide range of Digital Audio options. The versatility in music creation practiced by the music industry is accommodated by the following elements:

Available sampling frequencies are 48kHz, 96kHz, 192kHz, as well as 44.1kHz, 88.2kHz, and 176.4kHz. Bit resolution is also widely supported — 16bit, 20bit and 24bit. Up to six channels are available for multi-channel recording, with a maximum transfer rate of 9.6Mbps.

Recording options range from two-channel to multi-channel sound. In two-channel stereo, more than 74 minutes of recording time is possible on a single-sided/single-layer disc, even at the highest-quality mode of 24bit/192kHz. With multi-channel modes, even at 24bit/96kHz, six-channel recording can be included with more than 74 minutes of playback time. The signal is claimed to have an immediate presence, like that of an actual concert hall or an entirely new, high-quality three-dimensional surround sound environment.

Compatibility with the DVD-Video and DVD-ROM formats.

DVD-Audio content recorded in multi-channel mode can also be played back properly on a two-channel stereo system, as intended by studio producers, thanks to the dedicated content producer-directed fold-down capability.

Enriched Added Value Options — The format supports playback of video clips with PCM and/or AC-3 sound with the quality of the DVD-Video format.

Video slide shows can also be included for viewing while listening to the music.

DVD-Audio Discs can contain all kinds of information of interest to music fans, including visual display of liner notes (album title, song titles, artist data, etc.), artist discography, and a URL (uniform resource locator) for access to bonus contents on the Web which, at the content provider's discretion, might or might not be available only for users with certain commands or passwords.

DVD-Audio

In the January 8 *TWICE* Rebecca Day reports that "DVD-Audio Is Expected by End of This Year." However, there are complications. Onkyo Sales VP Ted Green notes that a format war (between the DVD-Audio disc with Meridian's Lossless Packing and the Sony/Philips Super Audio Disc that uses one-bit Direct Stream Digital and includes a second CD-compatible layer) "is a valid concern" but that "there may be a market for both." Denon has a mockup of a unit that can play both formats, but wasn't planning to show it at CES. According to Yamaha national marketing manager Tom Graham, they too have a mockup of a multi-format player "capable of playing CD, DVD Video, DVD Audio, and Super Audio CD" that "could be in stores by late 1999."

In the January 9 *TWICE*, Joseph Palenchar wrote that Warner Music and Universal Music ("the world's biggest music company" following its purchase of Polygram's music business) will release recordings in the DVD-audio format later in 1999. Universal's executive VP Larry Kenswil said that many of their albums have already been mixed for surround sound playback.

DVD-Audio – Too Late?

In *Widescreen Review* (v8n2, Issue 31; March 1999), Jim Taylor (author of *DVD Demystified*) argues that DVD-Audio will mean little to the home theater fan but will succeed because the music industry will promote it to get copy protection.

Meridian Lossless Packing

At CES, Meridian offered a reprint of the Philip De Lancie article from the December 1998 *Mix* magazine on this critical piece of the DVD-Audio version 1.0 specification that was recently approved by the DVD Forum steering committee. (Copy protection is still not settled.) The article provides a description of the process and its effectiveness in offering bit-perfect encode/decode processing. Dolby Laboratories is the exclusive licensee of the MLP technology.

DVD-Audio Copy Prevention

In the May 1999 "Sound & Vision" is a news item that IBM, Matsushita, Toshiba and Intel have jointly developed a 'watermarking' technology that they admit will "likely have audible effects."

DTS vs. DD

In the May 1999 "Sound & Vision" is Ken Pohlmann's discussion of Dolby Digital compared with

DTS. He and David Ranada found that setting up a fair level-matched comparison is almost impossible, and that once they have done their best, the differences in sound quality between the systems is quite small. Ranada claims that differences they heard can easily be attributed to the use of different master recordings or to his "inaccurate compensation for the DD system's dialogue-normalization effect" and that "real differences between DD and DTS encoding would show up as additional noise and distortion underneath the original signal." After testing several DVDs, they also found no discernible difference in video quality between DD and DTS DVDs of the same film.

Calibrate Your Surround Sound

Tom Holman, with James Abbott, Richard Cabot, Don Keele Jr., David Ranada, David Schwind, and David Young involved in test design and implementation, has used mathematics and computer programs to generate a comprehensive set of test signals to facilitate setting up stereo and surround sound systems, plus checking the noise floor of digital audio equipment and the headroom of speakers, with a minimum of test equipment. In fact, for most of these tests, only your ears are needed.

From the press release: "Virtually all the test signals are properly dithered. Extensive testing of the source signals and their integrity throughout the editing, mastering and pressing process was conducted to ensure that the final discs are identical clones of the originally designed signals."

According to the brochure:

Disc 1, *Stereo & Surround Sound System Setup & Test*, can also be used to check headroom vs. frequency of electronics and speakers using a unique boinker test, and permits copying of reference tones to the head of master tapes;

Disc 2, *Digital and Analog Audio Tests*, can be used to check the effects of various types of dither, check DACs for response, monotonicity (by ear), noise floor, etc. and also provides reference tones;

Disc 3, *Acoustic Tests*, can be used to measure background noise with just a sound level meter, a stopwatch and your ears, measure reverberation time by instrument or ear, test for flutter echo with multiple methods, and calibrate sound levels;

Disc 4, *Electroacoustic Tests*, can be used to check the frequency response and headroom (the boinker test) of electronics and speakers, and measure speaker IMD.

The 89-page tome that comes with the set is extremely thorough, and is as much a teaching reference as a user guide.

The discs are available directly from Hollywood Edge (800-292-3755). The set costs \$300; purchased separately, Disc 1 costs \$50 and 2-4 cost \$99 each.

DSP and (Non-Virtual) Reality

At the Third Annual DSP World Spring Design Conference in Santa Clara, California, April 26-28, Tom Holman was slated to give the keynote address on "why advanced digital signal processing (DSP) is critical for design of electronic systems that approach the limits of human perception in simulating reality.... Holman will lead the audience through a set of calculations that measure how many terabits of data a human can perceive both visually and aurally. The required bandwidth will be compared with both the current and future capabilities of audio and video replication. He will also examine the newly proposed DVD-Audio 1.0 specification from a DSP industry perspective" (from the press release). This conference offered 60 educational workshops plus exhibits of the latest products and services for DSP design. Holman also was to demonstrate an experimental 10.2-channel audio system that is probably similar to his multi-channel demonstration at WCES '99.

Digital Radio

The January 1999 *Wideband* has Thomas McKee's "100 Channels of CD-Quality Radio" describing the efforts of CD Radio and XM Satellite Radio to start broadcasting digital music and other digital services primarily for car reception. Pioneer, Sharp and Alpine have agreed to make receivers and adapters (attaching to current car receivers; from under \$200) for XM's service. Each service predicts subscription fees of \$10/month.

Internet Music

In the February 1999 *Stereophile*, Jon Iverson reports that the major record labels are staying away from the MP3 digital compressed music format, "which doesn't offer as many security and pay-per-download options as they'd like." He also wrote that Capitol Records and broadcast.com are joining forces to create an Internet music channel, with free audio and video excerpts from Capitol's new CDs, and that Sony and RealNetworks are offering "the Internet's first pay-per-listen jukebox," which requires the listener to have RealNetworks RealPlayer software.

Film Captioning

The February 1999 *SMPTE Journal* reports that DTS, General Cinema, Universal Pictures, and Paramount Pictures, through the WGBH Motion Picture Access Project, have developed the Rear-Window Captioning System. This system displays reversed captions on a LED text display at the back of the theater. The text is readable, reflected by clear acrylic panels mounted just in front of patrons using the service. DTS delivers additional descriptive narration via infrared or FM transmission to headsets. As with DTS soundtracks, the data are played back from CD-ROMs synchronized to the picture.

How Classical Music Can Be Profitable

In the February 28, 1999, *New York Times Arts & Leisure* section, Allan Kozinn's "Classical Labels Are Profiting but Paying a Price" describes how the major classical-music labels have achieved profitability by cutting staff, artists and projects to the bone, plus by making some strange determinations of what qualifies as classical music. Even well-known conductors have lost their exclusive contracts and now work by project.

Interaural Crosstalk Reference

On the Sursound SIG, Ralph Glasgal (www.ambiophonics.org) noted that Timothy M. Bock and Don B. Keele Jr. authored two very long Audio Engineering Society convention papers ("The Effects of Interaural Crosstalk on Stereo Reproduction," preprints 2420-A and -B), with many graphs of crosstalk frequency responses resulting from combinations of stereo loudspeaker positions, interchannel time differentials, off-center listening positions, etc.

New Stereo Handbook

The March 1999 *Pro Sound News* announced that the second edition of this reference by Ron Streicher and F. Alton Everest (originally published in 1991) "discusses the auditory and technical processes by which the 'stereo illusion' is perceived, recorded and reproduced, and traces the development of stereo" from Clement Ader's work in the late 19th century through surround sound. It is highly regarded by John Eargle, who said, "Psychoacoustical subjects are discussed throughout the book and add an important dimension that is not normally found in recording books.... The book is a pleasure to read, primarily because it relies on graphical explanations rather than mathematical ones." This book is available from Audio Engineering Associates, Pasadena, California (800-798-9127;

www.stereosoundbook.com; \$54.50 postpaid in North America, plus sales tax in California).

Speaker Testing Systems

The American Loudspeaker Manufacturers Association (ALMA) held their spring symposium in Nashville on April 28. Their winter symposium focused on "What to Measure and Why," and this one looked at commercially available measurement systems. ALMA Executive Director Carol Bousquet can be reached at 978-448-5658 or at www.alma.org.

Allison Speaker Replacement Drivers

Speakers don't last forever, so from the current Allison Acoustics I recently acquired two tweeters and two midranges (for the 3-way systems like the CD-9). According to independent tests, they do not match the performance of the originals in frequency response and even the bandwidth covered. So Allison owners should take care of their speakers.

Consumer Electronics Leads Technology Development

In his "From The Editor" in the February 1999 *Systems Contractor News*, David Keene discusses the phenomenon that while many in the world of professional audio and video want to believe that commercial technology leads the consumer world, the recent CES showed clearly that the consumer world often drags the commercial side along. Fred Ampel ("It's Time To Acknowledge Who's Leading Who") and Michael Heiss ("Let the Trade Show Season Begin") expound at length on this trend in the same issue.

Networking Your Car

The Society of Automotive Engineers (SAE) has developed open, non-proprietary serial communications bus specifications for the Intelligent Transportation Systems Data Bus (IDB), a plug-and-play computer bus technology for automobiles that could shorten vehicle design time, allow inclusion of newer technology at a later point in the design cycle, reduce costs, and ease integration of the growing number of electronic systems being installed by both car manufacturer and after-market dealers. This technology supports full transfer of data among any devices on the bus (such as audio systems, GPS, phones, navigation systems, computers), plus automotive system monitoring and control. The use of standard, plug-and-play bus technology simplifies, speeds and reduces the cost of after-market installation. This system would even allow easy upgrade of OEM car sys-

tems through modular swapout. Almost 20 companies — vehicle manufacturers, research labs, auto electronics manufacturers, and others — have been actively involved in this standardization effort. Three vehicles including IDB systems were exhibited at CES: a Chrysler Concorde, a Lincoln Continental, and a Cadillac Seville.

Winter CES

Impressions

CES is getting too large to cover, particularly now that they have added several seminar series, like Digital Hollywood. Even the day before the official start was filled (morning through evening) with press conferences.

The Snell & Wilcox image didn't look nearly as good as I remembered at previous shows. The range of Runco projectors exhibited at their press conference at the Beach (across from the Convention Center) displayed the most impressive images I saw at CES.

Video-scan multipliers that can be set to the display's natural optimum scan characteristics are becoming more prevalent. Joe Kane has long been a strong proponent of this concept.

The inclusion of CD players in receivers is a new trend recognizing that the CD has become the consumer's primary source of recorded music.

The mini-system is becoming more upscale as major component manufacturers announce complete-system products.

Digital Hollywood

The Transponder of December 1998 reports on this 4-day series of classes, workshops, seminars, and exhibits aimed at the growing convergence of entertainment and computer technology.

FireWire

The same issue includes a description of Digital Harmony's 1394 Pavilion exhibit of the FireWire integration of more than 20 companies' products.

DD Receiver Prices Drop Dramatically

Several companies showed DD receivers under \$1000. Denon has the AVR-1600 at \$300 that includes: 24/96 DACs; DD, DPL and six surround modes; three video and four audio inputs (including phono); a 6-analog-channel input; five channels at 60 W each (load, bandwidth, and distortion not specified), and remote control.

Harman Kardon

HK exhibited its Take Control, which was developed in conjunction with Microsoft. It claims to be "designed to work the way people think" (in direct contrast to my findings with any Microsoft product).

HK also showed their new A/V receivers. The three DD5.1 models (AVR35 \$700; AVR45 \$900; and AVR65 \$1200) offer reasonable power into all five channels (40, 55 and 65 W into 8 ohms, 20-20k Hz) and remote control. The AVR45 and AVR65 offer a 6-channel analog input set; the AVR65 includes DTS decoding.

Lexicon's New HT DSPs

Lexicon showed the new MC-1 preamp/processor (\$5995) that includes DD and DTS, has two RS232c ports for integration into home automation, supports digital dubbing, and boasts 24/96 DACs. It is undergoing THX Ultra certification.

Lexicon also has announced the DC-2. Like the DC-1, it comes in three flavors: DC-1/THX (\$2495), +AC-3 (\$3495), and +DTS (\$3995). The remote control and menu tree have been dramatically improved.

Pioneer

Pioneer's new A/V receiver line is headed by the VSX-D608 (\$550) that includes DD5.1/DPL and DTS decoding, additional surround modes, 100 W (each of five channels into 8 ohms, @1kHz), a 6-channel analog input set, S-video on all five inputs, four digital inputs. Their lowest-priced DD5.1 receiver is the VSX-D498 (\$380) comes with 70 W/ch (specked the same).

Pioneer also announced a 301-CD "Giga" PDF-1007 changer (\$475), the PD-R555RW CD Recorder (\$835) for both CD-Rs and CD-RWs, and the MJ-D508 Mini-Disc recorder (\$375).

Sharp

Sharp introduced the DV-A1000U "Amphitheater in a Box," a DVD player with built-in 240-watt receiver, DD5.1 decoding, five speakers and a powered sub-woofer, as a package for about \$1000.

Sharp offers several Minidisc units, including the MD-C2 Mini System (\$500) that boasts a 3-CD changer, a 3-Minidisc changer, a one-touch 3-CD to 3-MD dubbing feature and a 50 W/ch stereo amplifier.

Sherwood

Sherwood's non-premium line is topped by the RVD-9090R A/V receiver (\$700) including DD5.1, DPL, DTS, 100 W into each of five channels @8 ohms, a 6-analog-channel input set, four digital inputs (two coax, two optical) and a preprogrammed universal

remote. The RVD-7090R (\$450) receiver is similar but without DTS. The RVD-6090R (\$350) is similar to the 7090R but 60 W/ch.

Yamaha

Yamaha offers DD5.1 receivers from \$400 (RX-V495) through \$1000 (RX-V995). They also announced a minisystem consisting of CD player, receiver and two speakers for \$500, plus optional Minidisc recorder (\$350) and cassette deck (\$200).

Thomson

Thomson showed the DTC-100 combination DirecTV/USSB and terrestrial DTV tuner (\$650). This unit offers S-VGA, S-Video and composite video outputs (no component video outputs), optical digital and analog audio outputs; processes MPEG-2 video; and provides DD5.1 and DPL audio processing.

Zenith

Zenith showed their IQADTV1W HDTV receiver/decoder (\$6000), which claims to provide 1920 x 1080 resolution through an RGB output for front projectors and certain professional and computer monitors. (Zenith's Web site currently notes that while they are in chapter 11 restructuring, they are still in business and have no intention of getting out of it.)

Boston Acoustics

BA exhibited the DigitalTheater 6000, a complete DD5.1 fully powered 6-speaker system in quite small packages for an amazing \$600. The center-channel box houses the central processor and input selector (two analog and two digital inputs), plus status indicators. The amplifiers for all channels are in the woofer module; each amp is equalized for its channel. The included remote control holds codes for hundreds of TVs, VCRs and cable boxes. Under typically difficult show conditions, this system sounded quite good. For small rooms and apartments, it should be seriously considered.

BA showed further the Digital Media Theater (\$300), a 3-piece fully powered system that offers S/PDIF input (cable included), DD5.1 decoding, and Virtual Dolby Surround processing. Optional surround speakers (\$50/pair) are available that automatically defeat the virtual processing. Clearly this is aimed at the PC-based DVD/game/DTV market.

BA also offers new models in their designer series of flush-mount speakers, including a home theater diffuse surround model, and in their ProSeries car speaker series.

Receivers Include Players

HK was one of the companies showing receivers that have built-in CD players or changers. HK's two models include a 7-CD changer, AM/FM tuner, DPL, and other typical features. The HK Festival 80 (\$2200) has five satellite speakers plus subwoofer; the Festival 60 (\$1400) has two speakers. NAD offers their L40 CD Receiver at \$600, or with a pair of PSB Alpha Mini Speakers as the "NAD Music System" for \$800.

The Klipschorn Is 50

Celebrating that the Klipschorn is the only home entertainment product model that has remained essentially the same, and commercially viable, for 50 years, Paul W. Klipsch was at CES demonstrating the beautifully finished Klipschorn Jubilee, engineered with only slight modifications to the original design. It is a two-way system (they claim the new compression tweeter extends the frequency response sufficiently to avoid the need for a super tweeter) that includes its own corner, so it can also be used as a center channel. They will sell for about \$12,000-15,000/pair.

Koss

Koss has introduced "The Plug" — earbud in-ear audiophile headphones that incorporate viscoelastic foam earplugs (like the E.A.R. plugs) for a tight, secure ear seal with a central tubular port to transmit the sound into the ear canal. At only \$20 and with a lifetime no-questions-asked warranty, these sound pretty good, and effectively address the need for a tight ear seal for decent, power-efficient bass. There is a mute button on the cord to allow conversation without having to stop playback.

Their one problem is that when rolled between the fingers, the foam earpiece doesn't stay compressed long enough to get it into the ear. I have not yet heard of a solution from Koss. I have temporarily replaced the Koss-supplied foam pieces with E.A.R. plugs (poking a hole through their centers), which work fine.

Maxell Expands

Maxell is getting into noise-cancellation headphones by co-branding with NCTI on the Noisebuster label.

NAD

In light of the deletion of the phono stage from most recent receivers, NAD is offering the PP-1

phono preamplifier, which plugs into a preamp/receiver's line-level input.

Panasonic

Panasonic was one of the companies showing portable CD players with 40 seconds of digital memory to eliminate skipping from anything short of a shuttle liftoff, and the prices are quite reasonable; for example, the SL-S361C at \$140 includes 40-second memory and a complete car kit, plus it is claimed to run for 25 hours on two AA batteries. They further displayed everything from flat-and plasma-screen DTVs through SOHO devices. They are also one of the companies showing bright, multi-colored automotive front-end displays, which still reflect too much light to be easily readable under bright-daylight conditions.

Sony

Sony exhibited a prototype Super Audio CD player. They also showed several Minidisc units, including in-dash and car changer systems. Their MDR-DS5000 infrared-linked wireless headphones include Virtual Dolby Digital processing; \$500. A weakness is the use of nicad batteries (included), which have memory problems affecting how long each charge lasts and how many times they can be recharged. Two AA batteries can also be used.

Liquid Audio

Liquid Audio is one of the companies preparing to help others make money from Internet-based pay-per-download music distribution. They offer server software and free Liquid Audio Player software that allows consumers to create their own playlists and purchase music via download. Twin/Tone and BMG each use Liquid Audio. Consumers can also use the RealNetworks G2 player software. Liquid Audio Player supports creation of compilation CDs on a PC from the downloaded, and reportedly uses a proprietary encoding and encryption scheme.

The Home Entertainment Show

Not all manufacturers want to spend the money to participate in CES, but most do want to take advantage of the congregation of potential dealers and the press. Mike Maloney and Todd Brown have put together T.H.E. Show: www.theshow2000.com is about next year's; this year's was held at the St. Tropez Hotel (next to the Alexis Park Hotel, site of the official CES High End Audio exhibits). T.H.E. Show guidebook listed 154 companies. Poh Ser Hsu exhibited his new subwoofers there.

Cheap Tuner, Best Buy

by Bernard Kingsley (Massachusetts)

For whatever reason, tuners seem to have become an afterthought — one or two chips thrown into a receiver; add a transformer for a separate “tuner.” You’d think they could make a really good tuner with today’s chip sets, but for the most part they don’t.

With portable equipment it’s even worse. Most portable CD players assume you don’t want a tuner, and the combo cassette/tuner units put the emphasis on the cassette. There are a few portable tuners around (perhaps they should be called portable radios, which is what they are), but these seem to have inherited the chips from the cassette/tuner things.

Therefore it is with surprise and pleasure that I report on a portable model that actually deserves to be called “tuner” — good news for anyone who likes radio on-the-go, whether talk or classical.

The Sangean DT-110 (street price around \$50; bought at C. C. Crane, www.cccrane.com) is a digital FM/AM unit measuring about 3.7” x 2.4” x 0.8” (95 x 60 x 20 mm), so it easily fits into a shirt pocket. Sangean doesn’t offer much performance data, but the specified 32-ohm earphone impedance suggests it will work with most headphones (see below). For the feature-oriented, it comes with digital readouts, lots of memory settings, a 90-minute timer (handy for battery conservation), preset and normal scanning, and a bass-boost switch. It runs on two AAA batteries (not included). Particularly handy is the Priority switch that lets you quickly scan your three favorite stations (be they FM, AM or mixed). A lock switch disallows all changes except for the volume control; this switch is quite nice, since the band and tuning buttons require only the slightest touch and it is all too easy to change a station setting inadvertently.

The operator’s manual was well-translated from its original language, although a grammar checker might have prevented mention of “week” batteries.

The supplied headphones (actually, those earplug things) are not all that great. I recommend you toss them even if you are one of the rare individuals who find them comfortable. The earphones were clearly the afterthought, plus maybe the plastic “case” that has a sort-of belt strap.

The unit is well-built and withstood a few unintentional drop tests.

I checked out the DT-110 with several headphones including a \$30 Sony, a \$50 JVC and a \$100 Grado.

The three major aspects of a tuner were all carefully considered in designing this unit, for both FM

and AM. The DT-110 is sensitive enough to snap stations right out of the ozone. Stations I normally hear only after driving 50 miles closer come in clear as a bell. Sensitivity is very good on FM and good on AM. I was able to tune to four FM public radio stations separately that are fairly close together on the dial.

The FM stereo threshold seems a bit high. In some cases I knew the station was broadcasting stereo even though the DT-110 offered me mono, but that is a fair tradeoff for reduced noise and wide frequency response. On stereo signals, separation is very good, making me think they don’t use a high-blend circuit.

AM is a bit less selective, but the AM tuner is more noise-resistant than most I have heard in recent years. The listenable signals generally lack the annoying whining and hissing we are getting used to from AM.

The bass boost acts like a “loudness” control at low levels but boosts a bit too much at higher levels, where you can turn it off and listen to a remarkably smooth response including solid bass. This is particularly evident on the Grado headphones, which manage to handle bass without undue emphasis. High frequencies are crisp on all of the headphones.

While a tuner this small can’t have much of an amp, the DT-110 reminds us that headphones are generally efficient. Even on the least efficient ones (the Grado), I am able to play at more than satisfying volume without any evidence of clipping or other distortion.

I was sufficiently impressed to try out this little radio as a tuner in my current hifi systems. The headphone output works quite well into my receiver’s Aux input. Remember to keep the level fairly low and keep in mind that the headphone cord also serves as the FM antenna. The AM section slightly beat the AM in two of my systems. The DT-110 wasn’t quite as successful competing with my component FM tuners, but did a fair job.

Of course, that kind of comparison is unfair. The DT-110 should be compared with other portable radios and combination cassette/radios. In that market, it clearly holds it own; indeed, comparison listening tests with a Sony Walkman (about \$50), a Panasonic Walkman (about \$100) and a Sony FM/AM tuner (\$40) showed the Sangean to be superior.

If you are looking for good FM performance and, even rarer these days, good AM performance, you have found your unit. For a reasonably priced high-quality AM/FM personal portable, the Sangean DT-110 is probably one of the best on the market and clearly a best buy.

Southern Discomfort

by Bernard Kingsley

Lest you think that hifi arrogance has come and gone, let me clue you in: it's alive and well in, of all places, North Carolina.

Not long ago, during a brief vacation, my son and I were shopping around for amps. Robert has come to appreciate music as much as I and had recently plunked down ten big ones for new B&W 801s. Looking for high-end amps seemed reasonable.

We found an interesting-looking, out-of-the-way store that features the famed McIntosh brand, appropriately relegated to a small, rear demonstration room. After a while we found a McIntosh tube amp that appealed to us, and waited for a salesman.

Eventually someone ambled our way, looked us over, tapped on the McIntosh and said: "We only demonstrate these amps by appointment."

I paused, looked around the showroom and noted that the entire place was occupied by only one other individual: a teenage sales clerk behind the front counter reading *Stereophile*. Clearly we were graced with the presence of the senior salesperson, perhaps even the proprietor.

During the ensuing silence this "senior" apparently grasped the absurdity of the situation and shifted gears. "Well, we're not too busy right now, so I guess I could do it, but you need to know we charge \$150 to audition this amp. If you like it, the \$150 gets applied to the price of the amp; if not, we just write it up as a listening charge."

As the guy studied us I suddenly realized the problem: Robert and I were both wearing jeans. If you wear jeans you couldn't possibly afford a McIntosh amp! Guys in 10-year-old \$80 polyester suits know this kind of thing!

"How come you charge so much?" innocent son asked.

"Well, these things wear out fast. It's kind of like tires on cars. Tubes last for so long and then they are worn out and worthless. That's the way it is with this amp."

I could tell this guy would never demonstrate the McIntosh to us. Fortunately for us, we had just decided we would never want to hear one — at least not there.

An Experimental Classical Recording Using Three Separate Surround Miking Systems

by David Moulton (Massachusetts)

On January 10, 1999, I took part in an experimental orchestral recording of the Boston Classical Orchestra at a Faneuil Hall concert. We recorded the orchestra with three different surround setups as part of a combined Boston-AES and Acoustical Society project.

Instigated and organized by Richard Campbell of Bang-Campbell Associates, and with the kind assistance of Eric Reuter of Worcester Polytechnic Institute and Cavanaugh Tocci Associates, Mike Breault of Digital Media Services, and Mike Godfrey of Rising Sun Productions, Toronto, we rigged three separate overhead arrays, and ran everything through a Mackie console into a pair of synchronized Tascam DA-38 digital 8-track recorders. The microphone setups included a quad (actually quint) spaced array and two different coincident arrays. These were recorded on 16 channels of digital multitrack with no intervening signal processing.

The Quint Spaced Array

The quad/quint spaced array consisted of four Earthworks omni microphones hung in a trapezoidal pattern about 12 feet up, with the front pair approximately six feet apart and just above the first row of the audience, while the rear pair was about 15 feet farther back and 12 feet apart. A fifth microphone, a cardioid, was aimed at the ceiling from above and behind the rear array, actually located on the eagle at the center of the rear balcony rail.

The Double X-Y Array

One coincident array was a purely experimental microphone array built by acoustician Richard Campbell. It consisted of four Audio-Technica cardioid capsules placed at 90° to each other. This mike was oriented in a classic XY configuration, forming what might be reasonably described as "double XY" (with apologies to Curt Wittig and Neil Muncy, inventors of the "Double MS" microphone configuration). Capsules faced 45° left and right and 45° left rear and right rear. This mike system was suspended nine feet up and approximately six feet behind the podium.

A New 6.1 Channel Surround Microphone, Designed for Film Work

The final mike was a prototype developed by Michael Godfrey, working with George Wong of Canada's National Research Council. This microphone is designed for location film work, complete with battery power and seven channels of wireless transmission to the recorder position. Godfrey intends it for use on location sets and for recording surround SFX and Foley. It is actually suitable for a broader range of applications.

Six Sennheiser capsules are mounted on the dummy head (made out of hard black glossy plastic, it actually looks more like an alien from a late-'40s sci-fi movie than the typical dummy head we've come to know and love) to pick up left, center, right, left rear, right rear and overhead. In addition, a seventh capsule inside picks up low frequencies omnidirectionally.

This mike was hung about seven feet up and 10 feet behind the conductor.

With these mikes in place, we recorded directly to tape, warts 'n' all.

Conductor Steven Lipsitt conducted a program including Mozart's Overture to the *Marriage of Figaro*, an Alfred Schnittke work for string orchestra (with some interesting stage movements by the players), Haydn's Trumpet Concerto (Stephen Burns, soloist) and his *London Symphony*. The house was full, making the sound slightly dry. The playing was generally excellent in both ensemble and intonation. No major calamities occurred, just the usual coughs, rustles, and urban grunge.

I've had a good listen to the tracks, and all three recorded versions sound decent, if a little too dry (God bless digital reverb!). And they all sound quite different from one another. There is a fair amount of insight to be gleaned from this little exercise.

Two Schools of Thought About Surround Miking

There are two general ways to think about surround miking.

On the one hand, we can treat the microphones as a spaced array so that during playback we sort of "listen within the space" recorded by the microphones.

On the other hand, we can treat the microphones as a coincident array, like a dummy head, so that during playback we listen to what the hall sounded like from a particular point in space, or "listen inside our head."

Both views have some merit and both present some problems. Fortunately, the views aren't mutually ex-

clusive, and it is possible to make very successful surround recordings including elements of both techniques.

When we use spaced techniques, in very general terms, the playback space becomes sort of a miniature hall and as we move about in it, our perspective shifts from increasingly dry to increasingly reverberant, just as in a real concert hall when we move toward and away from the stage. Meanwhile, localization is a little vague, and we get little sense of any sounds originating from "within" the array of playback speakers.

When we record with a coincident array, we get a more specific, highly defined illusion that is primarily detected from a very specific point in space (the "sweet" spot). That illusion includes comparatively sharply delineated acoustic sources and ambiences, as well as a clear sense of being at a particular vantage point in the hall.

Both illusions are fun. Both can be extremely satisfying musically. But the sensations they provide are quite different. However, keep in mind that we still have much to learn, which leads us to how these different arrays sound in direct comparison.

The Sound of the Spaced Array

At first listening, the spaced array was the most spacious and entertaining version. The surrounds were rich and gave a strong sense of the hall. The orchestral timbres were very true to life, and the general orchestral ensemble sounded both lifelike and spacious. There was decent envelopment (the term David Griesinger has coined to describe our sense of being "in" the soundfield created by the recorded ensemble, as opposed to perceiving that soundfield as being in front of us), and a generally satisfying sense of spaciousness and involvement with the recorded event.

It's not perfect, however, and over time, a number of annoying flaws made themselves known. First, the lack of precise localization began to get a little obvious, and the entertaining wash of spaciousness began to be supplemented by a sense of a non-orchestral vagueness, which is to say that the orchestral image wasn't all that solid. Further, the highly directional characteristic of the trumpet soloist made the level of the trumpet sound a little louder in the rear mikes than it was in the front mikes. To make it worse, the off-axis sound quality of the trumpet in the front mikes made them sound comparatively reverberant. This resulted in a sense of "trumpet everywhere" rather than a point source. On the plus side, the

string soloists sounded quite decent in the front mikes, with their strong upward HF radiation.

Solutions for these problems lie with the inclusion of a center mike (we just ran out of omnis, plain and simple), plus placing the left and right mikes closer together, and possibly moving the rear mikes significantly farther back in the hall.

The Double-XY

When I switched from listening to the spaced-omni array to the coincident Double-XY, the sound immediately moved toward the front of the playback room. The sense of hall became a lot less obvious, although a similar sense of soundfield collapse occurred when the surround channels were muted. The general orchestral timbre and presence were quite good. The trumpet soloist was obviously a phantom image. The hall sound (too dry in fact) sounded too dry, and cried out for reverb in a way that the spaced omnis didn't. (When I sent a quick stereo rough mix to the orchestra, I added a fair amount of reverb just for this reason.)

In short, the Double XY was adequate but underwhelming in this application. In other chamber music recordings I have heard that used this mike, it works quite well, and has the virtue of simplicity and straightforwardness. The biggest technical problem with it is that it doesn't solve the center channel anomaly.

Mike Godfrey's 7-Channel Prototype Mike

Switching to Mike Godfrey's 7-channel microphone, the difference was quite striking, and remains so with repeated listening. The left-center-right spread was really excellent, and the Sennheiser capsules did a very nice job of resolving the soundfield. The result was a sense of engagement that grew stronger over time, an almost "itchy" sense of awareness of the orchestra and hall. The rear channels were too dry, as expected (can't blame the mike for this!). The soloists (especially the trumpet) had a wonderful crackling sense of presence and solidity, and the sense of solid placement of instruments in the orchestra was superb. A really enjoyable and effective listening experience. Some listeners may find it a little bright, as it is placed comparatively close to the orchestra, due to the size of the hall.

Comment

All of these configurations work, and all have both virtues and vices. The Godfrey mike yielded the best raw results in this case, but that wouldn't necessarily always be so. Further, some of the virtues of the God-

frey mike lie in the musical quality of its capsules, not in its configuration.

When I began to fool around with the playback mix, I found the recording got a whole lot better when I mixed the spaced-omni rear channels with the Godfrey mike tracks. And things got better yet when I added approximately 40ms delay to the Godfrey rear channels and 60ms to the omnis. This made the hall open up with considerable richness and sense of place. Some additional reverb wouldn't be bad, mind you, but the sound wasn't uncomfortably dry anymore, and little sonic incidents (a cough in the right hand balcony, a dropped pencil or something on stage that rolled a couple of inches, etc.) were palpable in their sense of realism.

Another point worth noting is that the overhead channel continues to impress. In all of the playback arrays, I included an overhead channel. It rewarded me with added richness of sound and integration of spaciousness. Maybe you can live without it, but now that I've got it, I'll never go back.

The point of all this is that there is no single right way to do this stuff. Depending on your needs, different qualities can be extracted using different techniques, and fortunately those techniques aren't mutually exclusive. As we build up a surround recording discography and literature, and a body of recording practice, these techniques will begin to shake out a little.

However, as I continue to gain listening experience and exposure to an increasing range of surround recordings, it has become clear that much of the playback experience lies in the listener's hands. I'm beginning to find, for instance, that each recording calls for its own setting of surround and LFE channel levels, depending on the playback setup, the predisposition of the listener(s) and their positions in the playback space, in addition to the approach of the producer and recording engineer. It's a much more interactive and involving experience than stereo has been, at least to my ears.

Copyright 1999; all rights reserved. This article was drawn from two pieces written for TV Technology magazine. For information on the 6.1-channel microphone, contact Mike Godfrey, Rising Sun Productions, Toronto, Ontario, Canada (416-504-5953).

January 1999 meeting: Winter CES

by David Hadaway

In Open Forum David Hadaway discussed ongoing promotional efforts, and also suggested having an occasional meeting on Saturday at 1 pm to attract members who are busy on Sunday evenings (one of our biggest recent turnouts was for the B&W meeting on a Saturday).

Lou Souther brought a Zenith table radio (made in China) similar in appearance to the Bose and the Cambridge SoundWorks models but selling for considerably less than either — about \$70. A BAS member has a schematic for this model, so he can make changes to it. Someone suggested we have a mini-clinic comparing these three products.

Souther also brought a portable clock that resets itself by monitoring the 60kHz time signal transmissions from Boulder, Colorado. [I bought one a few years back and returned it because it was unable to pick up a signal — DBH] The transmitter's power has been increased, making reception more reliable.

David Moran had read in the *Wall Street Journal* that International Jensen had gone out of business, not long after their meeting writeup appeared in the *Speaker* [one trusts there is no correlation — DJW].

Ira Leonard clarified some information on noise exposure. He has been quoting a safe level limit of 75dBA, which is for an 8-hour period and assumes the remaining 16 hours will be below 60dBA. That gives an equivalent of under 70dBA continuous noise level.

Moran brought up the really unpleasant frying and burbling noises that had been afflicting WCRB (audible from southern New Hampshire during their live BSO broadcasts — DBH). It is interference from the SCA carrier (lucrative Muzak-style audio for businesses), aggravated by new tower height (+230 feet) and placement. He sent email to WCRB's Web site (whose engineer, Rob Landry, has an extremely good essay there on FM reception and making coax-wire cable traps for signal overload problems), and Landry replied they were working on it. Recent listening to CRB shows him to be an engineer of his word, as the frying-bacon sounds are now quite gone. (The Web site says that FM is capable of near-CD quality. This is probably true, but that has nothing to do with the typical FM station's heavily compressed signal. At least CRB relaxes its compression for the BSO broad-

casts, and it has sounded good. The Friday BSO broadcasts on WGBH have been very good — DBH.)

John F. Allen has long been dissatisfied with the close miking of the orchestra. He recently found out that, contrary to general belief, the Boston Symphony has no policy regarding microphone positioning. WCRB always moves the mikes closer. Micha Schattner thought they did so because the compression that WCRB uses tends to enhance the ambience to the point of muddying up the sound. Allen feels there is potential for improved sound, with more of the ambience of Symphony Hall, at least on WGBH.

Member Lenny Plotkin, a holdout against DVD, has capitulated and now considers it better than laser-disc. He bought the Pioneer DV-414, which got excellent reviews that said it was one of the few that got the PLUGE (the reproduction of black level) correct and that "cross-color" artifacts were invisible.

Brad Meyer said Philips has announced a DVD player listing for \$299, and on a 32-inch TV [with composite or S-Video inputs] all players look pretty much the same [if the monitors are set up properly, differences would be a bit easier to see — DJW].

Joel Cohen said he started out with a heavy bias against DVD because of Macrovision (a widely used copy-protection scheme). On videotape its intensity is limited by the medium. In DVD there is a flag that switches on a Macrovision signal generated by the player, so it can be of much higher intensity. Faroudja had to redesign their line doubler to handle it. Older Sony projectors were incapable of handling it. It was really messy. Cohen finally embraced DVD because of the 10-bit video signal (allowing 60dB s/n, very good for video) and the wider color bandwidth. NTSC limits R-Y to 1.5MHz and B-Y to a little over 0.5MHz. In DVD, the color signals are half the luminance bandwidth — almost 3.4MHz. You see the benefit in adjacent colors, which don't bleed into each other, and in much higher color detail.

Meyer connected his DVD player to a friend's combined VCR/TV. The signal goes through the VCR electronics and it was unwatchable. DVD manufacturers have completely written off that rather large market.

Q. Are all discs encoded [with Macrovision]?

A. Almost all, with exception of a few documentaries and short films. It's an optional flag on the disc.

Q. What is Macrovision?

A. Cohen: Pulses of varying amplitude are put in the vertical retrace interval. Video AGC circuits respond and make the picture brighter and dimmer based on these signal levels. TV sets (and Beta VCRs) usually aren't affected. VCR AGC circuits seem to be

more aggressive and are much more sensitive to the level changes.

In DVD, they allowed for another copy-protection system that is so destructive most discs don't use it. It reversed the phase of the color burst every five lines. In spite of all this, Macrovision stock is skyrocketing because their royalties are so high [and because of the film and video industries' paranoid thinking that everyone wants to pirate their software for profit — DJW].

Hadaway reported reading in *TV Technology* about a studio demonstration of high-definition television at a studio facility of the Challenger Space Shuttle liftoff, which took place on October 29, 1998. The reporter noticed that the sound was out of synch with the picture. At a second monitor in the same facility the sound was out of synch with the first one! New technology, new problems.

In the *New York Times* there was a long article about MP3, the compressed audio format used to download free music from the Internet. An individual was selling an MP3 compilation of 26 Beatles CDs on one CD-ROM. The RIAA sued and forced him to quit. There was only one sentence about sound quality: "Since it is digital, it is an exact replica of the original." This shows the level of audio reporting in the *Times*. When the music is encoded in the MP3 format there can be different compression rates, but the above-mentioned release pretty much has to have been made at 64kbps, which is 20:1; at that data rate there is no music signal above about 8kHz. Hadaway wasn't the only one to be annoyed by this article. Michael Fremer, editor of the *Tracking Angle* magazine, wrote to the *Times* that "When we are trying to make an improved CD we don't need misinformation like that."

A subsequent letter to the *Times* stated that in blind tests the MP3 copy of a song was indistinguishable from the CD; "the music industry has good reason to be quaking in its boots." E. Brad Meyer said he planned to run double-blind tests in a few weeks. [A medium with flat FR but limited to 8kHz is going to sound just fine for all kinds of ≤ Beatles-era pop and rock recordings — DRM.]

A record company was reportedly upset when one of its bands gave away some of its songs on the Internet. The band is known for savvy marketing, and in the process harvested a database of 10,000 email addresses that they then used for selling T-shirts, albums, etc.

Feature: 1999 Winter CES

Reports were given by Phyllis Eliasberg, Alvin Foster, Ira Leonard, E. Brad Meyer, and Stephen Owades.

The scale of hotel construction in Las Vegas is hard to imagine. The Venetian will have canals with gondolas, 6000 rooms, and a full-scale replica of the Piazza San Marco. New York, New York [while the name is redundant, when you see the outside, it's superfluous — DJW] looks as if most of the buildings in New York went through the machine from *The Fly* — all half scale, crammed together, with a roller coaster above. The Parisian is building the Eiffel Tower in 2/3 scale. Then there's the Arc de Triomphe.

Meyer talked about the danger of format-shifting: asking the public to buy the same music a third time in a new format [for some, a fourth time — DBH]. DVD-Audio is potentially such a case. Meyer attended a meeting chaired by Michael Riggs and featuring the two competing incompatible formats: DVD Audio (which uses MLP, a lossless compression scheme designed by Meridian's Bob Stuart) and Super Audio CD (promoted by Sony & Philips, and using Sony's Direct Stream Digital 1-bit system). Meyer pointed out that the record manufacturers need a higher-bit format to use up the extra bits in any DVD-based audio format, because otherwise there is too much playing time on the disc. The high-end community supports the idea, having bought into the unfounded notion that CD sound is flawed, and audio engineers like it because it gives them a new [and old] toy to play with — multi-channel sound.

MLP relies on compression technology similar in effect to PkZip: it reduces the size of the stored file, but delivers a bit-perfect copy of the original upon expansion. The degree of compression is dependent on the absence of noise and the bandwidth of the signal. Meridian expects MLP to reduce bandwidth (which translates into read/write bit rates) by 38-52%, and extend the duration of the material that can be put on the DVD. Meyer pointed out that MLP achieves much of its reduction by sensing when there is no signal above 20kHz, which is true virtually all of the time with musical signals, and deciding not to encode the higher frequencies. In other words, it gets rid of most of the needless overhead created by unnecessarily high sampling rates in the first place. It can work with word sizes of 16-24 bits and data rates of 32-192kHz. The sound, reportedly, is just fine.

After the CES meeting, Meyer and Peter Aczel got in a long discussion with a marketing engineer from Sony, who claimed that in ordinary 16/44.1 digital

“something was being lost between the samples.” Bob Stuart, who was standing nearby, jumped into the fray. He was asked: “Is anything being lost between the samples?” “Of course not, if you dither properly.” “Do you have double-blind tests that show 44.1 is inadequate?” the Sony man was asked. “Yes, but they are company-private, as far as I know.” This sort of feeling is widespread in companies because they need to believe it to justify their marketing. [I don’t think it is always a legit assumption that they really believe this stuff; I think what they are knowingly doing is corrupt and immoral — DRM.]

Moran: It’s widespread partially because the *Wall Street Journal* prints it as fact and people believe it.

Meyer: In this case, the *Times* probably consulted Laurence Johnson or Robert Harley.

Moran: They still print that it’s hamburger and it will never again be steak.

Meyer reported his impression that the DVD-Audio group seemed to be acting like winners. The panel member from Sony was asked why they were trying to spoil the game with their minority format, and he simply claimed that their version offers better sound. [Expert sources have reported to me that actually, Sony’s Super Audio technology is at best a middling achievement: audibly fine but no great shakes technically at all, and hardly superior to anything — DRM.]

The DVD-Audio specification provides for automatic mixdown of multichannel sources to two channels. Both systems include provision for a bottom layer of pits to allow them to play on any CD player (so the “upper” layer, a semi-reflective between the aluminum layer and the surface that is actually below the main layer in actual playback, would carry the new, denser bits). Meyer feels if this feature is not implemented each format is doomed to fail.

Meyer went to a demo given by Tom Holman (to three people at a time, in a completely darkened room) of a multi-channel record/playback system. In the 1970s Meyer and Holman had both heard Bolt Beranek & Newman’s concert hall simulator, which was a 12-channel system of AR4ax speakers arranged in a hemisphere, and a subwoofer extending the system response flat to 20Hz (see *BASS* vol.2 no.11). The room was large and almost completely deadened. The source was a rather dry close-miked two-channel orchestral recording. BBN used a tape player running at 30ips with multiple playback heads spaced to give delays (at that time it was the only way to generate high-quality delayed signals). Each pair of speakers was delayed and equalized to represent different parts of the hall: ceiling reflections, side wall reflections,

etc. The BBN system could be set to simulate Symphony Hall or Carnegie Hall, and it sounded as if you were there. {One must wonder whether it would quite do so today, to our much better-educated ears — DRM.}

Holman’s goal was to recreate this effect in the home with 12.1 channels. In his demo there were separate channels recorded at various locations in the hall, not derived from two front channels. There was a great feeling of spaciousness, but to Meyer the illusion of being in the hall was not entirely convincing. In the concert part of the demo, one pair of surround channels (a pair of dipoles located above and behind the listener) were too loud. To this criticism Holman said that the channel balance was provided by the recording engineer, and he hadn’t altered it. (This of course implies that the gain of the playback channels was calibrated.)

Q. Were the recording microphones in the same location as the loudspeakers?

A. It wasn’t clear.

Hadaway: Richard Burwen went to 4-channel recording, then returned to two. He found that he got better results from synthesizing ambience rather than trying to record it with more channels.

Ira Leonard: David Griesinger says the same thing. In many cases he can use his Logic 7 processor to generate better ambience than recording it discretely. Apparently the placement of the microphone in a surround sound recording is very critical.

Meyer: And there is great temptation in engineering a surround-sound recording to make the surrounds too loud or too prominent. John Eargle, a very tasteful engineer, made a recording of the *1812 Overture* where the chorus at the beginning slowly migrates from the back to the front of the hall; but it doesn’t sound like a real chorus moving. Meyer asked him why he had created this artificial effect and Eargle’s answer boiled down to, “Because I could.”

Q. Was Holman trying to sell this system to manufacturers?

A. It was apparently a demonstration of what could be done. He did seem to think it was important that the head of Panasonic audio, who attended the same demo I did, should hear the system.

Comment: Holman has a consulting company; perhaps he wanted to advise companies on this kind of system.

John F. Allen: When we ran the digital *Fantasia* at the Century Plaza, in 1985, we derived the surrounds from two channels and it worked beautifully. When you turned off the main speakers the surrounds were

amazingly loud, yet people kept complaining that the surrounds weren't working. When we turned off the surrounds for them, the sound collapsed into the screen channels and they were startled. The temptation to put too much in the surrounds is almost irresistible.

J.K. Pollard: Remember the birds at the Tanglewood music shed?

Cohen: I was in the surround-sound business with Sound Concepts, and at one point I was thinking that part of the realism of the concert hall was the subtle audience noise. So I thought I should build an audience noise generator.

Panasonic had the biggest booth this year: 434 feet long, 22,000 square feet.

Phyllis Eliasberg: Panasonic had a great press conference. It was imaginative, engaging, mostly digitized and used a magician who popped back and forth between live presentation and appearing on a large high-definition screen.

Panasonic showed a portable CD player with a 40-second memory. A model wearing the unit jogged on a treadmill while you listened to the music being played on her CD player [she had a most graceful stride — DJW].

Eliasberg: You may need a new home for all the equipment. Sharp showed — "Be still, my heart" — a 56" plasma screen with breathtaking clarity. It put everything else in the shade, she thought, and was only \$52,000. Everything was digital: your house is connected to a server. Howard Stringer (who used to be Eliasberg's boss at CBS and is now president of Sony) made the keynote speech before a very crowded auditorium, telling everyone that they might be making wonderful products but no one is going to use them because they are too difficult. She applauded madly and was the only one. He turned to her and said "I thought I left my wife at home."

Meyer: Harman/Kardon is making a very user-friendly remote with simple menu-driven operation. You rotate a thumb-wheel to scroll through menus and press the wheel to make a selection.

Uniden is coming out with a cordless phone that will automatically choose the cheapest rate at the time of the call. You will get one bill from Uniden. Of course, this involves canceling your existing accounts and giving your business to the company that made your phone.

Koss has \$20 headphones that fit in the ear canal, using slow-release foam. They sound good and block airplane noise as well. They also introduced a version of the Porta-Pro, always one of the better phones in

the \$40-\$50 range, with two individual on-ear transducers instead of a headband. Designed for running, it's called the Sporta-Pro.

Alvin Foster reported that Stax is still in business. He compared their \$5000 Omega model with their \$800 model and they sounded very similar. Owades heard some Stax ear-bud phones (the SRM-1, \$500) that sounded really nice.

There were good reports of new headphones from Ergo based on the Heil pleated accordion-style driver and retailing for \$1000.

SOTA showed a turntable whose vacuum hold-down pump is quiet enough to be run in the listening room. The company was using a Souther linear tracking arm ("My arm?!" exclaimed Lou).

Bob Carver has bought his old company back [its stock has been under 40 cents a share since last summer and once dipped almost to a dime — DRM]. He has a revolutionary new product: a cigarette-pack-sized amplifier, running from a car battery, designed to drive a woofer.

According to Foster, the most transparent speaker at the show was the Von Schweikert Research, which seemed to disappear when the music was playing (the transparency, Foster felt, is due to lack of cabinet diffraction). [According to the Melbourne Audio Club newsletter: "Speaker manufacturer Von Schweikert Research is closing its facilities in the aptly named city of Watertown, New York. VSR announced that melting snow from heavy January storms flooded the plant, and the company's insurance did not cover the damage, which was over US\$ 1 million — DBH.]

Roger West of Sound Lab showed the new less-expensive version of the A-1 electrostatic speaker. It sounded very good until he turned it up to normal listening level, at which point it distorted grossly because the amplifier was rated at only 18W/ch. "Why?" Foster cried. West was using a grossly underpowered amplifier because of the magical aura of tubes; despite (or perhaps because of) the need to strain to hear the music, some people told him that his was the best sound of the show.

Hsu Research introduced a \$500 woofer with a built-in amplifier that looks like a winner. He won the 1998 *Stereophile* Woofer of the Year award and will pitch it to dealers [a change from his direct-to-consumer marketing — DJW].

Revox was back. The name was bought by a Swiss company that was showing plasma video displays as well as a complete line of home-video gear from the DVD player on.

Ira Leonard: Eggleston showed a loudspeaker that was not for the average home (audience: "A lot of speakers there weren't for the average home!"). When mastering engineer Bob Ludwig moved to Maine he started Gateway Recordings. He liked the Eggleston Andra but was looking for something better, so they built the Ivy (\$100,000 a pair, 790 pounds each) for him. The tweeters are at standing ear height because Ludwig works standing up. The side panels are made of black Italian granite ("none of that New Hampshire stuff").

Meyer noted that on a test he uses employing third-octave bands of noise, the Ivy system was the least-resonant speaker he's heard.

Foster: "I thought they had the best sound at the show except for the bass.' They had a small speaker for \$3000 that was very good.

The new Revel F30 speaker (designed by Kevin Voecks; \$3500) was considered by several of the BAS attendees to be the best value of the show. Voecks had a surround system accompanied by a nicely set-up video projector with the Snell & Wilcox line multiplier; Meyer opined that as at previous shows, the Snell & Wilcox was associated with the best NTSC video he saw anywhere.

Steve Owades remarked on the return of old brand names: Sansui, Akai. Yama's Enterprises (310) 327-3913 is now handling Stax and has repair facilities for all Stax phones under the name Accutech. They also handle Accuphase.

The nicest computer speakers Owades has heard are from Evette and Shaw in Salt Lake City. Unfortunately they're \$2200. They also make a power amplifier whose case is machined from 1½" aluminum billet.

Mbl was, as always, showing their speaker, made of strips in a vase-like shape, clamped at the top, with a loudspeaker driving the bottom. Meyer: "In some ways these always sound extraordinary, with almost miraculous detail, in a very ordinary and fairly reflective room with untreated walls." The speakers are very smooth, though not completely uncolored, and entirely omnidirectional horizontally.

Another German outfit, Burmeister, is in the Mark-Levinson mode, which is a lifestyle trip: "Be like Dieter Burmeister." Like mbl, they make the whole line: preamps, amps, CD players, tuners, power conditioners, D/A converters, etc. The prices are in the tens of thousands of dollars. The salesman said to look behind the speaker and see why. Owades couldn't resist — the back of the speaker was covered

with monstrous capacitors. So "they throw money at it."

Question: Are the caps soldered in or just glued to the back? A: "It could be they're not capacitors at all, just Coke cans painted white. It looked convincing is all I can say."

David Moran: In car audio you see whole trunkfuls of monstrous caps.

Owades: KEF (now owned by a Hong Kong company) has a new speaker called the Maidstone, named after the town they're still in, a large 4-way with a 15-inch woofer.

Leonard: A distribution group called IAG is aggressively marketing Quad electrostatics in the US. They have the new 98 series and a new one with bass panels, at \$6000 and \$8000.

Foster: Pipedreams is a speaker using the line-source principle like the McIntosh. It gets the drivers closer for better response without the need of equalization.

Owades: "In its largest realization: 84 tweeters, 42 midranges, eight 18" woofers; \$80,000."

Digital distribution by Avio: In one cable of telephone wire, you can pass four MPEG video channels, 16 24-bit audio channels, eight phone lines, and a 3Mbps channel for control.

Apogee (the digital design company in Norwood, Mass.) is making an amplifier that runs directly from a PCM digital source — basically a power D/A. A small board the size of a cigarette pack houses five channels of 20-watt amplification and doesn't get hot. They were using the Avio media wire as the digital input. Very intriguing.

Huff Loudspeakers in Iowa is making a speaker using what looks like an Ohm Walsh driver made out of titanium by German Physics. The company was using the Apogee amplifier.

DLP was back with its improved display, based on the Texas Instruments micromirror design, putting out a bright 1000 ANSI lumens [they still don't get deep black, but they are fine for a lit room — DJW]. A demonstration was given to theater owners to broach the possibility of replacing film with video. John F. Allen predicted 15 years ago that it would be 15 years before video would replace film [it hasn't become commercially viable yet, though — DJW].

There is concern about piracy of the video format. The average theater would see an improvement in picture quality [these must be some pretty poorly maintained theaters — DJW], but the average theater wouldn't buy this. In the tall stack of information provided, there were a few sentences devoted to

sound quality: up to eight channels of 16-bit/48kbps linear digital. No more SDDS or Dolby or DTS. But they're still going to need speakers! The one true standard for the last 90 years — 35mm film at 24fps — will vanish.

Meyer: The press release says this will be an affordable HDTV projector for the "budget conscience" (*sic*) videophile.

IBM has a similar product available through Ampro called HDLV CMOS reflective technology.

Owades: The Sharp LCD projection TV was big enough and bright enough to be satisfying for people who don't want to watch movies in a dark room. Pioneer was showing a rear-projection TV in a darkened room and you could see the reflection of the audience in the screen.

The big advantage of LCDs and micromirrors is that the image light source can be as bright as you want, limited only by heat dissipation. Conventional CRTs using phosphors "bloom" at high light levels.

A company called DVDO (founded by ex-Apple engineers) showed a line doubler on a chip. It is clever enough to recognize if the source had been progressive-scanned or from 24 frames-per-second converted by 3-2 pulldown, and reassemble the original progressive frames. It would do the best possible job with film or video sources. It will be installed in DVD players and projectors or come in a standalone box for \$1000.

Eliasberg: RePlay and TiVo are making hard-disk-based replacements for the VCR. A TV set has an 18GB hard drive that will hold 16 hours of programs you tell it to record. After you watch a program you can delete it and that space is freed for more programming.

Owades: These are very clever devices. Most people don't use their VCRs to record, but this might change their minds. You can program it to select programs similar to those you already like. One featured 8, 16, or 32 hours in a VCR-sized box. There is an option of VHS quality for double record time. One feature Owades was looking for was playback at higher speed with audio, but that is not available yet. You can record one thing and watch another even though it has only one tuner. You can be watching in real time, be interrupted, and "pause reality." So you can watch real time as if you were watching tape. [Virtual real time"? — DBH.]

Owades: Diamond Multimedia's Rio MP3 player is tiny. It can't record but can download from your computer or directly from the Internet. It stores 70

minutes of music or eight hours of voice-quality audio. A slightly larger device has record capability.

Diamond Multimedia was the first to bait the bull — to put out the red flag and get the industry to attack. Such devices are seen, rightly, as a way of evading copyright and distributing free music. The RIAA sued and lost (Rio won in court because it was a playback-only device).

Q: Were there a lot of CD recorders there? Yes, and Philips announced a price reduction of audio CD blanks, now \$4 [on the street — DJW]. There also are 80-minute CD-R blanks available for \$2 from www.cd-recordable.com. According to Owades, the tax on audio blanks has never been put into effect.

Beware of the incompatibility of CD-Rs with many DVD players. A separate laser is required for good results. Sony claims all their DVD players will play CD-Rs. DVD-R is on the way, but there are incompatible standards.

The 'Best' Loudspeaker: Revisiting Dispersion Issues

by Alvin Foster (Massachusetts)

In 1991 (BASS v18n1) I wrote that "the best stereo speaker is one that fulfills the requirements of the human auditory system for optimum localization, imaging, and clarity." I felt that an accurate loudspeaker would likely have a dispersion pattern that would be more directional than conventional box designs; increasing a speaker's directivity would improve its fidelity at the listening chair. These conclusions came at the end of a long article on the Carver Amazing Mark IV speaker. I pledged to continue my research into the causes of the "box" sound, and why planar line-source speakers sound different from conventional cone loudspeakers.

I have more recently concluded that there is no one speaker type or dispersion pattern that best fulfills the requirements of the human auditory system in all playback environments. For home stereo, however, I believe that the tall planar dipole line-source speaker offers the best compromise among the important variables of imaging, clarity, and envelopment.

Dispersion Types

In my article, I defined the typical multi-way cone speaker system as having a wide dispersion pattern.

In contrast, I mistakenly claimed that the Carver Amazing dipole speaker had a narrower (beamier) dispersion pattern, stating “the narrow dispersion pattern of the line-source driver more closely fulfilled the auditory requirements of the ear” [the Carver’s narrow ribbon has the wide horizontal radiation that would be expected for its size — DRM]. The difficulty with mistakenly applying my 1991 definition of narrow dispersion to the Amazing loudspeaker has come when I try to reconcile why I do not prefer speakers with narrower dispersion even though they typically produce more pinpoint imaging. I am not alone in this finding. In the December 1997 *Audio* review of the JBL SVA1600 horn speaker, Don Keele Jr. concluded that although the imaging and clarity of the JBL were superior to his B&W 801s (a multiway cone loudspeaker), he preferred the “laid-back, staid sound” of the 801s on balance [but also affecting one’s preference would be overall in-room response or tonal balance and familiarity with a given radiation pattern — DRM.]

The Major Comparison Factors — Frequency Response and Dispersion Pattern(s)

Based on my library and laboratory research, I have concluded, as have others, that the best measures of speaker quality are frequency response and dispersion pattern.

I have not found any credible research showing that most of the differences we hear among loudspeakers cannot be explained by examining these two variables. In fact, controlled listening tests have consistently shown that speakers sound the same if they have the same frequency response and dispersion pattern and are operated within their linear range. Finally, the speakers must occupy the same space.

The Role of Distortions

My 1991 conclusion on the minor role distortions of all types play in determining playback quality still stands. Harmonic and IM distortion, phase response/time lag, transient response, squarewave reproduction, decay time, etc., measured in my tests and others’, have proven to be unreliable indicators of a loudspeaker’s playback quality. I cited, among others, the definitive research of Salmi and Wickstrom, Toole, and at Bose, all of which concluded that such distortions pale in significance to frequency response and dispersion pattern. Tomlinson Holman, during his November 1997 Boston-AES/BAS presentation, reported on German research that similarly concluded there was no hint of a relationship between such dis-

tortions and perceived playback quality, based on a study of 45 different speakers in three different rooms.

But even if not a major factor, distortion is somewhat important. My research with multiple listeners indicates that harmonic distortion above 1.2% on 20-60Hz tones is audible, and above 0.3% at higher frequencies is audible. On complex music, about 10% distortion is considered the requirement for audibility.

In my study with tones, I used two sinewave generators. One fed the main tone while the second generator was set to the second harmonic; in other words, if 16Hz were under study, the first generator was set for 90dBspl at 16Hz and the second was set to 32Hz (second harmonic) and its level raised from -100dB (0.001% HD) to a level at which the listener in a real room could detect a difference when the second tone was switched on or off by a second party, single-blind.

A regular feature of Keele’s reviews in *Audio* is maximum peak power tests. Using his custom tones, he has reported that audible distortion in loudspeakers does not occur until extremely high levels are reached. Similarly, Tom Nousaine, in his *Stereo Review* subwoofer reviews, has demonstrated that low-frequency distortion on music is heard only at very high playback levels. Both report harmonic distortion of more than 10% for audibility.

Wide Dispersion:

Planar Dipole Line-Source Loudspeakers

An extremely large radiation surface, such as a long ribbon, characterizes the planar dipole speaker. The Sound Lab A-1, an electrostatic design, and the Wisdom Adrenaline, a ribbon design, are excellent examples. Each is about 6’ high. When stereo-only playback is desired, they and similar speakers have the dispersion pattern most closely fulfilling the auditory requirements of the human ear: wide and uniform.

How much direct and indirect energy does such a dipole generate? It presents a more diffuse overall soundfield to the listener because 50% of the energy generated is projected out the back of the speaker toward the front wall, away from the listener; thus at least half of the speaker’s output is reflected at least once before being heard [in a listening with typical placement, though, this is true of all speakers over a wide, non-treble frequency range, because of the integrating time of the ear — DRM]. Because the soundfield is diffuse in this way, it imparts a greater

sense of envelopment — a feeling of being there and of being involved in the music.

How tall does such a speaker have to be to perform like a line source? There are at least two answers to this question, according to David L. Smith (formerly of McIntosh, now at Snell) in a 1995 AES convention paper. One rule of thumb is that the far field begins at distances equal to three times the source's largest dimension. In the case of the Wisdom ribbon, this means a listener distance greater than 18'. Another definition of the far field is that point where the line source's spl falls off at the same rate as a point source: -6dB with a doubling of distance (the line-source level begins its dropoff with 3dB per doubling of distance) [this may not always be precisely the case in listening rooms — DRM]. At higher frequencies the far field is even farther away. Smith concludes, "When long arrays are used for home loudspeakers, the listener is very likely to be in the near field."

When you sit within one foot of any speaker, the direct sound is much stronger and louder than the room reflections. This, too, is sometimes referred to as near-field listening. As you move away from the speaker, you start to hear more of the room. Typically, after about three feet, you hear more of the room than you do the speaker. In my 1991 *Amazing* article, I quoted Daniel Queen's assertion that a "typical wide-dispersion loudspeaker permits only about 14% of the direct energy to reach the listener."

Dipole line-source designs address the shortcomings of other driver designs: (1) acoustic resonances inside the cabinet, (2) different acoustic impedances on the dynamic driver between the inside and outside of the cabinet, (3) stronger ceiling and floor and sometimes wall reflections, and (4) less consistency in vertical, and sometimes horizontal, dispersion. Well-designed cone or horn loudspeakers can reduce these limitations, however.

Power Response

The power response of a loudspeaker, the sum of all the energy radiated from the system, is difficult to measure, and this probably accounts for its receiving insufficient attention in speaker evaluation [plus the mania for impulse-based measurement gear — DRM]. Ideally to measure power response, one must employ an anechoic chamber (or simulate an anechoic environment) plus multiple microphones positioned around the speaker (or a single mike placed at multiple points), and then sum the total. A comparison of the power response with the direct sound defines a speaker's directivity.

A dipole's bidirectional radiation often means it will have a flatter power response than a monopole loudspeaker. Flatness is important because in a room we listen chiefly to a speaker's power response, as Roy Allison and some others point out.

A major fault sometimes alleged for dipole speakers is the 'unnatural' reflection created by the strong rearward radiation toward the front wall [this is chiefly a treble effect compared with conventional forward-facing speakers, and some find it highly pleasant — DRM]. It arrives at the listener well after the initial sound. I maintain that since all speakers generate both useful and unwanted reflections within a room, the real questions to settle for the listener should be: (1) the amount of frequency response alteration, (2) the composition of the delayed sound, i.e., how many early and late reflections are included, and (3) the percentage of direct and indirect sound.

A dipole should be placed at least 7.5' from the front wall — an adequate distance according to the BBC information provided by Holman during his recent presentation. Holman stated that a reflection is of negligible importance if it occurs at least 15ms after the initial arrival and its energy is at least 15dB lower. Such reflections do not affect either timbre or localization. And longer delays can augment the listening experience.

Floor and Ceiling Reflections

Having vertical dispersion restricted means planar speakers send less energy to the floor and ceiling, so a listener encounters fewer early reflections. What further distinguishes planars from other designs that aim for partly reduced vertical dispersion, such as midrange-tweeter-midrange, is that planar speakers maintain a more consistent response with different head heights. In some MTM speaker designs, vertical dispersion is limited only over an octave; above that range the speaker is beamy and below it the dispersion is broad.

Boundary augmentation affects planar dipoles like any speaker, but less so because of the height of the source driver, its restricted vertical radiation pattern, and the effective multiple distances to the floor and ceiling, which distribute the Allison effect over a broader frequency range, tempering its severity. As a test, I placed a cone speaker 18" off the floor, and there was a dip around 188Hz, just as Allison's work predicts. The dip caused noticeable voice coloration, a tonal or timbral change that was a clear result of the floor, front wall, and side wall reflections. To introduce a similar 200Hz dip into the output of my

Amazing speaker, I used a 1/3-octave equalizer, and the bottom-of-the-barrel sound that I had associated exclusively with box speakers was now being exhibited by the Carvers, pushing the voice from front stage.

By judicious placement, such boundary-augmentation problems can be minimized for any design, including box speakers, along with other early reflections that color the sound.

Dips to the Side

Another advantage of planar dipole loudspeakers is the sideways cancellation that results when the front-firing signal meets the rearward-firing, out-of-phase sound. When this happens, a dip ("null") occurs and potentially annoying early side-wall reflections are reduced.

Multiple-Speaker Interactions

According to Keith R. Holland and Philip R. Newell (September 1997 AES preprint), using "loudspeakers in pairs for the reproduction of two-channel stereo give rise to mutual coupling [multiple speaker interaction] effects, which compound the usual loudspeaker/room interface problems."

There are two primary effects, and one historical reason, that have instigated the requirement for a separate center channel speaker in home theaters.

Any pair of speakers radiating the same information creates a phantom image between them. If one speaker is louder, or if the listener is closer to one speaker, this phantom image will shift toward that speaker. If the pair of speakers is the left and right channels, this shift of the phantom center image will skew, or distort, the front proscenium of sound.

Compared with a signal coming only from a single center channel speaker, the interaction of two speakers radiating the same signal causes a frequency response notch at around 2kHz at the listener's ears. This obviously results in a change in timbre. Off-center listening to a single signal from two speakers results in further comb-filtering effects, the frequency response changing with position.

The movie industry puts dialog in the center channel, since dialog is of primary importance in most films.

As a result of two speakers radiating the same signal, the frequency response balance at the listener's ears is also gradually boosted in the lower midrange and bass, due to mutual coupling. Having two speakers radiate the same signal at the same level, mid-range and highs increase 3dB compared with either

speaker alone. As the frequency drops and the wavelengths get longer than twice the distance between the speakers, the coupling gets stronger, ultimately reaching +6dB in the bass [this gradual reinforcement is shown in several real-world in-room measurements graphed in *BASS v17n6* — DRM]. The impact of these effects is affected by the reverberant nature of the room and the speaker dispersion patterns, with wide-radiating speakers being more strongly affected.

According to Holland and Newell, "Dipole loudspeakers, such as most electrostatics, behave in a different manner. The dipole radiation pattern means that little or no sound is radiated toward the other loudspeaker, thus rendering them immune to mutual coupling effects.... Some room-related mutual coupling will still occur, however, although to a lesser extent than for monopole loudspeakers."

If tall dipole planar speakers can be so good in these criteria, why isn't the design more popular? The likely reasons are space limitations, cost, size, visual appearance (spouse-acceptance factor), and the distance required from the front wall.

Medium Dispersion: A Cone Loudspeaker

Depending on its size and the frequency range it is asked to reproduce, a cone loudspeaker can have dispersion wider than a planar driver or a narrower directivity that rivals the horn. As Allison explains it, "Directionality is, with rare exceptions, a function of the wavelength of the frequency being generated in relation to the size of the driver (or the dimension of the mouth of the horn) normal to the plane of interest" [this holds for all drivers, planar as well as cone — DRM]. For a 10" woofer, the transition point to less than omni output is about 500Hz and above; for a 4" driver it is about 1.4kHz and above; and for a 1" dome tweeter it is the 4-8kHz octave. When drivers are called upon to deliver sound higher than these points, their output becomes increasingly concentrated on axis and their off-axis response falls.

Power Response, Reflections and Horizontal Dispersion

Allison: "If the power response of the system is well-dispersed and free of abrupt changes throughout most of the audible frequency spectrum, then our ears will interpret the reverberant field as smooth and natural. [Presuming a relatively flat on-axis frequency response,] if the power response of the system varies significantly with frequency, we will hear an uneven response." With too many cone/box speakers, the power response of the system falls until the crossover

network brings in a smaller driver, at which frequency the output is again more omnidirectional. At this crossover point the dispersion broadens and the power response jumps up again. Sawtooth power response curves like this can easily be heard even when the axial output from the system is flat.

A typical two-way cone loudspeaker, such as the Paradigm Phantom, has no rear-facing drivers. The 8" and the 3/4" drivers are asked to deliver the entire audible bandwidth. The result often is a power response that does not equal the planar driver in smoothness. James Moir states, "At first thought it would appear that the reduction in the horizontal off-axis output at high frequencies would be of little consequence to a listener seated on axis, but experience shows that the effects on sound quality are indeed obvious to a moderately experienced listener."

The effect of a speaker's distribution of sound is often discussed in audiophile literature, as in comments like the "cymbals and trumpets sound better on horn loudspeakers" or "they sound too laid-back." What is not often discussed is the cause, or how the speaker's characteristics — directivity, and frequency response as a function of angle (both of which affect the ratio of direct and indirect energy as a function of frequency, at the listening position) — are most likely the cause of the perception.

Since wide and consistent horizontal dispersion is impossible for a single forward-facing cone driver to produce, it is better when multiple drivers of different widths are used to cover the audio band. And even then, both the reflections that influence imaging, and the total in-room power response, sometimes will be ragged.

Narrower Dispersion: A Horn-Loaded Speaker

A speaker with narrow dispersion directs more sound forward than to the sides and rear and thus is less affected by the room. This characteristic translates into excellent imaging but, of the three major speaker dispersion types, with the least sense of envelopment and spaciousness. Controlled-directivity horn speakers are known for their clarity and imaging. You can pinpoint the horns; in fact, horns and cymbals sometimes appear to stand out or sound more forward than the other orchestral instruments.

Some people believe that a stereo loudspeaker *should* have a narrow radiation pattern, like a horn's. It produces less of a reverberant field and some feel it thus is ideal for pop music. It simulates more "they are here" than "you are there." It is the opposite of, say, the Bose 901.

The good news is that there typically are fewer early reflections than from a cone loudspeaker — behavior more like that of planar loudspeakers. The downside is that a horn's limited dispersion can mean it is less suited to being used as a lone pair in a stereo system [depending on your goal and taste — DRM]. Wide-dispersion proponents argue that in any case, since pinpoint imaging is not that important a part of the concert experience, it also is not that important for playback.

Power Response

The dispersion pattern of a typical horn-loaded driver, such as the JBL SVA1600, might be quite narrow especially in the treble, meaning the overall balance at our ears will probably have too much bass and too little highs and will contain the least amount of reverberant energy [also depending on how close one sits and on the liveness of the room surfaces — DRM]. This imbalance might happen even if the axis response is flat.

Floor and Ceiling Reflections

Early vertical reflections are typically minimized because horn-loaded drivers often have restricted vertical output.

Horizontal Dispersion

Although constant-directivity horns can be designed to have wide and even horizontal dispersion, the equal of [and sometimes better than] many other speaker types, most often the radiation pattern is restricted to a defined listening area, which is great for theaters. The result is minimized side-wall interference and extremely tight imaging — about the best.

Why All This Is Important?

The effect of the sound distribution of a loudspeaker — its dispersion pattern or patterns — is rarely correlated in audiophile writing with what we actually hear in a room.

Correcting my 1991 definition of the narrow-driver planar dipole speaker to that of a speaker having wide dispersion, for example, fits better with the conclusions reached by the authors listed in that article: Moir, Queen, Kates, et al. According to Moir, "The soundfield in a room does not become increasingly diffuse with the passage of time as is generally thought, but instead becomes increasingly ordered, with the sound energy concentrated in well-defined spatial patterns even at the lower frequencies." Thus, reverberation is not the decay of a diffuse soundfield

but the decay of well-defined patterns of energy. The resulting sound is composed of short and long reflections and imperfect frequency response(s). Hence, listening to a narrow-dispersion speaker will be a very different experience from listening to a wide-dispersion one. The latter will produce the type of reverberation patterns that contribute to the envelopment that many audiophiles crave. Such a reverberant field provides the blending of orchestral voices and the feeling of spaciousness that are the essence of the concert hall experience. [Some listeners feel wide-dispersion designs are superior for all kinds of music, not just large-force/large-space classical — DRM.]

Multichannel Sound Requirements

There is considerable debate in the home multichannel playback arena about how many speakers are needed and what constitutes the ideal dispersion pattern when the music source is a stereo CD. Signal processors have been manufactured to convert existing stereo CD output into surround signals that their manufacturers claim provide the best of both worlds: discrete, localized effects that image to the left, center, right, and sides and rear. They also claim to have effects that wrap all the way around the listener. The Yamaha DSP-1, the Citation 7.0, and the Lexicon processors are among the many units available. The goal of these devices is to place the listener in a 3D soundfield. To do this most successfully, each speaker's dispersion pattern, the number of speakers, and location requirements will be different from a system set up in accordance with the THX guidelines for video soundtracks.

The home speaker setup for the playback of movies was largely copied from the THX movie theater standards, established after considerable research. However, the playback requirements are not the same if reproducing music is the main criterion. In the theater, many people sit off-center in a very large room. To keep dialog centered, a center channel was incorporated in the standard, along with directional front left and right speakers. The THX criteria have a frontal bias; the intent is not to enclose you in a musical soundfield.

To prevent the listener from localizing sound to the side speakers, dipole speakers were specified. An added reason for a diffuse soundfield on the side was to reduce the audibility of film dropouts, clicks, random noises, etc., that enter during the moviemaking process, and leakage from the Dolby Surround matrix decoding of some front-channel sounds.

In the home music system, however, spaciousness and envelopment are key for many listeners. Stereo

means three-dimensional; only minimum localization cues are required. The sense of being enclosed or having the music all around you requires a different emphasis, not narrow directionality, especially if you are limited to 5.1 playback channels. According to Holman, for maximum envelopment in a 5.1-channel system, the front two loudspeakers should be at $\pm 36^\circ$ degrees, the two side channels at $\pm 108^\circ$ degrees, and the remaining speaker at 180° degrees, behind the listener [the points of a regular pentagon — DJW].

Conclusion

All speakers in a room generate a total soundfield that plays the key role in fidelity. The main concerns should be to dissect the composition of the sound, my categories being: (a) potentially annoying early reflections, (b) the more benign late reflections, (c) a frequency response altered by boundary augmentation and then by room dimensions and (d) the proportions of direct and reflected energy.

The latest studies on the need for envelopment and its causes are right-on. All speakers, whatever their dispersion, generate a reverberant field in a room, and for maximum high-fidelity envelopment with music I submit that we want a soundfield that most closely maintains the balance of the information on the disc [those who feel that most recordings are made too close to the sound source probably will not want their playback to be chiefly direct sound, though — DRM]. As audiophiles, we have paid too much attention to reports on the various other distortions generated by loudspeakers. We need more emphasis on correlating the speaker's frequency response and dispersion pattern(s) with what we hear. [And the room is an equal partner; not even horns can be divorced from the room — DJW.]

This situation can improve if audio reviewers would categorize speaker system dispersion into my three main groups of wide, medium, and narrow, and note dispersion uniformity as a function of frequency. By correctly typing speakers, reviewers will give their readers a better idea of how a given system fits their both playback requirements and their environment.

Classifieds

Wanted

A recording engineer who could do a remote in September. It involves recording (to DAT, probably) a live jazz party (three days) in Chautauqua, New York, which is near Jamestown, not too far from Buffalo. Contact Doug Pomeroy at pomeroyaudio@att.net .

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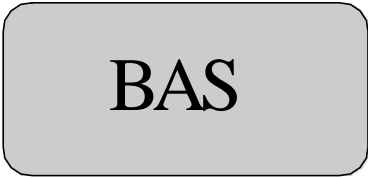
The *BASS* can always use articles on audio matters. Send them to the editor, David J. Weinberg, *BASS*, 10705 E. Nolcrest Drive, Silver Spring, Maryland 20903-1006; 301 593-3230; **DJWeinberg@compuserve.com**.

Your byline will appear in good company, as a number of our contributors have gone on to eminence as audio writers and editors. Note that for meeting summaries there is compensation.

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