THE B.A.S. SPEAKER

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In This Issue

The most important portion of this Speaker is a request for help with its publication. After 2 to 4 years of effort, some of the key members of the staff are retiring and replacements are needed. If you want to see a Volume 5, please respond now.

In this month's publication section, we have another winner. While Consumer's Union tests loudspeakers, Alvin Foster tests preamplifiers. His much more useful review of contenders for perfect phono reproduction may be closing in on the last word. Foster tested every quality unit he could find in as many different ways as he could invent, and at last he may have found a technique for correlating subjective musical quality with numerical electronic measurement. The "why" of the method remains a mystery, but a large panel of audiophiles and designers agree it does indeed work.

Renewals for Next Year

As much as we appreciate the foresight of those of you who have renewed already for next year, the Executive Committee requests that you please hold off a bit until 1) an application form is printed for next year, with the proper boxes for requesting reprints of 1974-5, 1975-6, and membership for next year and 2) dues for next year are established by vote of the membership. This will help to keep our records straight and will reduce the number of refunds and/or requests for additional payment we must handle. Thank you.

Speaker Stuffing Party

Because of increasing out-of-state BAS membership, it is necessary to share some of the tasks involved with distribution of the newsletter. The following members have offered to rotate the responsibilities of labeling, stamping, and bagging the newsletter for a particular month.

Membership dues are $12 per year (October 1 to September 30) or portion thereof. Dues include a one-year subscription to the BAS Speaker. (Note that almost the full amount of dues is allocated to production of the Speaker. The local activities of the BAS are strictly self-supporting.) For further information and application form, write to: The Boston Audio Society, P.O. Box 7, Kenmore Square Station, Boston, Mass. 02215.

If you are interested in assisting, please contact the monthly distribution manager.

Month	Name	Community	Home Phone
June	Frank Farlow	Brookline	232-9654
July	John Ousts	Brookline	738-1035
August	Richard Jansky	Medford	391-3491
September	Jim Topali	Watertown	924-4944

Coordinating Editors

For those unfamiliar with the workings of the BAS Speaker, note that we have four members who have volunteered to edit, in turn, a monthly issue of the Speaker. These are presently Jim Brinton, Mike Riggs, Mark Saklad, and Harry Zwicker. You will see these names alternating on the masthead of the various issues. Correspondence to the Speaker can be addressed to a particular editor if you wish, but all mail sent to Box 7 flows first through Corresponding Secretary Joyce Brinton and then to the upcoming Coordinating Editor and/or to the person addressed as the contents of the letter dictate. Although each editor takes suitable pride in the content of "his" issues, often some material listed under one person's editorship has been passed to his issue from the previous month's editor.

Please note that we have no paid typing staff (until the final copy is set into type) and therefore it helps immeasurably if contributions are typed and triple-spaced; if you don't type it, the Coordinating Editor must, and this becomes a 30- to 60-page chore every month.

Finally, for any local members who would like to assist editing the Speaker, we need your help. This work can be an interesting and unique experience, and perusing the many complimentary letters that never see print is a satisfying reward. With four editors, each works one issue only every four months. If we find more than four editors, the load is accordingly reduced. See also the following article.

BAS Officers and Publications Staff

As mentioned on page 1 of this issue, several of the present BAS mainstays will probably not be able to serve after the September General Meeting. This will include: Jim Brinton (President, Editor-in-Chief of The Speaker, Coordinating Editor, Program Chairman), Bob Borden (Production Manager), Harry Zwicker (Coordinating Editor), and Joyce Brinton (Corresponding Secretary, Refreshments Chairman).

Although each of the above will continue to be involved in the BAS, other committments make it impossible for them to continue to fulfill all their current responsibilities. Descriptions of these positions are given below. Anyone interested in assuming any of these responsibilities should contact the incumbent to volunteer.

We've had a stunningly successful two years under the present crew. The BAS has grown extremely rapidly in reputation and size, all without ever placing a single advertisement. The respect for The BAS Speaker and for its very unusual purposes is outstanding. The Speaker has filled a need that no commercial publication could possibly fill: it provides a forum for anyone with something interesting and valuable to communicate about audio or music. This article, like the Channel 2 Auction and the WBUR Marathon, is perhaps unpleasant, but if there is to be a Volume 5, local members must organize themselves to help out now.

Below is a listing of the duties of each of the people needed for the BAS and for The Speaker.

1) President: The major job of the President is to see that everyone else does his job, and does it in coordination with everyone else. Depending on the time of the month (near a meeting or a deadline for The Speaker), this can approach a full-time occupation. The best two-word description of this activity is "making sure," and there's a good deal to make sure of:

- Before meetings: Locate lecturers, programs, demonstrations; find a location for each meeting; locate any needed audio equipment and arrange for transportation; prepare meeting announcement for Corresponding Secretary. In the aggregate, this may mean coordinating the efforts of four to a dozen people.

- At meetings: Arrive early to ensure that demonstration equipment is present and connected; if not, locate it and help set it up; collect volunteers to aid Corresponding Secretary in Speaker distribution; supervise and aid in room re-arrangements when needed.

- Between meetings: Answer mail and phone inquiries in re BAS, membership, programs, equipment, etc. The BAS averages up to 14 new member letters weekly and at least twice that many letters of other types. Simple informational inquiries re membership are forwarded to the recording secretary for action, but most other letters demand personal answers.

2) Editor-in-Chief of The Speaker: The BAS president presently acts as Editor-in-Chief of The Speaker. That is, he coordinates the efforts of the Coordinating Editors and is responsible for the overall quality of The Speaker. There is no reason why this function couldn't be separated from the presidency; Jim Brinton simply does the job now because of his background as a professional editor and writer. More specifically the task of Editor-in-Chief includes:

- Coordinate monthly Speaker effort—i.e., schedule articles and then dog authors to see that deadlines are met; make sure the Coordinating Editors have all the help they need, such as meeting report writers, copy editors, and offering personal backup when necessary.

- Make sure that there is a Coordinating Editor for each month, and that material passes smoothly from Coordinating Editor to Coordinating Editor.

- Act as liaison between Coordinating Editor and Production Manager, and sometimes as copy messenger boy.

- Review final copy for Speaker if necessary.

- Review and edit (some) incoming material for Speaker, especially that from out of state.

- Recruit (when possible) new Coordinating Editors and train/coach them when necessary.

- Recruit additional Speaker staff members when possible.

- Act as Coordinating Editor when all else fails (it did four times last year).

3) Production Manager: The Production Manager is responsible for producing press-ready repro copy from the manuscript supplied by the monthly Coordinating Editor. To fill this position, we need a person or persons who possess or have access to the following skills and facilities: copy editors, technical typists and typing or typesetting facilities, technical illustrators, proofreaders, and page layout artists. We currently pay for typing services, some illustrating, and printing and binding. Bob Borden currently handles the final copy editing, proofreading, and page layout, and interfaces with the typists, illustrator, and printer. Funding can probably be arranged to cover some of these functions. Bob will continue to provide printing and binding facilities.

4) Coordinating Editors. At least two are needed. See the preceding article for a description of duties.

5) Program Chairman: The Program Chairman assists the President in planning meetings. This includes helping obtain a meeting room, making guest speaker arrangements, and arranging any equipment needed for demonstrations.

6) Corresponding Secretary: The duties of the Corresponding Secretary are: receive all BAS mail; sort, acknowledge and/or answer, and forward to appropriate parties (i.e., material for newsletter to the next Coordinating Editor); forward checks to Treasurer; forward addresses and address changes to data processor for address labels; mail back issues to 7 to 14 new members weekly; answer miscellaneous mail (up to 20 pounds weekly); type, mimeograph, and mail meeting notices to 350 to 400 members; arrange for stamps to be prepared each month for newsletter mailing; maintain supply of envelopes; maintain supply of back issues; organize newsletter distribution at meeting; maintain data for membership/telephone list; produce list.

7) Refreshment Chairman: The Refreshment Chairman must bring coffee pot and supplies to each meeting, and buy coffee, soft drinks, and cookies in advance.

Want Ads

For Sale

When you send in want ads, please indicate whether we should include your address as well as your telephone number.

- Quad loudspeakers. R. D. Phillips, 1292 Norstead no. 6, St. Louis, MO 63121.
- Dynaco Stereo 150 wired, $150; Crown DC60 with walnut cabinet, $170; Shure SME non-detachable arm with XLM Mk. II Super, $95; Tandberg TLD310 with recently replaced R/P head, $300. Lewis Dalren; (617) 273-1105 days.
- Bose four-channel preamplifier with SQ board, $450; Sony 3200F basic amplifier, $250; Teac AN80 outboard Dolby unit, $75. Jim Krugh, 4600 Lamont, San Diego, CA 92109; (714) 273-0425.
- Dynaco PAT-5, nearly new, $125. Ken LaFleur; (617) 749-2219.
- Soundcraftsmen PE2217 preamplifier/equalizer, $300; SME non-detachable arm with ADC XLM, $90; Dynaco Stereo 150, $180. All equipment absolutely mint, with all packaging materials, etc. Dennis Curley; (617) 658-6568.
- Kenwood KT-7000 tuner with Abbott Lahti/Scott Kent phase-lock loop modification, $95. Bob Borden; (617) 276-3417 days or (617) 475-4817 evenings.
- Bose 1801, $500; Thorens 125/Rabco SL8E, $250; Transcriptors Saturn with Vestigal arm, $225. Tandberg 6041X, $300; Sony TA-2000F, $250. All equipment in excellent mechanical and electrical condition. Mike; (617) 237-0824 after 6 p.m.
- Small quantities of Scotch 207 open-reel tape, on 7- and 10 1/4-inch reels. Some virgin, some recorded once at conservative levels. Make an offer. Ken; (617) 646-3427.
- Dayton Wright XG8 Mk. I, mint, half price; J. E. Sugden C.51 (new) and two P.51's (demos), $680; Pioneer SE-700 electret headphones, new, with warranty card, $50; Quad 33/303, mint and less than 1 year old, $325; Sony ST-5000 FM tuner with walnut case, perfect, 25 hours of use, $350; B&W DM70's, standard, warranty still in effect, $750; Vacumatic 11 LP disc cleaner, new, $38; Audio Research SP-3A-1 with three years left on warranty, make offer; Watts Parastat Mk. 4 kit and Preeners (new); Audio Alternative. Ross Robinson, Apt. 1707, 8888 Riverside Drive East, Windsor, Ontario, N8S1H2; (519) 945-8486.

Wanted

- Crown VFX electronic crossover; Accuphase T-100 or Luxman ST-310 tuner; Cerwin-Vega 18-inch, Hartley Concertmaster 24-inch, or Janis infrawoofer; Revox A700 repair manual; prerecorded tapes, 7 1/2 ips half-track (from about 1959-1962); Quad AM11 tuner; Quad AM3

tuner; Sony TC-880-2 tape deck; Radford STA100; Lowther tubed amplifiers (two needed); NAIM NAP250 amplifier; Radford ZD200 amplifier or ZD200 pro amp; Dynaco 120 amplifier; Dynaco Mark IV tube amplifier. Ross Robinson, address above.

- Carrying case for Advent 100/100A Dolby unit. Will buy outright or will trade present walnut case. Dave Satz; (617) 492-2263.

Davis-Brinton Preamp

The Davis-Brinton Reference Standard Preamplifier will continue to be available to BAS members at dealer cost of $167.50 (plus Mass. sales tax of $8.38 for Mass. residents) until mid-August, after which the price will increase substantially. Interested parties should write to: Preamp, P.O. Box 215, Wayland, MA 01778. Payment in full is required with order. Units will be shipped approximately two weeks from date of receipt of prepaid order.

DAK Tape

If any members would like free samples of open-reel tape or cassettes, I suggest they call, toll-free, 1-800-423-2636. DAK Industries will send what you want, along with a catalog.

Have any BAS tape-philes obtained data on this brand? If the results are good, this line offers extremely favorable prices. — William McCarthy (Massachusetts)

The Case Against Audio International

There are two Audio Internationals in Germany, one legitimate and one a probable fraud. The legitimate one is located in Frankfurt. (Dick Burwen has informed me that Burwen Laboratories has had successful business dealings with AI-Frankfurt.) I apologize for my ignorance of their existence in my previous note (see April Speaker) and for any inconvenience I may have caused them.

The questionable AI is (or was) located in Berlin. I say "was" because I received a letter from them saying that they have given up that address, but not stating any new address. I received a letter from a Frankfurt bank whose stamp appeared on my cancelled check; they tell me that there is no company called "Audio International GmbH. i.G." in their area. But the clincher is a letter I received from Hermann Hoffmann of AI-Frankfurt that states that AI-Berlin is a fraud and that AI-Frankfurt is bringing criminal charges against them.

In the meantime, I'm still trying to recover my loss. I would like to hear from anybody who knows anything more about AI-Berlin, anyone who has sent them money, and especially anyone who can offer intelligent advice or help in my legal problems. Write to me via P.O. Box 7 or call (617) 646-3427. — Ken Deen (Massachusetts)

Direct Equipment Imports

The mail-order firm "Photofidelity Ltd.," Box 8716, Tamuning, Guam 96911, offers a rather complete catalog of Japanese goods at very low prices. Have any members dealt with this company, and are they reliable? — Ross Robinson (Ontario)

Sound Advice/International Audio Review Fission Unraveled

Peter Moncrieff, editor of the old Sound Advice, has taken many of his helpers with him to his home in Berkeley to produce the new International Audio Review. But Ed Wodenjak, publisher of the old Sound Advice, is continuing the new Sound Advice. Moncrieff and Wodenjak were the main staff of the old Sound Advice. — John Puccio (California)

The CSO

From Chicago we receive word that, while the BSO spent a few months at the Pops, the Chicago Symphony Orchestra went on strong until June 4. The current season has included twelve guest conductors (Giulini, Abbado, Barenboim, Haitink, Kondrashin, Kubelik, Muti, Rozhdenestvensky), a few dozen soloists (Janet Baker, Claudine Carlson, Maureen Forrester, Alicia de Larrocha, Thomas Paul, Josephine Beasley, Charles Wuorinen), and an ocassionally daring program (Wuorinen, Piano Concerto No. 2; Janacek, Sinfonietta; Dvorak, Stabat Mater; Vaughan Williams, Tuba Concerto; Sessions, Lilacs; Stout, Passion). It is unfortunate that these performances are available only to Chicagoians.

Penguin Stereo Guide—Part III

This a continuation of the list of outstanding records that Brian Leeming has culled from The Penguin Stereo Record Guide. All are available from the BAS Record Importing Service.

- Mayr, Piano Concerto No. 1 (C Major), Littauer (piano), Hamburg Symphony, Turnabout 34526.
- Moeran, Symphony in g Minor, Boult, New Philharmonia, Lyrita SRCS 70.
- Monteverdi, Madrigals, Books 8-10, Leppard, English Chamber Orchestra, Philips 6799006 (5 discs).
- Mozart, Piano Concertos 8 & 9, plus Rondo no. 1, Ashkenazy (piano), Kertesz, London Symphony, London 6501.
- Mozart, Piano Concertos 21 & 25, Bishop (piano), Davis, London Symphony, Philips 6500431.
- Mozart, Piano Concertos 23 & 24, Kempff (piano), Bamberg Symphony, DGG SLPM 138645.
- Mozart, Piano Concerto 27 and Double Concerto for Piano (K.365), Gilels (piano), Vienna Philharmonic, DGG 2530456.
- Mozart, String Quartets 1-23, Italian Quartet, Philips 6747097 (9 discs).
- Offenbach, Tales of Hoffman, London 13106 (3 discs).
- Paganini, Violin Concerto 1, Pearlman (violin), Royal Philharmonic, HMV ASD2782.
- Prokofiev, Violin Concerto 2, Ostriakh, Philharmonia Orchestra, HMV SXLP30155.
- Prokofiev, Peter and the Wolf and Symphony No. 1 (Classical), Ralph Richardson (narrator), Sargent, London Symphony, Decca SPA90.

Good Vinyl: "Unrehearsed Experiment" and Imported Decca

I have auditioned Doug Erikson's "Unrehearsed Experiment" and find the record superb; it is far above the calibre of most commerical recordings. The album has tremendous dynamic range, excellent frequency range, and possibly the best illusion of depth I have ever heard. But it's not as closely miked as many other recordings. It presents the listener with a perspective slightly more distant than, say, the Sheffields. Also, it is noisy [my copy, two or three pops aside, is very quiet—Michael Riggs]—understandable with the low recording levels used, but not understandable when compared to the latest Sheffield, which is the quietest record I've ever heard. Of course the Sheffields have their faults too, among which I find is a rather strange imaging.

For the more standard repertoire, I find the current Deccas to be, overall, the most acceptable records available, especially if one wishes to listen to a good performance as well as good sound. They may be "hard as bricks," but I find them balanced, spacious, detailed, sharp, and clear, with excellent dynamics and frequency range and almost perfect imaging. My latest "Scheherazade" (Mehta, Decca SXL 6731) is everything I could want a good orchestral work to be. I find no trace of the edginess or glassiness I sometimes encounter with EMI recordings.

— John Puccio (California)

Looking for that Low End

One big disappointment in the typical audiophile's life is the absence of really deep bass on most commercial recordings. Consequently, the following three records may be of interest. One is already a classic, one is brand new, and one is a little known and hard to find import. I measured the frequency distribution of the bass on each with a 500-line (linear) real-time analyzer.

- "Dark Side of the Moon," Pink Floyd (domestic edition): The peak of the fundamental of the heartbeat occurs at 35 Hz.
- "The Sound of Musical Instruments," Acoustic Research: The jazz cut on side 2 is especially fine sounding, with very low noise. The opening cut on that side, "Toccata in D-minor," contains what must be among the lowest sustained fundamentals on record. The fortissimo passages have a fundamental (11 dB above the remaining information) of 36 Hz.
- "Concerto Grosso Per 1," The New Trolls on Cetra Records: This is a superb mixture of classical and rock, with very good recording quality and very nearly the lowest noise level (both hiss and pops) of any album I own. The fundamental of the pedal drum during the interesting drum solo on side 2 is 54 Hz. — Anon.

Nonclassical Classics

I have come across four nonclassical records that BAS members may find of interest.

Recently I was introduced to the jazz album "Matchbook," with Ralph Towner on twelve-string and classical guitar and Gary Burton on vibraharp (Polydor ECM 1056). The recording is unusually quiet and clean. Of special interest is the reproduction of the vibraharp. The attack transient is superbly reproduced, followed by the very open sheen of the instrument as the tone trails off. The guitar is also well recorded, though at times it seems a bit too metallic. Though Towner and Burton are excellent musicians, their form of jazz is a bit too "laid back" for my taste (except to serve as background music), but others may react differently.

The above album brought to mind an earlier but forgotten album in my collection by Gary Burton, "The New Quartet," also on Polydor (ECM 1030 ST). The recording quality is as good as that of "Matchbook," and the music is less mellow, thus more in line with my own taste.

Stanley Clarke's "Journey to Love" (Nemperor Records NE 433) is an excellent example of jazz-rock music. This recording is quiet, clean, and dynamic. The transients are especially well reproduced (listen to the first cut on side one, "Silly Putty"). At times the frequency extremes seem a bit attenuated, especially the cymbals. They seem mute, lacking their normal "air" (for example, on the title tune on side one). Clarke and his friends (including Jeff Beck, John McLaughlin, and Chick Corea) offer a wide range of material from the hard-hitting "Silly Putty" to the mellow "Song to John" (Part I) to the more ambitious "Concerto for Jazz/Rock Orchestra."

An unusually good recording of a live folk-rock performance is Joan Baez's "From Every Stage" (A&M Records SP 3704). According to the liner notes, an attempt was made in this two-record set to capture the sound of the actual performance, without later augmentation or overdubs, and the final product demonstrates that they were fairly successful. The recording is very quiet and clean. Ms. Baez's voice is especially well recorded, with a touch of ambience which, I assume, results from the live performance situation. The result is a smooth, three-dimensional reproduction of her voice. The backup instruments and vocals are almost as well recorded, though at times they seem more distant, with a slight attenuation of frequency extremes (the "acoustic" first disc is superior to the "electric" second one). The material she performs ranges from her early folk days ("Blowin' in the Wind") to more recent efforts ("Diamonds and Rust"), plus her usual political commentary ("The Ballad of Sacco and Vanzetti"). She also does new material, including a very good rendition of Bob Dylan's marvelous narrative, "Lily, Rosemary and the Jack of Hearts."

— Collins Beagle (Virginia)

Feedback from Authors

Regarding the use of Fletcher-Munson-type hearing sensation curves, two authors have reminded the editors to be a bit more accurate.

The first comment comes from author Elliot Berger with regard to his article "It's Even More Complex Than You Thought" in the April issue of the Speaker. In the introduction (page 1) it was stated that "our hearing is less frequency-sensitive than we may have thought." This is not quite in agreement with the article, and Berger remarks: "Actually, at the low frequencies, the Robinson-Dadson curves show lower thresholds than the Fletcher-Munson, but at higher levels, the latter show better sensitivity. Put another way, at low frequencies the Robinson-Dadson curves stay more parallel than the Fletcher-Munson curves, which tend to bunch up (see Figs. 1 and 2)." [At high input levels, the Fletcher-Munson curves diverge, while the Robinson-Dadson curves retain generally identical curvature. The point of the introductory comment was that the variation with level is smaller if the newer data are correct. Berger's point is that the variation in sensitivity with frequency is larger with the new data. — H.Z.]

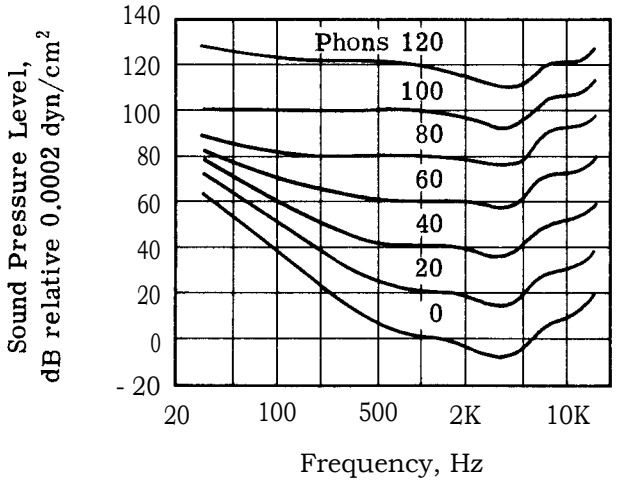

Fig. 1. Fletcher-Munson curves

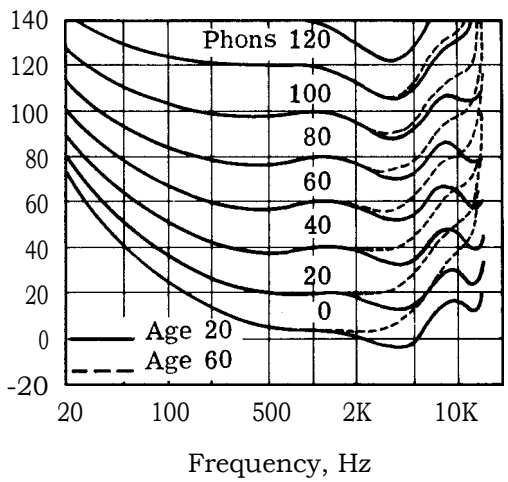

Fig. 2. Robinson-Dadson curves

Regardless of the behavior of these averaged data, the deviation of any individual's hearing from the curves is enormous, and loss of high-frequency sensitivity with old age is not the only important factor (see point 8 of the article): "In fact, the major factor is that at higher frequencies, when the wavelengths of sound start approaching the dimensions of the convolutions of the pinna and concha, there will be more inter-subject variance due to varying ear geometry. In young populations (less than 30), the standard deviation also increases with frequency; my data show that the deviation goes from 4.5 dB at 500 Hz to 17 dB to 6 kHz. The magnitude of the presbycusis corrections amounts to approximately 25 dB (median value) at 6 kHz and 60 years of age."

The second comment comes from author John Sprague, and is in relation to "A-B Testing and `Golden' Versus `Tin' Ears," on page 5 of the March issue of the Speaker.

Sprague indicates that, when the title of the note was created, the reference to A-B testing was misleading:

"In A-B testing, whether of different recordings of the same music (the same performance in different pressings, or different performances) or of the same recording played on different equipment, the usual possibility of quickly switching back and forth allows relative level setting to be done fairly accurately even without a meter. If a reference frequency is used in the range of highest hearing sensitivity, this will probably be better than 3 dB and quite possibly within 1 dB. Such care is usually taken in A-B testing situations, although it is rare in A-B demonstrations by salespeople.

"My example (in the fifth paragraph) is of two people (or even one person) hearing the same recording at different times and levels. Having them use the same room and equipment, etc., is intended to eliminate all variables except playback level. Of course, in practice, the equipment will not perform identically at playback levels 10 dB or more apart. This 10 dB seems about the least at which the non-linearity of hearing might be expected to cause noticeable differences in tonal balance.

"A sentence left off the end of paragraph two, although repeated more simply as the second sentence in paragraph four, leaves a gap requiring the reader to answer a question. The omitted sentence is: `The one with the less linear hearing will experience the greatest differences due to playback level changes, and the one with more linear hearing will experience the least differences.'

"In the fifth paragraph, the third sentence originally was: `If they, from differences in personal preference, use different volume control settings, this can be a source of different playback levels with attendant differences in perceived sound quality due only to differences in their hearing characteristics.' The underlined part was omitted. More simply, . . . this can be a source of subjective differences due to their hearing characteristics. The word `exactly' in the last sentence of this paragraph is not mine.

"In the next to the last paragraph, the second sentence, the first word `and' was omitted.

"My last paragraph was not intended to offer a panacea, but rather to provoke response from live recordists. The trap the editors walked into is room acoustics. Various resonances and standing waves are excited during the live performance, depending on the location of the instrument or instruments, and are recorded to some degree depending on microphone placement. Even though the loudspeaker and listener may not duplicate these locations, some of the same resonances are likely to be excited again during playback (in the same room). Unless the room is quite good, this increase in some resonances may become disturbingly obvious. This is most likely to be evident in the upper bass range, about 100 to 200 Hz, where there is significant musical content and a wider spacing between resonances than at higher frequencies. Thus the resonances stand out instead of blending. This could be avoided by using music falling in the treble clef, or with lower tones of only brief duration.

"Most of us will still rely on reviewers to some degree for economic reasons."

Otala Reports TIM Measurements

Unfortunately I have not been a regular reader of the Speaker, but a copy of the April 1975 issue prompted me to some comments on the letter of Robert Carver, President, Phase Linear. Bob explicitly states "Can the musical signal source from a tuner or cartridge or tape recorder exceed the slew-rate limit of a conventional well-designed (heavy lag compensation) amplifier? The answer is NO WAY! This is not a matter of opinion; it is a matter of fact."

We have not tested any of Bob's designs so far, so that the above statement might possibly hold true for them. However, they would then be rare exceptions, as roughly two thirds of all commercial amplifiers we have measured show a marked tendency to produce TIM with ordinary

tape or disc input program material. We suspect that in most of the cases, excessive tendency to TIM has been created by design errors,[1] the designer apparently having been unaware of the phenomenon and of ways of avoiding it.[2] As a black-and-white generalization, Bob's statement, therefore, seems to be a matter of opinion, not a matter of fact.

The source of misunderstanding seems to be the definition of TIM.[3] It is quite different from the definition of slew rate, and though these two phenomena are loosely related, their mechanism of occurrence is different. Consequently, a good slew rate does not automatically decrease the probability of TIM. In many amplifiers we have measured, TIM begins already at signal risetimes below a tenth of the slew rate.

TIM testing must therefore be performed with reliable methods, for instance; 1) the CCIF-IM method using two sinusoidal high-frequency test signals, 2) with the sine-square test,[4] or 3) with pseudo-random-noise intermodulation test.

As a large official government testing laboratory we would be interested in confidential testing of Bob's, or anybody elses, amplifiers in order to further the art of amplifier design, especially in regard to such subtle but crucial performance criteria.

References

1. Otala, M., Circuit design modifications for minimizing transient intermodulation distortion in audio amplifiers, Journal of the Audio Engineering Society, Vol. 20, No. 5, pp. 396-399, 1972.
2. Otala, M., and Ensomaa, R., Transient intermodulation distortion in commercial audio amplifiers, Journal of the Audio Engineering Society, Vol. 22, No. 4, pp. 244-246, May 1974.
3. Otala, M., and Leinonen, E., The theory of the transient intermodulation distortion. To be published in Proc. IREE (Australia).
4. Otala, M., and Leinonen, E., Possible methods for the measurement of transient intermodulation, 53rd AES Convention Zurich, March 2-5, 1976. To be published in Journal of the Audio Audio Engineering Society.

— Matti Otala (Technical Research Centre of Finland)

Input Capacitance: A Reply

On page 11 of the April Speaker, Peter Mitchell pointed out that some preamp manufacturers intentionally use very low capacitance at their phono input jacks while others use a medium-low value. I hope someone will accurately measure input capacitance values of many preamps and suggest a standard to the IHF. Also I certainly hope that my 1500-pF proposal is inappropriate, after all.

I have sent copies of my original note, together with Peter Mitchell's reply and the above comment, to Len Feldmen, of the IHF, for his consideration. — Dan Shanefield (New Jersey)

Double-Blind Testing: A Reply

Regarding Tom Mashey's comment on page 8 of the April Speaker regarding no-difference A-B comparisons, I must admit that a person who administers a double-blind AB test might indeed sway the listening jury into ignoring real differences in the sound. I try to avoid this by mixing some "blank" AA comparisons, and also by mixing in unequalized comparisons that do show audible differences. But it does seem likely that any test manager will have some influence on the actual test results.

For various reasons, with fully equalized tests, I never intentionally suggest that there is a difference and then just count on the jury's reports being random and self-neutralizing (component A coming out "better" about half the time and "worse" equally often). I do always ask other people present to alternate in running the double-blind tests, and I hope that this will at least tend to randomize the test-giver's bias or "set."

Adding another tier of blindness might seem a way out, but I can't think of any such procedure that is not extremely cumbersome. A physician friend of mine says that medical researchers joke about "triple-blind" tests; that's where the test-giver is incompetent and can't interpret the data. — Dan Shanefield (New Jersey)

Consumers Union

Consumers Union strikes again! Someone should really lambaste CU for the disservice they do. A recent issue contains ranking of medium-priced loudspeakers (Feb. 1976). Their rankings are based solely on the untenable assertion that total fidelity is based on a speaker's omnidirectional frequency response from 110 Hz to 14 kHz. They pay no attention to the importance of front hemispheric response, bass range or definition, transient response, midrange clarity, dispersion of higher frequencies, distortion, compatibility with other components, and on and on. Even their one measurement is dubious: An omnidirectional response curve does not say much about the capabilities of a speaker, unless that speaker was meant to reproduce omnidirectionally.

The results of their tests show up some of these inadequacies. Most notably, the ranking of the Larger Advent next to last because of a peaked midbass. What they miss here is that a peaked bass response will show up in all measurement angles around a speaker, while a peaked treble will not. Thus, a speaker, such as their highest rated Avid 102 (a speaker I greatly admire), that has a peaked treble on-axis and a falloff in response to the rear has a measured overall linear omnidirectional response. But which peak is more objectionable?

Worse still are their statements reducing all component purchases to the lowest common denominator: "The best speakers tested for this report would give most listeners about as much fidelity as they could want . . . bass deeper than these speakers can reproduce well should be of concern mainly to those with special fondness for organ or electronic music; extraordinary bass capability isn't really needed for most other kinds of music." Obviously, CU has been listening only to records whose bass has been severely limited, namely, most American records.
— John Puccio (California)

Oscillator Queries

I have assembled the BAS oscillator, and found it to work well. However, proper calibration is a problem. A friend with an oscilloscope and commercial oscillator helped with an initial effort, but we found it a difficult task, even in the broad 20- to 100-Hz range. Can anyone suggest a more easily used replacement vernier tuning mechanism plus trimming resistor for easier calibration or recalibration in the future?

I plan to use the oscillator as an aid in designing speaker enclosures. Has anyone a voltmeter design appropriate for speaker work? I'm interested in an inexpensive kit similar to the BAS oscillator, as commercial units are too expensive. — Carlos E. Bauza (North Carolina)

Help Wanted

Have any members found good FM antennas for apartment installation? They should be more effective than a ribbon dipole, but should not require rooftop installation.

How about automobile radio/cassette units priced under $300?

Anyone with good recommendations, please write Robert Garlitz, 33 Fox Park, Plymouth, New Hampshire 03264, or write the BAS at Box 7.

The Quad 405 Amplifier Gains Another Fan

Several years ago when I acquired a pair of IMF Monitor III's, I became aware that my McIntosh tube amplifiers, dating from 1959, were no longer adequate. From time to time I tried several of the then-current solid-state amplifiers, but they all had a slightly shrill "transistor sound."

Early this year I tried a new Quad 405 and was converted immediately. As compared with the McIntosh Mc-30's, the most obvious improvement was the apparent strengthening of the lower register and the added impact of bass drums and tympani. I next noted the enhanced transparency of the upper midrange and treble. Even my wife and daughter noticed the stronger and more detailed bass and commented on the uncanny clarity of the system as heard at low volume from the next room.

Aware of the controversy over wide-range versus restricted frequency response in amplifiers, I can only say that the 405 has done a lot for my system. I think its low-end rolloff below 30 Hz is a positive benefit—it seems to minimize the low-frequency "garbage" that gets through the transmission lines of my IMF's. In short, I am very pleased with the Quad 405. Its 100 watts/channel seems to be about right for the IMF's, and I find not a trace of "transistor sound." I've had no problems of any kind in 300 hours of operation. — Thomas Shedd (Illinois)

More on the Quad 405

In the comment on page 13 of the March Speaker discussing the Quad 405 power amplifier (as taken from the March issue of Wireless World and from advertising literature from the company), it was noted that: " . . . the raw specs are not outstanding. Power is 100 watts/channel at less than 0.01% THD, but the use of limiting is suggested with Quad's own electrostatic loudspeakers." Quad has taken exception to the wording and suggests that the 0.01% THD at 100 watts is indeed outstanding. Based on several members listening tests and comments, we agree, Quad also correctly emphasizes that it is the Quad loudspeakers, not the amplifier, that must be protected by the voltage limiting (± 30 volts).

The total power available does, however, remain on the low side for many audiophiles, however clean those watts are. And the loss of power into low impedances is indeed a problem, as many members are using AR-LST's, AR-3a's, or smaller Advents in the rear. Here the comparatively low power, much less the lack of higher power into 4 ohms, is a serious disadvantage. For higher power, Quad offers a method for using both channels of a 405 into a single loudspeaker, and information can be obtained from them on the proper connections. (Don't just parallel the outputs.) — Acoustical Mfg. Co., Nate Garfinkle, & Ed.

KEF 104, and Fulton 80 and J Loudspeakers

The KEF 104 loudspeakers are well-balanced and exceptionally clean, but I doubt that they are a match, overall, for several other, admittedly more costly, speaker systems. For example, the 104's haven't the midrange clarity, of the Magnaplanars or Dayton-Wrights. They haven't the tightly controlled bass or realistic high end of the Infinity SS-IA's or the Fulton J's. Nor do the 104's possess the razor-sharp definition of the Beveridge speakers [see article below].

On the other hand they have none of the glaring faults of their competition, e.g., the peaked upper treble of the Philips or the loose, flabby bass of the "improved" Dahlquist. Readers might, however, be interested in the views of a British magazine, Hi Fi Answers, on the 104's. To paraphrase its summary, the 104 has an extended bass response, but one not particularly well-defined, a slightly constricted midrange (another reviewer in the same magazine said the 104 is boxy), and a quite linear but unrealistic-sounding treble.

The KEF speaker sounds to me very much like another fine English speaker, the Gale GS-401A. But if I were in the market for speakers, I think I might spend the extra few hundred dollars necessary to buy some old reliable Quads. And if I didn't have the money to spend, I would seriously consider spending a lot less and buying a pair of Avid 103's. In spite of their high-frequency peak, the 103's are a remarkable value.

Next the FMI 80 and the Fulton J's: I don't consider the 80 to be the finest speaker in the world, but I am impressed with its clarity. I do fault the lack of deep bass. The bottom octave or so is entirely missing and they exhibit an elevated response of 2 to 4 dB centered about 240 Hz.

[Note: In the Absolute Sound review of the Fulton 80, unit-to-unit variation was a problem. Puccio has tested six units and found one defective and one with a 2 to 3 dB dip at 2000 Hz. I do hear a midrange peak. — Michael Riggs]

I now own a Fulton J system, using the 80 in the midrange, and I have heard few speakers to compare, overall, to these. I have never heard a high-end peak, as has been reported by some other listeners. — John Puccio (California)

B&W Loudspeakers

In the 18 issues of The BAS Speaker I've read to date, I've seen Bowers and Wilkins loudspeakers mentioned only once. This neglect is unfortunate, because I sincerely believe that each one of the B&W units represents the best speaker in its price class.

Members might be interested in two interesting professional opinions of B&W speakers. First, Rectilinear uses the model DM2a ($700/pair) as a guide in producing their own loudspeakers. They have admitted that they find it impossible to produce units with B&W's quality and still make a profit. Second, Audio magazine has privately admitted that the DM6 is "by far" the best loudspeaker system they have heard. There are only two pairs of these in the U.S. today—one at The Audio Lab in New Brunswick, N.J., and the second at an unknown location.

I use DM4's, which are identical to the 2a's except for the use of ducted-port woofer loading instead of the acoustic-line loading used on the 2a. These are, to me, the best speakers available for less than $700 a pair—and with the 4's selling for $460/pair, that is quite a bargain. I find the highs on the 4's utterly clean, with those of the 6's even more so. The bass from the 6's is both room-wrecking and accurate.

If you can find a dealer, I urge you to listen. You won't be sorry.

— David Sherwood (New Jersey)

Some Impressions of the New I. M. Fried Loudspeakers

Recently Irving M. Fried held a speaker seminar at The House of Sound, his dealer in Baltimore. He had on hand for demonstration and discussion his entire line of speakers. Among them were the new Super Q, which he is bringing to market after two years of development, the Model R Series II, which, like the Super Q, is available only as a factory-built unit, and the Model H, currently being offered only as a kit. A production line for the H is almost ready, and a built-up version will be available shortly.

Next to the H, the most surprising speaker at the seminar was the Super Q. Its transparency is amazing. The company line is that the Q was harder to design and to build than either the H or the R because of the limitations imposed by the projected retail price. They had to develop a new cone material, etc. *In* any event, the Super Q is going for $140, a price that has got to make it a great value if it sounds as good the second time around as it did on first listening. (Really definitive impressions of any of the speakers were precluded by the absence of A-B comparisons between the Fried speakers and models by competing manufacturers.)

The Series II R's are very wide range and open, with good driver blending. As with the Super Q, it will be offered only in a factory-built version. When asked, Mr. Fried said that neither will be offered in kit form because of inadequate customer interest. His son, H. M. Fried, mentioned that it doesn't take much effort for a speaker company to offer a kit version of a current production model, so should demand for these speaker kits increase sufficiently, there's no reason why the company couldn't reintroduce them.

The star of the show was the new Model H ($700 kit, $1900 factory-built). Its low end is astonishing. Again, I note the lack of direct A-B comparisons with other brands, but even so, I should venture to say that the Model H has a more natural, life-like bottom than the DQ-10's, the Quad ESL's, or the Modular J's. The bass isn't strained or forced; it is neither larger-than-life nor distant.

Emphasis on the smoothness of the low end is not to slight the H's reproduction of the rest of the audible spectrum. It seems, on first listening, to be up to snuff with other full-range systems. It's just that the bass reproduction of the H is so outstanding that it overshadowed everything else at the seminar. Surely one would need a multi-amp system with electronic crossovers and an infrawoofer or two to equal the naturalness of the Model H's low end.

— Charles F. Eastman (Maryland)

The Beveridge Loudspeaker/Amplifier System

I would like to report on a new loudspeaker system, the Beveridge, produced by a small California company. A Beveridge stereo system comprises two loudspeakers plus integral power amplifiers.

Before I pass on my listening impressions, I should note that my auditioning session lasted only one hour, which was inadequate for a final opinion. Also, high ambient noise was present in the showroom, and the source material auditioned was from discs. Ancillary equipment included an AGI preamplifier, a Denon moving-coil cartridge, the Denon transformer, and an ST-7 turntable.

With the above qualifications noted, I will commit to an interim opinion that the Beveridge system is the best loudspeaker pair I have ever heard, the only commercially available system that I have not heard is the latest version of the Dayton-Wright.

The system has no audible coloration and the quality of construction, including integral hybrid power amplifiers, seems excellent. The speaker has recently won an industrial design award in California.

Of course, I did find some negatives. The system can attain only 90 to 95 dB levels in an average size room. The bass response is limited to above the visceral range, although flat response to 40 Hz (and nothing much following) is claimed. Each speaker is overly imposing at 6½ feet in height. Price is $4000 for the stereo pair.

The Beveridge representative informed me that Harold Beveridge, the designer of the system, was once a Boston audiophile who worked for Raytheon. The system has been in design since 1950, and several patents are on issue. The Company employs seven people and all manufacturing is performed within the company. The company guarantees all parts except tubes for a period of 10 years.

— Joel Disend (Rhode Island)

[Accompanying Disend's contribution was an imposing manuscript by Mr. Beveridge, entitled "Some Reflections on Sound Reproduction for the Home." Members may be able to obtain a copy from Harold Beveridge, Inc., 422 N. Milpas St., Santa Barbara, CA 93103. We cannot reproduce portions of this paper here, but we do note that the "Beveridge Cylindrical Sound System" includes

"an electrostatic transducer" and "a dispersion lens covering 180°." Operation of the lens is "invarient with frequency, and a radiation pattern of 180° is achieved. Energy radiates from a slot six feet high. No subdivision of the audio spectrum, either electrical or mechanical, is used . . ." Peak output of the amplifier is specified as "1000 Volt-Amperes." — Ed.]

Helpful Hints for Speaker Builders

For anyone interested in building speakers with JBL drivers, the JBL Speaker Construction Kit is available for $5. It contains very useful information, plus plans for a variety of enclosures, all in an elegant presentation. I highly recommend it.

Altec provides a similar brochure for $2, but it is not as good.

— Carlos E. Bauza (North Carolina)

In the Literature

The Absolute Sound, Vol. 2, No. 7

H. Pearson and Company are with us again, returned after these many months. This issue contains feature reviews of the Infinity SS-IA, the Yamaha B-1, the Dyna PAT-5, the Dayton-Wright XG-8 Mk. III, the Levinson JC-2, and the Ohm F. Also included are shorter pieces on the Quad ESL, the Yamaha YP-800, the Epicure Model One, the Quintessence preamp, the Denon cartridges, the Marantz 3600, the Audio-Technica AT-1009, the Yamaha NS-1000, the ARC Dual 76a, the BGW 500D, the Kenwood 700C and 700M, the Luxman M-6000, the Linn-Sondek LP-12, the SAE 31B, the ADC XLM Mk. II and Q-36, the Sony 756, the Dayton-Wright 535 head amp, the H/K Rabco ST-7, the Dahlquist DQ-10a, the Luxman 3045, and the Crown OC-150. The reader will aso find letters, record reviews, the results of the last reader survey (on audio dealers) and, perhaps most interesting of all, a brief article on TAS's attitude toward A-B testing and toward Sound Advice. An enormous issue.

Audio, June 1976

- Note the Panasonic SP-10 Mk. 2 turntable ($695) on page 16; another "Making Records" piece, the fourth this year in the slicks (p. 38); ignore the rumble filter on page 44; and note in passing the appearance of a McIntosh receiver for review. Unless you subscribe, read this one standing at the newsstand.

Audio Amateur, 1/76

- Audio Mixers: For the recordist. This two-page installment is the first of promised four, all by Edward Gately, Jr., a pro who should know whereof he writes. (p. 4)
- A Vacuum System for Cleaning Records, by BAS member Bob Borden: When this appeared in the October 1974 issue of The Speaker, we commented that this unit was 1) extremely effective, 2) a necessity for the audiophile truly concerned with getting the most out of his disc collection, and 3) really easy to build. We repeat those comments now. (p. 6)
- A tube-amplifier construction project is specialized and ambitious. (p. 12)
- A Seismic Platform: If you're a mechanical engineer, for about the same cost as the acoustic-feedback isolation unit described in the June 1976 issue of Stereo Review, you can build a unit specifically suited to your turntable dimensions. (p. 17)
- The kit report on the Ace preamplifier is too kind to this unit (p. 26). The review of the Toyo 67 peak reading "VU" meter contains information not included in the April 1976 issue of The Speaker (p. 31).
- A long letter by BAS member Scott Kent on preamp mods, tape, and tape recorders. (p. 41)

Audio Engineering Society, Journal of the, April 1976

- The Use of Fibrous Materials in Loudspeaker Enclosures: These materials are used to damp resonances and also, as shown in this article, to increase the effective volume of an enclosure by reducing the propagation velocity of sound waves. In this theoretical paper, reduction in dimensions of labyrinth and horn-loaded enclosures is discussed. (p. 162)
- Lacquer Warp, Advance Ball, and Disc Cutter Dynamics: This is an analysis of an equivalent circuit model of the Westrex 3DII cutter mounted on a Scully lathe. Some disc cutter systems utilize an advance ball mechanism that rides the lacquer disc and mechanically transmits surface irregularities to the cutter head to reduce groove modulation over warps. Models show that without advance ball techniques, there is an 18 dB rejection of warp inputs below 6 Hz; with the ball technique, the rejection rises to 38 dB and remains better than 18 dB up to 15 Hz. The Westrex system uses a spring and dashpot mechanism, similar to that of Rabinow's tonearms. This article, which comes from CBS Technology Center, may be of interest to those experimenting with tonearm damping. (p. 182)
- A Note on Modulation Distortion: Coaxial and Spaced Tweeter-Woofer Loudspeakers; and A Note on Modulation Distortion: Two Frequencies Radiated from the Same Diaphragm: Both of these are, of course, by Paul Klipsch. (pp. 186-187)
- News of the Boston Section Meetings for Sept., Nov., Dec., and Jan., where David Greisinger, Amar Bose, Chris Newman (film recording engineer for The French Connection, Godfather, Exorcist), and Dan Keele of Electro-Voice were featured. (p. 221) Between the BAS and the Boston chapter of the AES, lots of good programs are available in this area.

dB, April 1976

- Broadcast Sound: This new column discusses Dolby B in FM broadcasting. (p. 14)
- Two humorous articles (p. 19 and p. 41), plus three on PA and recording techniques: Enhancement, by Don Davis (p. 24), Zen and the Art of Recording (p. 32), and Reinforcement (p. 38).

dB, May 1976

- The Digital Delay Line Revisited: This piece is by the vice president of Eventide Clockworks, a leading manufacturer of delay lines. He discusses general operation and specific features of the model 1745M delay unit. (p. 30)
- Note also the advertisement for the Sound Concepts delay line on page 24.

EDN, April 20, 1976

- Op-Amp Active Filters—Simple to Design: Designs discussed here use IC's such as the LM144 which have programmable supply current. (p. 79)

Electronic Design, April 26, 1976

- Use FET's to Switch High Currents: By Lee Shaeffer, author of the EDN filter article. This piece has an interesting chart comparing four types of power transistors, including bipolar, standard JFET, VFET, and VMOS. (p. 66)

Electronic Design, May 24, 1976

- Current Controlled Bandpass Filter Can Be Built With One IC: This unit uses a Harris HA-2735 dual op-amp to give bandpass response, similar to an equalizer channel, with direct current-source control over center frequency. Might make the heart of a flexible 3- to 5-band equalizer that would do as much as a 10 to 12 fixed bander. (p. 96)

Hewlett-Packard, Application Note 192

- As pointed out in a previous column, this free 16-page pamphlet on narrow-band frequency analyzers is by way of an advertisement for the HP 3580A spectrum analyzer and the 3581A wave analyzer. Tests described here include distortion (HD and IM), frequency response, acoustic response, S/N, and crosstalk. Many of these are being seen in the Feldman tests, and this brochure is well worth obtaining. Available from HP at 1501 Page Mill Rd., Palo Alto, CA 94304.

High Fidelity, June 1976

- Reviews of five inexpensive loudspeakers make for very interesting comparison, keeping in mind the anechoic test conditions. Just think what sound the BIC can produce on the floor in a corner. (p. 35)
- The "Pathfinders" review of Henry Kloss's life is a joy. (p. 42)
- After several $/dB articles in The BAS Speaker, we find the same approach taken by High Fidelity. Decibels are indeed more important than raw power. (pp. 44, 50)

Popular Electronics, June 1976

- Time delay is here. The appearance of a very inexpensive time-delay kit ($40 for one channel, $60 for two) is a true landmark, but the specific circuit presented is of very questionable use in a true high-fidelity system. Treat either version as a toy, but a very interesting one, and perhaps something to hear to appreciate the psychoacoustic design subtleties of the two audiophile delay units presently on the market. (In addition to more easily varied delay and carefully selected mixing of the two channels in the audiophile units, the Sound Concepts analog delay unit uses compression-expansion to increase the limited dynamic range of the bucket-brigade chip.) (p. 33)
- This time appearing first in Popular Electronics, the review of the Sound Concepts SD-50 analog delay unit is unfortunately lacking in technical details. One quote is worth mention: "The delay unit makes almost any stereo or mono program sound more real than 99% of the available quadraphonic programs." (p. 76)
- Also of interest in this issue, Ten Speaker Enclosure Fallacies (p. 39) and a simple new synthesizer (so far it is only an organ, since VCO operation is not specifically included; perhaps more modules are to come) from reliable old SWTPCO. (p. 59)

Radio Electronics, June 1976

- Testing HiFi Gear: A short summary of repair-shop tests, perhaps of interest for a noise-weighting circuit (A, B, and C weighting). Unfortunately, the specific input and output impedances for proper use are not given. (p. 45)
- Equipment reviews of the Phase Linear 2000 preamplifier show it to be perhaps overpriced and similar in innards to the Crown. Review of the Sansui SC-3000 cassette indicates another ho-hum unit. (p. 48)
- All [sic] About Function Generators, Part 2: Like the Hi-Fi testing piece, don't go out of your way for this. The crossover-distortion examples apply to 1960 equipment, and the use of triangles for clipping indication is not worth buying a function generator. (p. 56) The prime reasons for obtaining a function generator remain simplicity of automatic sweep and constant output voltage with frequency.

Recording Engineer Producer, April 1976 (current issue)

- If you have never paged through this or similar publications, try to beg a copy from a professional friend. Advertisements for new equipment hitting the professional market is out of any normal audiophile's world.

- Of some interest is the announcement by Wakefield Manufacturing of a premium quality pressing operation (p. 14, p. 63)
- Stereo Miking Techniques Using Computer Pattern Analysis: Contains ". . . graphs of the polar response of the sum of two mikes at some arbitrary angle to each other." The many illustrations given can be used as a guide in placing crossed-cardioids for best pickup of small groups. (p. 19)
- Magnetic Tape Heads—Ferrite Vs. Metal: A biased report. (p. 26)
- Automated Mikedown: Computers run multichannel mixing. This is an impressive piece for its multichannel complexity (but why do the results sound so bad?). (p. 35)
- Soundstream—The First Digital Studio: Again, very impressive techniques in an all digital studio. (p. 57)
- Catch the ads on p. 5 (Ampex) and p. 47 (digital time delay).

Reel News, Jan.-May, 1976

- In spite of the final demise of Ampex open-reel tapes, Barclay-Crocker issues another newsletter. Ambiphon/Sonar are still offering new releases, but RCA is letting their open reel contract with Stereotape lapse. On the bright side, London and DGG may be signing up with Stereotape, and all future offerings will be Dolby encoded. Barclay-Crocker's manufactured tapes remain a while in the future.

Schwann, Artist Issue, 1976

The ads say that this one goes fast, even at $3.95. They aren't kidding, so buy one now or be sorry for another half a decade. In case you have never seen this issue, it is a cross listing by performing group, conductor, soloist, etc., for all discs in a Schwann standard edition. An example of its use might be finding all of the listed recordings by Janet Baker, or all the extant recordings by the Berg Quartet.

Stereo Review, June 1976

- In the letters section, note Nakamichi's comment that they have data showing five times as much abrasivity with chrome than with ferric cassette tape. (This is in disagreement with Advent data, which show that environmental factors are much more important than difference in tape type. Perhaps both views are correct, but it would be nice to see some actual data verified by a third party—but not TDK and not DuPont (TDK makes Nakamichi tape). (p. 8)
- Subscription information to dB and to Recording Engineer/Producer is given on page 20.
- From Julian Hirsch comes a tirade against Consumers Union for their loudspeaker rankings. One wonders, however, if CU readers will ever hear of it. (p. 26)
- The review of the simple but apparently effective Netronics turntable sub-base should provide glad tidings to many of us. The review of the SAE XXV power amplifier, as far as it goes, is stunning. And the ESS/Heil AMT-la loudspeaker looks like a really new beast, even if the designers apparently tried for uniform power response in spite of a vertically beamy tweeter. (p. 30)
- This fine issue continues with some really good suggestions for perking up the hi-fi system, plus a hard stab at TV "music" and an enjoyable Eric Salzman review of early opera. If you don't read this one cover to cover, it's a mistake.

May BAS Meeting

Business Meeting

MIT again provided an auditorium for the May meeting. High on the agenda for the business portion of the meeting was a request for volunteer editorial staff for The BAS Speaker. The distribution operation is also bogging down from lack of help. Details are given in the body of this issue.

Again we are looking for a meeting location. Can you suggest one?

Al Southwick reported some correspondence with the designers and manufacturers of Sound Guard, Discwasher, and DiscProtec. It was found that use of the Discwasher does not affect Sound Guard, nor is the Discwasher affected by Sound Guard. However, an objection to the method of applying Sound Guard was raised by one individual involved in the development of all three products. When sprayed on the record as advised, nine to ten splotches of fluid form, and only very careful and thorough use of the burnishing tool will spread these splotches evenly and to the proper thickness. Unless the coating is thin, the noise level rises instead of decreasing. Under an electron microscope, the globules on an improperly burnished disc look like basketballs, whereas ideally they should look like ping pong balls. It is the application technique that the DiscProtec company is improving, since both companies use the same "glop." Jim Brinton reported that there is a firm theoretical reason to believe Sound Guard is a good protection system when applied correctly. Al Foster will perform some investigations to help clarify the situation.

This month's market action included all that was reported last month, plus an announcement by Abbott Lahti of a new accessory that disconnects one's loudspeakers when the power amplifier is turned on or off. A construction article will appear in a future issue.

Meeting Feature: McIntosh Laboratory

Our guests from McIntosh were Gordon Gow, Executive Vice President; Sidney Corderman, Vice President for R&D; and Roger Rusell, Director of the Acoustical Laboratory. Mr. Gow made the major presentation. His talk addressed phase shift, square waves, technical writers, advertising, product reliability, future products, and other subjects. At one time he was a director of the General Semantics Society at San Francisco State College, and he has great interest in the use and misuse of language. A careful listen to a recording of his talk reveals that his use of modifiers and metaphors was outstanding. Gow returned several times to the subject of technical writers who pontificate on the requirements for zero phase shift and perfect square-wave response in electronics, and to those writers who use nebulous terms such as "grainy" or "sheen," which are undefined and imprecise (although no precise, well-defined words were offered as replacements). Potshots were also taken against critics of McIntosh, "the foremost producer of acoustical measuring equipment in the world" [B&K], hi-fi dealers' lack of knowledge, some BAS members, The Stereophile, Audio, Stereo Review, High Fidelity, The Absolute Sound (which Gow termed "The Absolute Baloney"), and people considerably over his height of "5 feet nothing."

Gow's use of words as a battering ram on enemies of McIntosh, real or imagined, was highly skilled and could cause one to suspect sophistry. His message was somewhat stream-of-conscious. Gow claimed that advertising "puffery" was forgiveable, even necessary, to move a product out of the warehouse. In defending the use of autoformers in their amplifiers, however, he did attack advertising by Yamaha, which, in praising their use of DC coupling throughout one unit, claimed they did not "transformer" or "capacitor" the sound to death.

Picking on technical writers in popular audio magazines who "pontificate" and abuse language in the praise of new products, he attacked Bob Carver's article in Audio on amplifier design as an example. Carver claimed that connecting two of his amplifier channels in series resulted in amplifiers working in "quadrature" and producing four times the power output of one channel alone; no way, said Gow, can this happen, and the amplifier will produce only twice the power of one channel. The use of "quadrature" and the faulty math should have been caught by the editor. One member of the audience commented that there are very few editors of commercial audio magazines ("about 1½ of them") who are technically competent.

Gow stated that when one wishes not to communicate detailed information, one should use polysyllabic words and higher order abstractions, as in the Nazi regime of the thirties. Today one

of the most misused words of advertising puffery is "breakthrough." All designs are compromises of geometry, weight, complexity, and cost, and nothing is idealized. No company has a monopoly on brains, and any step forward by one company will quickly be followed by others. The "breakthrough" may not even be a step forward. One of today's heralded breakthroughs is the vertical FET. Attempting to buy a Sony VFET, McIntosh found that only the Yamaha was available. They went through three of these before completing their tests. Finding 12 fuses on each side, Gow felt this showed "the feeling of security the engineers had in their product!" Measurements showed four harmonics at higher levels than the one measurable in McIntosh's latest 200-watt/channel unit. He failed to remark on any other measurement for the sound—Ed.] of the Yamaha amplifier.

To add to the state of controversy, the company is presently commissioning an article on "Conditional Truths and Propaganda Methods in Stereo Merchandising," and they are arranging for an article on phase shift and square-wave response to be written by Leonard Feldman. Praising the honesty of some of the British magazine reviews, Gow suggested that American magazines should follow suit. He praised one British magazine that panned one of their products for deserved reasons, which resulted in tightening of Mac's preproduction engineering practices.

McIntosh does not submit equipment for review for three reasons: (1) reviewers use only one degree of adjective, the superlative; (2) some reviewers ask for units "permanently," and Gow cited one case where he was told this was the price for having the unit reviewed; and (3) market research revealed that customers were influenced more by reviews in stores than in magazines, so they provided "reviews" for use in stores and promulgate the results of their amplifier clinics.

Gow stated that only about 120 to 150 days are required for an engineer to design a feasible product, while an additional three years is often required before production starts. This period is needed to design a product that can be manufactured on a production line to meet all specifications for every unit produced, with a high reliability in the field. It is possible to tie up $250,000 before one unit rolls off the production line. Failure to properly specify each part can be costly. The first McIntosh stereo preamp used a filament rectifier that had 1800 failures—at $30 per failure. This loss of approximately $55,000, when the company's gross was only $1 million, did not endear management to the owners. If a product has 400 components and the reliability of each is 0.9996 (4 component failures in 10,000), overall product reliability will be only 0.852, or roughly one failure in every seven units. Some failures are not immediately obvious. One of the foremost speaker manufacturers used a driver which in a year slowly demagnetized due to the alternating currents in the voice coil. Some transistors or IC's also fail or become noisy after some time because of chemical reactions resulting from improper cleaning.

There are parts to the "value" you get in an audio component: (1) the performance you get when you buy the item, (2) the performance through time (reliability), (3) the repairability, and (4) the dependability of the manufacturer. The emphasis by Gow on reliability, and the time and money McIntosh spends on it, confirms the belief that this is a prime motivating factor at McIntosh. Although their list prices fall into the usual range of 4 to 7 times parts cost, it is reliability and its achievement that adds to McIntosh's high price.

Today's customer is both sophisticated and hostile. The only real democratic institution left in this country is the cash register, and a manufacturer simply collects votes which are cast for him. If the votes are insufficient, the manufacturer goes out of business.

The average retail audio salesperson stays at a store for only two years, and he suffers from low pay and harassment. Many store owners are poorly informed and fail to read even the manufacturers' technical literature. To expect a salesperson to perform better than the owner is unreasonable.

Gow specifically named The Stereophile, The Absolute "Baloney," Richard Heyser ("If anyone can understand two consecutive lines, I'll give him a cigar."), and some members of the BAS all as publications and people who are propagating the square-wave "myth." Gow's basic thesis was that phase shift is unaudible and square-wave response is unimportant. A demonstration using a Tandberg 10X tape recorder was given showing that square waves at any frequency will not even pass through the recording process, yet change was not audible. At low frequencies the output looked like a differentiated waveform, similar to the waveform that would occur in air if we had a perfect transducer [Gow's opinion—Ed.]. So neither a tape recorder nor air will pass or propagate a square wave. Gow knows of no reputable article in any professional journal that makes the claim that square waves can be generated in air. Further, according to Gow, all so-called "marvelous transients" consist of close approximations to sine waves when spread out in time and looked at closely, and this includes the striking of the hammer on a piano string. When writers talk about the superb transient response of something, "it gives one the distinct impression that a lot of writers speak from minds unburdened with knowledge."

To align the two channels of a record or playback head to have effectively zero phase shift is generally impossible claimed Gow except for some rare random heads that will have no phase shift between channels. Playing a record with and without the Tandberg, Gow attempted to show that phase shift between channels was inaudible for musical material. A phase shift network with zero gain, exactly duplicating the tape recorder, was substituted for the tape recorder, with the same results. Then the network was kept in one channel and the other channel was connected directly, again with no claimed difference. One person in the audience did hear a difference immediately after the changeover. Gow stated that in a stereo recording with phase shift between the two channels, there is an audible effect on the stereo perspective, but after two seconds the ears have adapated to it and the listener is no longer aware of a definitive effect. Several times during his talk he remarked on the need for some unbiased research on phase distortion, transient response, and square-wave response to put to rest some of the myths that have grown up around these subjects. Mark Davis [MIT acoustics Ph.D. candidate] knows of one article that describes one type of phase distortion that is audible.

Corderman also spoke. He commented on the Holman square-wave preamp test and reported that McIntosh was unable to duplicate the results listed in The Speaker. He also suggested that a 0.6-volt peak signal could forward-bias some bipolar transistors and thus cause the even-harmonic distortion noted. In addition, he suggested that the C26 preamp that was tested had a 300-picofarad capacitor across one of the phono inputs, which may be the cause of the poor listening rating the preamp received.

A description of a method for measuring input capacity was given by Corderman, including a complicated equation. Those interested in making the measurement, which requires an oscillator or test record with single frequencies plus an AC voltmeter, can write to him at McIntosh Laboratory, Binghamton, New York, 13903 for a copy of a related article.

An analysis of the RIAA feedback network in a phono preamp was given. In particular it was noted that if the equivalent resistance of the network at 20 Hz is low, a "power" output stage in the phono preamp would be needed to drive the network properly. If the resistance is high, the input noise level would increase. McIntosh compromises this conflict by using a differential input stage with two low-noise transistors. This produces 3 dB more noise than the theoretical minimum, but McIntosh believes that this is the best possible choice for driving RIAA networks at the present time.

Gow believes that the variable time delay unit is a very good idea that holds great promise and that does not have the disadvantages of the various other four-channel processors. He finds it is a very satisfying psychoacoustic effect that he believes will be easier to sell than other quadraphonic equipment, and that has the advantage [to the consumer] of not immediately obsoleting stereo source material and equipment.

McIntosh has been associated with loudspeakers since 1950. At that time they hired Arthur Janszen as a consultant, and for six years essentially paid for the development of the Janszen constant-charge electrostatic tweeter. During the same time they also retained Rudy Bozak as a consultant. At the time a very small company, McIntosh felt too small to enter the loudspeaker business or to buy Bozak's facilities after a flood in his basement speaker factory so discouraged Bozak that he offered the business to McIntosh for $7,500. When Jim Lansing died, his company was offered to McIntosh for $15,000. Gow turned them down also. At that time the total loudspeaker business amounted to only about $350,000 yearly. Only when the figure reached $4,000,000 did Gow feel that McIntosh could afford to hire both good speaker designers and purchase the necessary test equipment and facilities to do the type of design that would meet McIntosh standards. Gow claims that no loudspeaker can be marketed today unless it can produce a sound pressure level of 110 dB. [There are a number of expensive units currently in the marketplace that will not exceed 95 to 105 dB.—K.N.] Encouraging them to enter the loudspeaker field is the fact that speakers are more profitable than electronics, the same reason given by Acoustic Research for withdrawing from the electronics part of their operations.

Gow announced that they will soon be marketing a line of equalizers, and in addition will market acoustical measuring equipment for dealers to use in customer's homes. Whereas Altec's goal is to obtain maximum gain of the system and to reduce peaks that cause acoustical feedback, the McIntosh goal is simple—to make the room sound good. The greatest cause of audible unhappiness with the sound field in a room is re-radiation by objects in the room, followed closely by room resonances. It is his belief that 2/3 to 3/4 of the hi-fi systems in the United States achieve less than 30% of their paid-for potential because of what can happen to the sound in the room. For the next several years it is McIntosh's goal to see that their customers get all the sound that they have paid for.

The question and answer period involved some very pointed questions, which, in several cases were not directly answered. The BAS is now almost four years old and the members are showing the effects that those four years have had in the types of questions asked. Perhaps it is also contributing to a growing reputation as "piranhas," for some of the questions attempted to pull down the edifice erected by Gow in support of his theories.

— Keith North

A Test For Preamplifier Audio Quality

Alvin Foster

After years of comparing and living with preamplifiers of various transistor and tube designs, I had concluded that none was significantly superior in flexibility or sound quality to my modified Marantz 7C. I remained convinced until I tested an Audio General Model 511. The 511 was audibly smoother and less veiled and elicited more detail and ambience from records than the 7C. The bass, unlike typical tube or transistor bass, was not "fat" (tube) or "smeared" (transistor), but was deep and realistic.

I began to purchase additional test equipment in an effort to measure what I was hearing. I was unwilling to accept the notion that my subjective observations could not be correlated with objective tests. My buying spree yielded a wave analyzer, a spectrum analyzer, and a true rms meter (AC VTVM). This equipment combined with a white/pink-noise generator, an RIAA pre-emphasis network, and a sine-wave generator that I already owned included all I needed to correlate my subjective evaluations with objective measurements.

Controlling Test Parameters: Level Matching

How typical it is for audiophiles to conduct subjective tests without controlling all known variables. This includes eliminating or minimizing any test parameter that may disguise or mask the outcome. Probably the most important parameter in comparison tests is matching levels.

To illustrate the importance of level matching, I'll describe a test I conducted of the hypothesis that it is impossible to subjectively balance the outputs of two amplifiers, and that small level differences produce subjective quality differences.

I first attempted to balance the output levels of two amplifiers without the aid of a pure signal source (sine-wave generator) and an AC VTVM. I was assisted by a panel of two or more audio "experts" or "golden ears" during this subjective level-matching and throughout all of my double-blind tests.

I next asked the panel to listen for differences, and I asked them not to discuss their subjective findings until each was satisfied or convinced of his own impressions. All panel members settled on amplifier A as the better. I then measured the 1-kHz level difference between the two amplifiers with a sine-wave generator and an AC VTVM, and found that amplifier A was 0.5 dB louder than amplifier B.

The panel had described amplifier A as being more open and realistic, particularly in the bass. When the amplifiers' outputs were properly matched, the panel concluded that the amplifiers were sonically identical, which indeed they were. Both amplifiers were the same model from the same manufacturer and were identical in all respects.

Subsequent testing indicated that level differences greater than 0.2 dB can be discerned by a panel 65% of the time if the program material contains a large amount of bass information and the panel is informed in advance that the two amplifiers are identical in all respects. (The importance of bass information agrees with the findings Rene Jeager reported to the BAS in April 1975, when he stated that small volume differences in the bass range are more discernible than in higher frequency ranges because of the compression effect the ear has on low-frequency energy.)

Too often reports from "golden ears" are accepted by the audio community as fact. Our unquestioning acceptance to a large extent probably accounts for the confusion, duplication, and waste that exist in our hobby. A typical example of this is the "Sweet Sixteen" speaker system published in Popular Science magazine some years ago. Several of us got burned or deafened by that experience.

Preliminary Tests: Search for a Definitive Test

The results of conventional tests (THD, IM, and frequency response) were outstanding for both the Audio General and the 7C (see Table 1), and thus could not account for my subjective test findings of added ambience in the phono stage of the Audio General. I postulated that there had to be a test that would correlate with the subjective differences, and I set about to find it.

My first test was for separation to see if the increased ambience was the result of some mixing or blending between the two channels. I alternately fed a 1-kHz sine wave, a 1-kHz square wave, and pink noise into one channel of the preamp under test. I terminated the undriven channel with a 50K resistor and measured its output, or isolation. Traditionally, a 1-kHz sine wave is used for this test, but I felt the square wave would yield results that correlated more closely with impulse noise, or music. Also, because I was looking primarily for out-of-phase information—ambience--I decided to employ pink noise, which has random phase. There were no significant differences between the two preamplifiers. The Audio General, contrary to my first theory, actually had superior separation.

My second test consisted of modifying the input capacitance of each preamplifier until the exhibited frequency responses from the CBS STR-100 test record were within 0.5 dB. The differences still persisted. (Subsequent tests indicated that differences of less than 200 pF are not audible in a typical tonearm/cartridge setup using the Shure M95ED or the Shure V15-III, two units with high inductance.)

Thirdly, I conducted the Holman cartridge interaction test and the square-wave test for even-order harmonic distortion (see Table 1). I also measured each unit's phono frequency response, all to no avail.

Next, I connected my pink-noise generator to the 7C via an RIAA pre-emphasis network and A-B'ed the output with the input. As expected, the output sounded identical to the input.

Then I accidently switched the noise generator to the unfiltered white-noise position, and immediately I noticed a drastic change in the character of the noise after it passed through the preamplifier. Instead of being diffuse and resembling steam escaping from a radiator, it sounded thick and heavy. It sounded as if someone had turned off the treble and raised the bass to maximum. I discounted the importance of this white-noise test, but eventually decided to try it on the Audio General, since all previous tests had failed to yield any correlation with my subjective impressions. To my surprise, the output of the Audio General sounded exactly like the input white noise and remained identical to the source until output clipping was reached. There was none of the bass emphasis of the '7C.

I discussed my results with Tom Holman (Advent), Robert Carver (Phase Linear), Mark Davis (Davis-Brinton Engineering), Dave Speigal (AGI), Ron Dunlap (Dunlap-Clarke), Scott Kent (BKM Associates), and Abbott Lahti (Power Systems) and all concluded initially that the test is unreal-

istic. It is essentially a test of slew-rate limiting, similar to the Holman square-wave test but much more difficult for a preamplifier to pass. In spite of our doubts as to its validity, I continued to conduct the test with as many preamplifiers as I could to see if my subjective impressions continued to correlate with the test outcome.

The clincher occurred somewhat by luck. Abbott Lahti had just completed a breadboard phono preamplifier. I listened to the unit with a panel and determined that it was audibly inferior to the AGI but smoother and less harsh than the 7C. Like the 7C, the Lahti preamplifier sailed through the Holman test, exhibiting no even-order harmonics greater than -80 dB, but it failed the white-noise test. I returned the unit to Lahti, and he modified it until it passed the white-noise test. A panel then A-B'ed the unit with the AGI, and, to our surprise, both were now identical. Eureka!

The White-Noise Test

Perfect white noise is infinite, continuous, random noise power distributed uniformly across the frequency spectrum. In the real world most things are not infinite, but the Scott 811-B random-noise generator is close enough, exhibiting constant energy from below 2 Hz to approximately 1 MHz. This entire bandwidth was used in all tests. Attempts by myself and others to band-limit the noise, for example, with a passive filter down 2 dB at 20 kHz, failed to give results that correlated with subjective impressions.

A consistent rms input noise level was now needed for use in all white-noise tests. The Lahti preamplifier was used to establish this reference because it misbehaved earlier than the other units that otherwise tested excellent. The true rms output of the white-noise generator before slew-rate-limiting in the Lahti preamp was 0.5 volt. This signal level fed an RIAA pre-emphasis network having an attenuation of 33 dB at 1 kHz. (See pre-emphasis network design in the November 1975 BAS Speaker.) The noise level entering the preamplifier under test was therefore 11 mV at 1 kHz and 110 mV at 20 kHz, clearly not enough to amplitude-overload (clip) any preamplifier. (Most preamplifiers have in excess of 1 volt input overload margin at 20 kHz; see Mark Davis, BAS Speaker, April 1976.) The true rms output of the Lahti preamp, which has a gain of 40 dB, was 0.66 volt, or about 1.4 volts peak-to-peak, well below output-stage clipping. I now had a well-defined test signal that would not cause clipping in any preamp to be tested.

Clipping Measurements: An Alternative to White Noise

Abbott Lahti reasoned that because the white-noise test was essentially a severe measure of slew rate, or speed, we could effectively resolve the level necessary for a preamplifier to pass the white-noise test by simply measuring the relative clipping levels at 1 kHz, 10 kHz, and 50 kHz. This test would be quantitative, while the white-noise test is qualitative.

We observed (see column 6 of Table 1) that if the 50-kHz clipping level is at least 50% of the 1-kHz level, the preamp sounds excellent. However, if the 50-kHz clipping level is 30% of the 1-kHz level or less, the unit sounds veiled. We therefore postulated that somewhere between these extremes is the acceptable minimum slew rate. With all the units we have tested, the subjective correlation has been 100%.

Observations on a Cartridge Fed Directly Into a Spectrum Analyzer

In an effort to rationalize the white-noise test I tried to determine what input a preamp actually "sees" from a cartridge. I terminated a Shure M95ED with a 47K resistor and fed the output directly into my spectrum analyzer. Because I was dealing with extremely low levels, however, spurious responses, hum, etc., limited my measurement accuracy. For example, the AM band (500 kHz to 1.5 MHz) was visible. The loudest radio stations were 125 μV, visible but not enough to cause audible problems. Shielding the cartridge decreased the radio interference.

I decided that the easiest way to observe the cartridge-record-preamp interaction would be to connect the tape outputs of the fastest preamplifier, the AGI (which claims a slew rate of 250 volts/microsecond) to the RIAA pre-emphasis network. The output of the network was then fed to the spectrum analyzer. This permitted me to reconstruct what the cartridge was feeding the preamplifier without interference. Observations:

1. There was no output above 55 kHz, ever; 55 kHz was the highest frequency observed and it was 75 dB down from the highest peak level. Output at 40 kHz was typically down 65 dB. No surprise, since cartridges are essentially low-pass filters.

2. In an effort to observe the noise spectrum of a record scratch or pop, I scratched several times with a pin the locked groove (spiral at the end of a side, closed by a concentric groove) of a record rotating at $33\frac{1}{3}$ rpm. I found that scratches behave essentially as square waves containing frequencies from about 1 kHz to 20 kHz at -30 dB and 30 kHz at -35 dB.

3. Music is very dense and consists of thousands of closely spaced frequencies, a good argument for the new two-tone intermodulation test.

As expected (see Holman, BAS Speaker, April 1976) none of the observed levels at the higher frequencies justifies the use of the bandwidth exhibited by the AGI. However, the audible correlation with the slew rate or white noise (see below) has held 100% of the time with both FET and transistor designs. I suspect that the cause of the correlation may lie somewhere in the ambiguous phenomenon called transient intermodulation distortion (TIM) or a similar high-frequency distortion effect.

Explanation of Tables 1 and 2

The data I obtained after measuring several preamplifiers is given in Table 1. The following is a description of each column in that table.

Column 1 identifies the preamplifier by name, model number, and serial number, and gives the price.

Column 2 lists the average of the Holman square-wave test. In most situations I was limited by the sensitivity of my test equipment. This is indicated by the symbol < (is less than), meaning it was not measurable. In the Holman test, a pure 1-kHz square wave is fed into a preamplifier and the level of even-order harmonics between 2 and 18 kHz produced by the preamp is measured. A preamp producing -68 dB or less of even-order harmonic distortion is believed to sound "good." (See BAS Speaker, Nov. 1975.)

Column 3 lists the phono section's frequency response deviation when driving an AC VTVM. An ideal phono preamplifier would have all zeros except at the frequency extremes, which indicates no deviation from the RIAA standard.

Column 4 lists the total harmonic distortion (THD) of the various preamplifiers at 2 volts out at the tape output. (For some tests, I had access to a Sound Technology or GR analyzer. This accounts for some variation in the limits of several of the measurements.)

Column 5 indicates the true rms signal-to-noise ratios, i.e., the ratio of the magnitude of the signal to that of the noise. A 1-kHz, 10-mV sine wave was fed to the preamp's phono input. The noise level, expressed in –dB, is an indication of how far down the noise is below the output level produced by the 10-mV input. A true rms meter was used because it is the most accurate and reliable type of meter for measuring noise. It generally yields figures higher than average responding meters.

The "shorted" column gives the signal-to-noise ratio when the preamp's inputs are terminated by a shorting plug. This condition often produces the best signal-to-noise figures.

The "1K resistor" column lists the signal-to-noise ratio when the preamp's input is terminated by a 1K resistor. A 1K resistor was used because it simulates the resistance the preamp "sees" when loaded by a typical cartridge. Because the terminating resistor is connected close to the input, extraneous noise and rf signals are minimized, allowing a more accurate reading.

The "cartridge" column lists the observed signal-to-noise ratio when the inputs are terminated by a real cartridge mounted inside an aluminum box. (The cartridge box was located so as to minimize hum.) Attempts to use a cartridge mounted in a turntable were quickly discarded because of the impossibility of repeatability. The turntable had to be physically moved in at least a hundred positions before noise was at a minimum. In general, this technique yielded figures about 2 dB worse than having the cartridge mounted in the metal box.

The "gain" column gives the output amplitude of the preamp when fed a 10-mV signal.

A filter that is down 2 dB at 20 kHz and rolls off at 6 dB/octave was used at the input of the true rms meter during the shorted signal-to-noise measurements. This was to eliminate extraneous rf, noise, etc., which was inaudible. All measurements were made at the tape output jacks.

A passive C-weighted filter was used in the noise measurements to represent the range to which the ear is most sensitive. The filter's response is about -3 dB at 30 Hz, -11 dB at 20 kHz, and generally flat but rolling between the two extremes. A-weighted measurements have been criticized because they have too much attenuation in the 60-Hz region.

How much signal-to-noise ratio is considered adequate? Currently there are no records with better than 70 dB signal-to-noise ratio. However, that may change, and therefore the higher the signal-to-noise figure the better. The cartridge signal-to-noise when filtered by the C-weighted filter is perhaps the most realistic figure. Note that preamps with less than 40 dB gain often exceeded the capabilities of my test gear.

Column 6 represents the test that correlates 100% with listening. Testing to date with the panel indicates that the 50-kHz output clipping level should be at least 50% of the 1-kHz level (see above). This is effectively a measure of power bandwidth.

The measurement is taken by feeding 1-kHz, 10-kHz, and 50-kHz sine waves into the preamp's phono inputs until clipping or slew-rate-limiting of the phono preamp is observed on the oscilloscope. The input level is then reduced to just below clipping, and the preamp's output is measured on an AC VTVM.

Column 7 lists the results of the white-noise test. This is an either-or test; the unit either passes or it fails. The preamps passing this test all sound identical. The Soundcraftsmen, which fails the white-noise test, is sonically identical to the other units rated excellent. This is obviously due to its exceptionally high slew-rate capability (see column 6). Some other anomaly, probably within its output section, causes it to fail the white-noise test. The Davis-Brinton preamplifier reacts similarly.

The level at which a preamp starts to fail the test can be observed on an oscilloscope or by ear. On an oscilloscope, the white noise becomes concentrated and starts to jump around on the screen at the onset of limiting by the preamp. Large gaps eventually appear in the scope's trace, indicating severe slew-rate limiting.

To detect limiting, I simply have a loudspeaker connected to the output of the Ballantine 320 true rms meter. At the onset of slew-rate limiting the noise becomes thick, heavy, and lacking in high frequencies. The sudden increase in bass energy is caused by the poor slewing of the white-noise peaks, which turns them into sawtooth or triangle waves. Most preamps will accept a small level of white noise, but only the units rated excellent accept the minimum rms level of the Lahti preamplifier.

An article by Edward F. McClain, Jr., in the March 1976 issue of the Journal of the Audio Engineering Society supports the idea of using white noise to determine audio quality. The author suggests that TIM can be measured by feeding white noise through a filter that eliminates the range between approximately 2 kHz and 17 kHz. The filtered noise also is down 3 dB at 46 kHz. He then suggests using a wave analyzer to determine if there are any signals remaining in the nulled region. "Clean" amplifiers, or those rated by the author as pleasant to listen to, do not produce significant outputs in the nulled region. This test is essentially a severe measure of IM distortion.

Column 8 indicates the subjective audio quality, the main point of the myriad of tests thrown at the preamps. The audio quality is divided into three categories: edgy, good, and excellent.

Edgy preamplifiers sound harsh and overly bright, and are tiring to listen to. (See Foster-Davis, BAS Speaker, Nov. 1975.) This may be because of high-frequency IM distortion.

The good preamplifiers all passed the Holman square-wave test but failed the white-noise test. Preamps rated good (see Foster, BAS Speaker, March 1976) are represented to some extent by the 7C or the "soft" sound. They sound thick, veiled, and lacking in ambience, probably the result of too much upper bass and a slight diminution of the high frequencies. They are not tiring to listen to, and one may prefer their sound to that of preamps rated excellent, especially if one's playback system tends to be overly bright. The bass is lacking in detail, depth, and realism.

Preamps rated excellent all sound alike. The realism is uncanny, and the increased ambience resembles the effect of adding a rear speaker for playing back out-of-phase information. All three categories were easily discernible by the panel when the test parameters were tightly controlled. The test parameters should include at least frequency response, input capacitance, and output level, and a good playback system should be used.

Two separate high-quality playback systems were used at various times to complete the test. System 1 consists of a Shure M95ED or a Shure V15-III cartridge mounted in a Decca tonearm, Phase Linear 700 amplifier, and a pair of LST-2's mounted on top of a pair of LST-1's and angled outward about 35 degrees. System 2 consists of a Denon 103-S (Shibata) moving-coil cartridge mounted in an SME (improved) arm, Dunlap-Clarke prototype moving-coil preamplifier, a Dunlap-Clarke Dreadnaught 1000 amplifier, and the improved Dayton-Wright Mk. III electrostatic speaker system.

The switchbox used to A-B the preamplifiers is completely passive (it is described in the May issue of The BAS Speaker).

Two primary systems were used to adjust level: a 1-kHz sine wave and a 1-kHz square wave. Both proved equally effective in determining level and generally agreed on the AC VTVM except in cases where one of the preamps exhibited RIAA deviations. In some isolated cases the output level of a preamplifier might drift. In order to prevent this anomaly from interferring with the results, the output levels were constantly checked before, during, and after the A-B test.

Initially I included a cartridge interaction column in Table 1, but dropped it because none of the preamplifiers tested, after matching capacitance was added to the low-capacitance buffer amplifier, exhibited any aberration. To conduct the test, 20- to 20-kHz sine waves are fed through a cartridge into the preamp and an output curve is plotted (Holman, BAS Speaker, Nov. 1975). A buffer amplifier with the same input capacitance as the preamp is inserted between the cartridge output and the input of the preamp and a second frequency response curve is made. If there is no discrepancy between the two curves, no measurable cartridge interaction exists.

Table 2 lists units that have been given the white-noise test but have not been listened to or tested further.

Table 1 - Preamp Test Results

1	2	3									4	5				6				7	8
	Holman Square-Wave Test, Distortion in dB	Frequency Response of Phono Section, dB									THD at 1 kHz,	Phono Signal-to-Noise Ratio, True RMS, dB				Overload Vs. Frequency at Clipping, volts				White Noise Test	Subjective Audio
Preamplifier	Below Fundamental	**5 Hz**	30 Hz	**400 Hz**	**1 kHz**	**5** kHz	10 kHz	**14 kHz**	20 kHz	30 kHz	%	Shorted	1K Resistor (C Filter)	Cartridge (C Filter)	Gain, dB	**1 kHz**	**10 kHz**	**50 kHz**	**%**	Results	Quality
Audio General 511 no. **5500012** $400	<76	0	0	0	0	0	0	0	0	0	0.005	<80	79.5	<80	40	7	7	7	**100**	Pass	Excellent
Davis-Brinton **$167.50**	<80	-40	0	0	0	0	0	0	-0.2	-7	<0.01	<74	<74	<74	**34**					Pass*	Excellent
Dunlap-Clarke 10 **$650**	<80										0.005				40	10	10	9	**90**	Pass	Excellent
Dynaco Pat-4 $199	**34**														**34**	4.3	**2.5**	0.5	12	Fail	Edgy
Heath **AP-1615** $130 (kit)	**<65**										<0.05					11	11	3.3	30	Fail	Good
Lahti PSI **$134.50**	<80	-6.6	-0.3	0	0	0	0	0	0	0	<0.01	**69.5**		70	40	9.6	9.5	5.2	**54**	Pass	Excellent
Levinson JC-2 no. 1661 $1000	<65	-8.3	-0.6	0	0	+0.3	+0.3	+0.5	+0.5	+0.4	<0,05	<76.3	<76.3	<76.3	36.3					Pass	Excellent
Marantz 7C no. 10191 $285	69	-3.2	0	0	0	+0.2	+0.3	+0.2	+0.2	0	0.013	67				21	18	4	19	Fail	Good
Soundcraftsmen **PE2217** no. **P075898** $500	**<65**	-3.3	-0.5	0	0	-0.3	-1.2	-1.9	-3.4	-5.5	<0.05			70.5	41.5	10.5	10.5	6.4	**63**	Fail	Excellent
Stax **SRA-12S** **$500**	**<65**	-2.6	0	0	0	0	0	0	-0.5	-1	<0.05	74		76	40	8	5.5	1.2	15	Fail	Good
Yamaha C-1 no. **1341** **$1800**	**<65**	-3	-0.2	0	0	0	0	0	0	-0.2	<0.05				**34.4**					Fail	Good
Yamaha **CA-800** $ 470	**<65**	-6	-0.2	0	0	0	0	+0.2	+0.2	+0.2	<0.05	<72	<72	<72	**32**	**3.5**	3.5	2	57	Pass	Excellent

*Passes white-noise test when filters removed.

Comments on Physical Facilities of Each Tested Preamplifier

This section is not intended to provide complete descriptions of the preamplifiers. Only gross comments are made about each unit's flexibility and design. Preamps that were not compared by the panel are not commented upon.

AGI 511. My new reference standard. The unit has sufficient inputs and outputs but lacks tone controls. It is always on (like the Dyna PAT-5). My engineering friends have been impressed by the quality of construction and the unique ultra-high slew rate circuit design.

Davis-Brinton. The Davis-Brinton FET phono preamplifier contains no switches. It rolls off rapidly below 20 Hz and above 20 kHz. The low-end rolloff is extremely effective in isolating the electrical results of tonearm/cartridge resonances and record warps from the speaker. The benefits are easily visible, particularly on speakers that are not damped at the lowest frequencies. An active high-frequency rolloff is included in the unit, giving it an additional 6 dB of attenuation above 20 kHz. Rolling off inaudible high frequencies before feeding the signals to the main amplifier is given as one method of curing TIM in some power amplifiers, according to McClain.

Interestingly, the Davis-Brinton preamplifier was A-B'ed with the AGI and the two units were sonically identical. However, when I fed white noise through the Davis-Brinton preamp, it failed the test. I asked Mark Davis to remove the low- and high-frequency filters, which are located at the output of the preamplifier. The unit then passed the white-noise test with flying colors. This indicates that ultra-high slew rate is necessary somewhere in the early stages of the preamp only. Rolling off the frequency extremes at the outputs obviously has no effect on sound quality.

Dunlap-Clarke. The Dunlap-Clarke preamplifier contains the input and output flexibility of the Marantz 7C, separate level set controls for each channel, a delayed turn-on relay, a magnetic and a moving-coil cartridge input, a Levinson JC-2 type profile, and a switchable infrasonic filter. It will be available in June.

Dynaco PAT-4. The only tests completed on the Dynaco PAT-4 were the square-wave, listening, and power bandwidth tests. It failed all three.

Heath AP-1615 (Kit). The unit uses a Fairchild 739 chip in its phono section. It has adequate input and output facilities. It lacks tone controls and is designed to be used in conjunction with the Heath equalizer kit.

Abbott Lahti. This phono preamplifier contains no switches or frills. It has the lowest price of the preamplifiers tested and is well made. This and the Davis-Brinton preamplifier are designed to replace the phono section in an "edgy" sounding preamplifier, thereby instantly converting your sleeper to the best sound available for very little money. (This is possible because most high-level preamp sections are extremely neutral.)

Levinson JC-2. The Levinson has the lowest profile and the best signal-to-noise ratio of the units tested, and it can be rack mounted. I tested the 36 dB gain module/card, and the AC/DC output amplifier switch was in the mode for driving direct-coupled amplifiers (an exclusive feature of the Levinson). Part of the power supply is outboarded as in the Davis and Lahti preamplifiers to obtain the highest possible signal-to-noise ratio. The unit does not have an on/off switch.

Marantz 7C. My standard preamplifier for the last two years and probably the most flexible. I never used all the inputs and outputs available on the 7C.

Soundcraftsmen PE-2217. The major feature of this preamp is its octave equalizer. The major limitation is its phono overload margin. When the equalizer is switched into the circuit, the phono overload is 26 to 39 mV depending on the setting of the unit's zero-gain control feature. With the equalizer switched out, the phono overload is 90 mV, which is excellent. The high end of

the preamp was audibly attenuated, but otherwise it was identical to preamps rated excellent. (Soundcraftsmen has available a modification, which is already incorporated in newer units. It is claimed that this raises the phono overload to 65 mV with a reduction of gain by 6 dB.)

Stax SRA-12S Integrated Amplifier for Ear Speakers. The unit has a class A amplifier that drives the headphone output jack. The jack is designed to accept only Stax headphones. The unit runs hot and draws in excess of 30 watts. It is small and compact.

Yamaha C-1. This was the heaviest (30 pounds) and most expensive preamplfier tested. It has a lot of inputs and outputs, including a headphone amplifier. The unit runs hot to the touch and draws 55 watts. It has an accurate built-in pink-noise generator and a low-distortion (0.1% THD) sine-wave generator for 70 Hz, 330 Hz, 1 kHz, and 10 kHz. Both the Yamaha and the Stax preamps were obtained for testing from Tweeter, Etc.

Yamaha CA-800 Integrated Amp. The preamplifier and amplifier sections can be used independently of each other. The specified maximum preamp output into a 10K load is low (3 volts); however, it is still sufficient to drive most power amplifiers. The bass and treble controls have two selectable turnover frequencies and the preamplifier has a switchable infrasonic filter that is down only 0.6 dB at 30 Hz. It has two tape recorder inputs, a microphone input, switchable cartridge input impedances, and the ability to drive two sets of speakers independently or together for 50 watts of power per channel at 8 ohms.

Summary

When most of the testing parameters are known, it is easy to design an excellent sounding preamplifier. This frees the audiophile, permitting him to concentrate on preamp features versus price and on other weak links in the hi-fi playback chain. Controlling all known testing parameters is a must before reliable and accurate hi-fi literature can be disseminated. Let us hope that we all do our part to reduce ambiguity in our hi-fi consumer advocate groups.

Table 2 — White-Noise Test Results

Unit	Price	Pass/Fail
B&O 1000	$ 595	Fail
Fisher T100 (tubed)	Discontinued	Pass
McIntosh 1900	$949	Fail
McIntosh C-28	$649	Fail
McIntosh MA-6100	$ 699	Fail
Pioneer SA-6500	$179	Fail
Pioneer SX-737	$ 400	Fail
Pioneer SX-950	$600	Fail
Sony 4650	$400	Pass
Sony 7055	$ 450	Fail
Sony 7025	$260	Fail
Tandberg TR-2075	$1099	Fail
Tandberg 1040	$ 599	Fail
Technics SA-5550	$480	Fail
Yamaha CA-1000	$ 600	Pass
Yamaha CR-1000	$850	Pass
Yamaha CR-800	$ 580	Pass
Yamaha CR-600	$460	Pass
Yamaha CR-400	$330	Fail