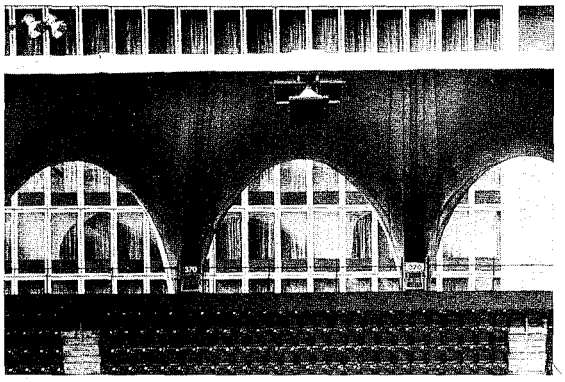
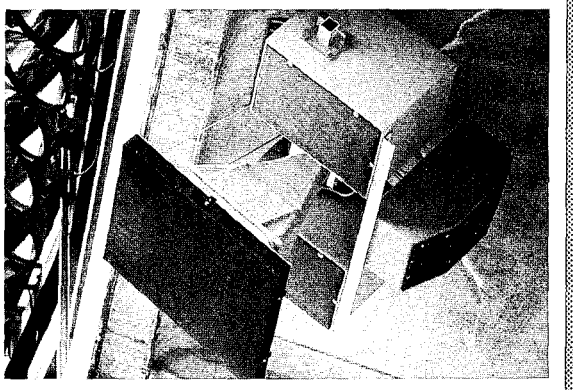
SYNERGETIC
SYN AUD CON
AUDIO CONCEPTS

newsletter

Volume 16, Number 3
Spring, 1989

COMMUNITY





Busch Stadium—St. Louis

SYNERGETIC SYN AUD CON AUDIO CONCEPTS

Synergetic: Working together; co-operating, co-operative.

Synergism: Co-operative action of discrete agencies such that the total effect is greater than the sum of the two effects taken independently.

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The information conveyed in this NEWSLETTER has been carefully reviewed and believed to be accurate and reliable; however, no responsibility is assumed for inaccuracies in calculations or statements.

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—Community—
A Success Story

Community

Some companies hit on a great idea, others strike a fad at its beginning, some can say, "Dad's million sure helped get us started." Community's success stems from hard work, long hours, application of hard won skills to correctly perceived needs, and a remarkable team that has grown together over many years.

The tedious, but steady development of their horn fabrication capabilities, their inspired development of the M-4 driver, and their unswerving improvement of their production facilities has led to them being the preferred vendor in a great number of the new large stadium arena jobs. The M-4 is an excellent example of their understanding the fundamentals of electroacoustics. Even today many years later, their copiers still have not grasped that the real virtue of the unit is the fact that it is a one decade driver.

Once an excellent driver and large high Q horn were developed, the advent of TEF, precision signal delay, and crossover networks intelligently designed with the acoustic phase response in view, and in mind made, today's super coaxial units a practical possibility.

The cover shows the latest system in Busch Stadium, St. Louis, Missouri, wherein IED electronics wedded to Community loudspeakers and designed by a competent consultant team, Joiner-Rose Group, provides a level of aural satisfaction unachievable just a decade ago. Shown here is one of the thirty four clusters using the Community M-4 drivers and horns with EV DH1A drivers coaxially mounted on smaller Community horns inside the horn driven by the M-4. Fifteen inch woofers and a backfill system are shown along with the coaxial horn setup.

Jack Wrightson of Joiner-Rose was involved in the design of the system which was installed by Throckmorton Sales Co. of St. Louis. Wrightson reaction to the M-4 echoes the majority of consultants today when he states, "We find the M-4 very beneficial where you need high power and directivity. . . it gives a fair bit of impact and punch in the 500 Hz region."

Community has been a sponsor of Syn-Aud-Con for the past eight years and their personnel have helped substantially with many workshops.

John Kenneth Hilliard

1902-1989

In 1978 Syn-Aud-Con held their first graduate workshop. Those who attended were privileged to meet and talk with the true pioneers of the audio business: James Moir, Richard Heyser, John Hilliard, and V.M.A. Peutz. Only one of that illustrious staff is with us today, Victor Peutz. The recent passing (March 21, 1989) of John Kenneth Hilliard at 87 years of unparalleled achievements in the audio field removes one of the most remarkable men it has ever been my good fortune to know and work with. John Hilliard was married the year I was born. With a B.S. in physics from Hamline University in 1925, and post graduate work at the University of Minnesota (1926-1927), he was soon hard at work as a transmission engineer for Metro-Goldwyn-Mayer working with the legendary Douglas Shearer, (1933-1942) and being a key part of a team that won an academy award for sound. During part of World War II he was at MIT as a project engineer and in 1943 moved to Altec-Lansing Corp. as chief engineer. During the war, Altec produced MAD (Magnetic anomaly detection equipment) for the navy. John was chief engineer from 1943-1962—Golden years for theater sound equipment as the motion picture world went stereo. He then became Director of the LTV Research Center—Western Division in Anaheim, CA, from 1962 until his formal retirement. After retirement he started and successfully ran his own consulting business dealing in noise control problems in Southern California.

John Hilliard was, in his lifetime, literally showered with awards, a few of which were:

- Fellow of the Audio Engineering Society
- Fellow of the Acoustical Society of America
- Fellow of the Institute of Electronic and Electrical Engineers
- Fellow of the Society of Motion Picture and Television Engineers
- Winner of the AES Potts award (the equivalent of today's Gold Medal)

Hilliard's writings on the measurement of phase response in audio systems appeared in his book ***Motion Picture Sound Engineering*** (1938). I treasure a personally autographed copy by Dr. Hilliard of this still thoroughly up-to-date reference. This has been a key starting reference to two generations of audio engineers.

It was my good fortune to be assigned as liason between Altec and LTV research by the late "Mo" Morris from 1965 until 1973. During that period, John Hilliard worked on telephone voice frequency transmission equipment for use at Cape Canaveral, and for the world wide telephone system for the air force. We worked together on introducing 1/3 octave equalization to the motion picture industry as well as new versions of loudspeakers for motion picture use. When William Snow, the legendary Bell labs researcher of the 1930's, retired from Besset-Berman, he came to work with

John Hilliard had a way of establishing instant rapport with any serious engineer and was soon deeply involved in their most complicated design problems in his gifted solution oriented way.

John Hilliard and I had the further privilege of working with both these remarkable pioneers and receiving their assistance in evaluating the proper application of 1/3-octave analyzers and equalization in the real world. It was John Hilliard's letter to the president of Altec after witnessing the authors prototype 1/3 octave equalizer that led instantly to its adoption as a product funded sufficiently to rapidly reach the market place. His analysis of the insolvable problems of existing systems at that time and his view of the virtues of the new approach lent support to my efforts that were never forgotten.

During the late 1950's and early 1960's, I would drive John around to the companies involved in military communication work to discuss applications of the first transistorized repeater amplifiers produced by Altec. John Hilliard had a way of establishing instant rapport with any serious engineer and was soon deeply involved in their most complicated design problems in his gifted solution oriented way.

Rare individuals retain all their mental acuity and energy of youth into their eighties. John Hilliard was so blessed.

New Earplug that Reduces Level Without Changing Tonal Quality

"God protects musicians. Otherwise, they'd all be deaf."

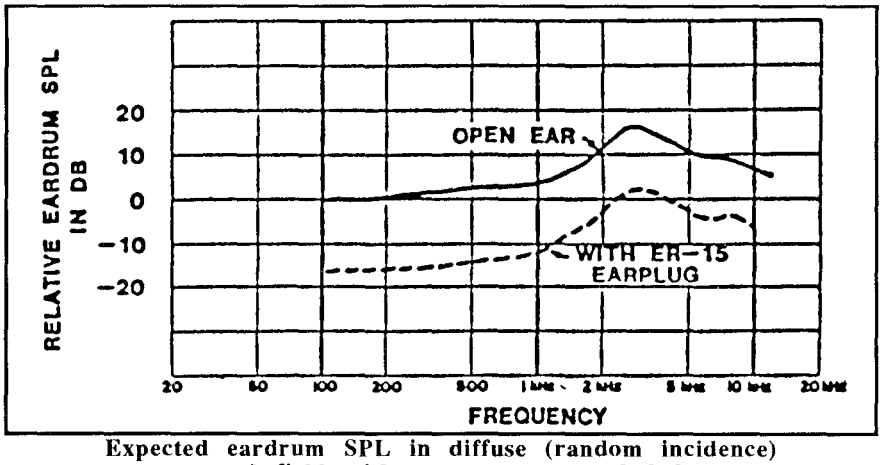
—Dr. Mead Killion

Dr. Mead Killion of Etymotic Research in Elk Grove, IL is making a wide frequency range, uniform 15 dB attenuation earplug.

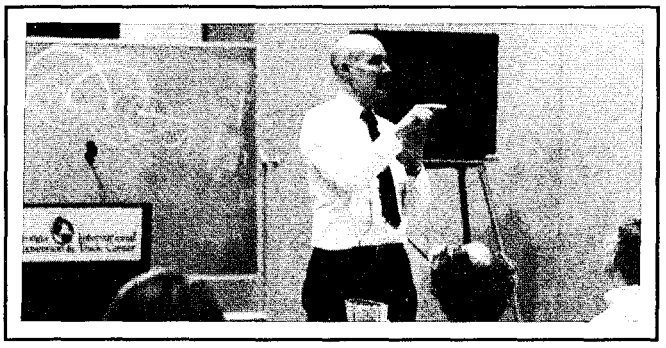
These are ideal for use by concert sound personnel as *the earplugs reduce the level without changing the tonal quality or balance.* The ER-15 is referred to as the Musician's Earplug. There are about 200 of the carplugs in use, mostly in the ears of musicians and others in associated activities.

Those of you who attended the Loudspeaker Designer's Workshop in Atlanta and/or our summer 3L Workshops know why we have come to appreciate Mead Killion. The name of his company, Etymotic means "true to the ear." It is the "true to the ear" that is going to keep us working with Etymotic in the coming years. It is Etymotic who makes our In-the-Ear microphones.

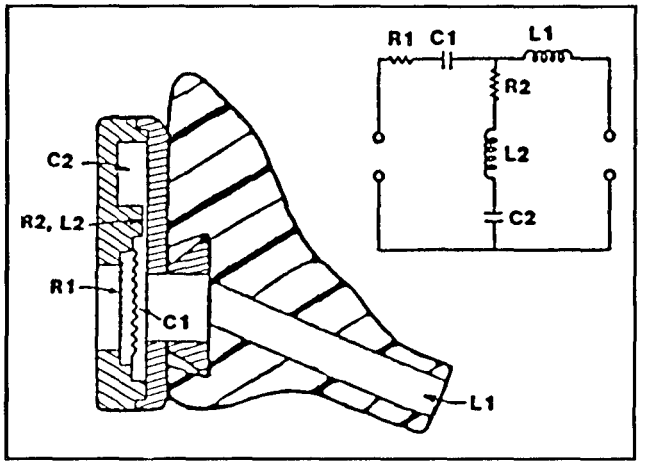
If you want to learn more about the ER-15, contact Etymotic Research, 61 Martin Lane, Elk Grove Village, IL 60007. (312) 228-0006 or FAX: (312) 228-6836.



Expected eardrum SPL in diffuse (random incidence) sound field with ear open or occluded.



Mead Killion addressing the class at the Loudspeaker Designer's Workshop



Construction of 15-dB earplug

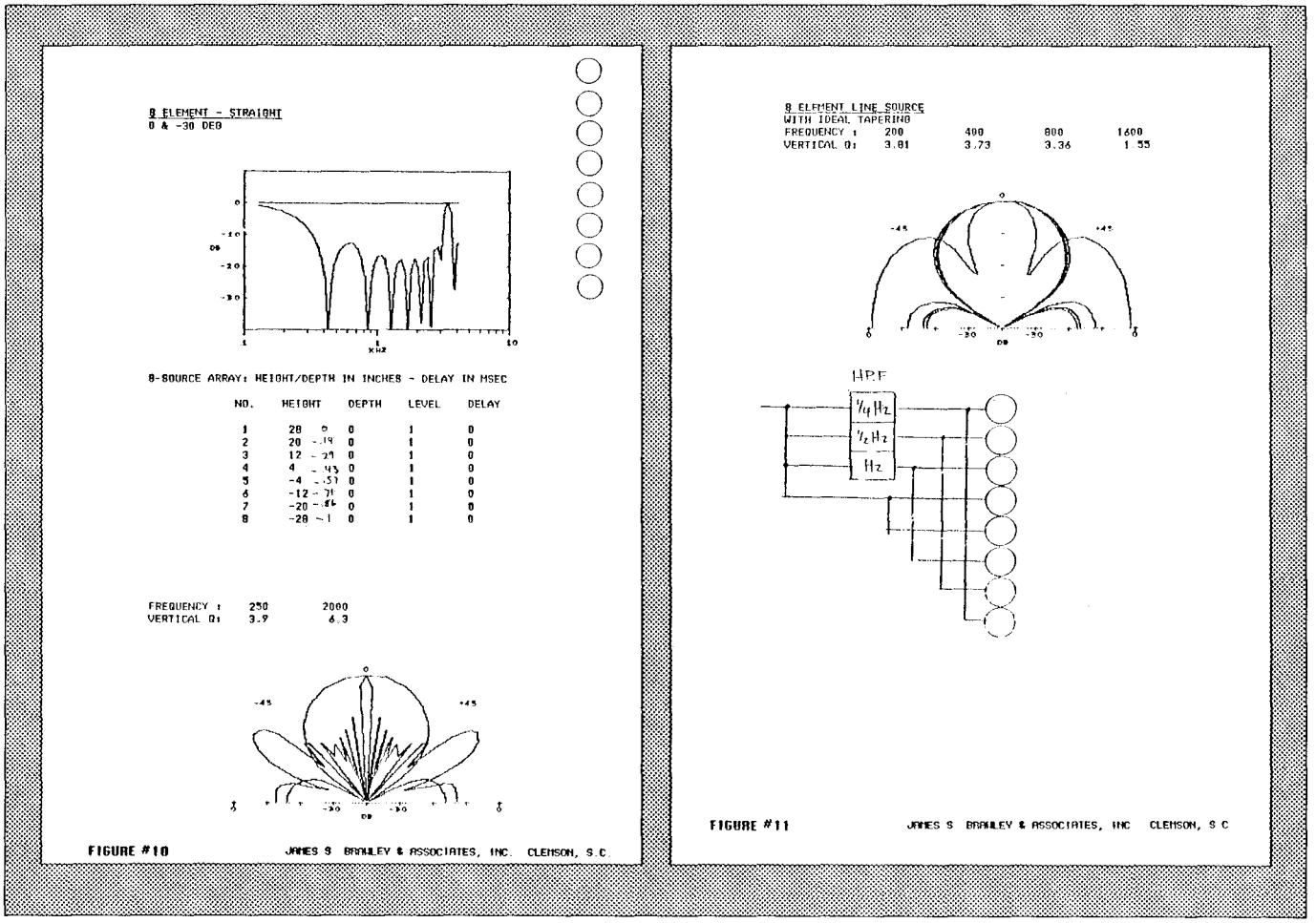
Comparison of the Geometry of Eight Different Line Arrays

Jim Brawley of James Brawley & Associates in Clemson, S.C. is doing a lot of interesting work. We saw a handout from a talk he gave at a rep's seminar. We asked if we could reproduce some of his work. He wrote that we could, but that it would be published soon as an article in an audio magazine. So, we are reproducing only a small part of his work here and will wait to read his complete work when it is published.

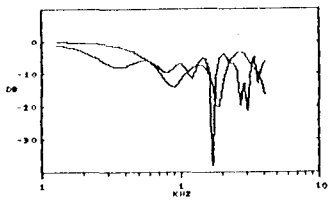
Jim has used a computer to simulate 8 different line arrays which are all approximately the same size:

8 element straight
8 element with ideal tapering
8 element curved 90 degrees
8 element curved with J1 shading
7 element Philips Bessel coefficient array
8 element Kruttuff & Quandt coefficient array
5 element Ogha spaced array
6 element Augspurger spaced and shaded array

Jim's computer generated work makes the message completely clear.



90 DEG 8 ELEM NO SHADING
0 & -30 DEG



8-SOURCE ARRAY: HEIGHT/DEPTH IN INCHES - DELAY IN MSEC

NO.	HEIGHT	DEPTH	LEVEL	DELAY
1	28 0	0 0	1	0
2	20 -14	5 .09	1	0
3	12 -29	9 .16	1	0
4	4 -43	11 .2	1	0
5	-4 -57	11 .2	1	0
6	-12 -71	9 .16	1	0
7	-20 -86	5 .09	1	0
8	-28 -1	0 0	1	0

90 DEG 8 ELEM NO SHADING

FREQUENCY :	250	2000
VERTICAL Q:	3.43	0.39

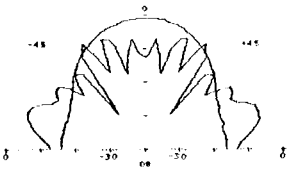
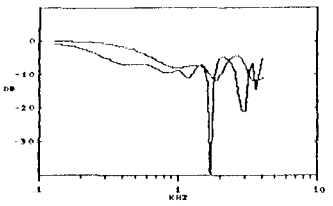


FIGURE #12 JAMES S. BRAWLEY & ASSOCIATES, INC. CLEMSON, S.C.

90 DEG 8 ELEM SYM J1 SHADED
0 & -30 DEG



8-SOURCE ARRAY: HEIGHT/DEPTH IN INCHES - DELAY IN MSEC

NO.	HEIGHT	DEPTH	LEVEL	DELAY
1	28 0	0 0	.43	0
2	20 -14	5 .09	.71	0
3	12 -29	9 .16	.92	0
4	4 -43	11 .2	1	0
5	-4 -57	11 .2	1	0
6	-12 -71	9 .16	.92	0
7	-20 -86	5 .09	.71	0
8	-28 -1	0 0	.43	0

FREQUENCY :	250	2000
VERTICAL Q:	2.96	0.73

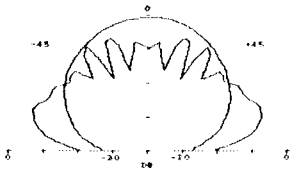
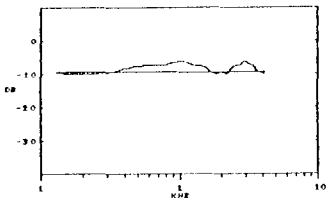


FIGURE #13 JAMES S. BRAWLEY & ASSOCIATES, INC. CLEMSON, S.C.

PHILLIPS 7 SOURCE
0 & -30 DEG



7-SOURCE ARRAY: HEIGHT/DEPTH IN INCHES - DELAY IN MSEC

NO.	HEIGHT	DEPTH	LEVEL	DELAY
1	28 0	0	.5	0
2	21 -12.5	0	1	0
3	14 -25	0	1	0
4	0 -5	0	-1	0
5	-14 -35	0	1	0
6	-21 -87.5	0	-1	0
7	-28 -1	0	.5	0

PHILLIPS 7 SOURCE

FREQUENCY :	250	2000
VERTICAL Q:	0.84	0.79

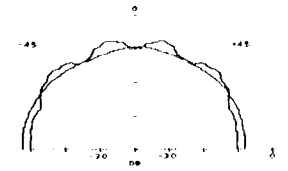
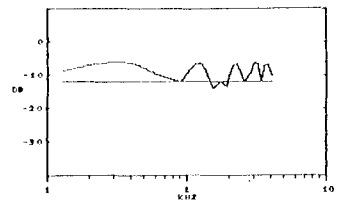


FIGURE #14 JAMES S. BRAWLEY & ASSOCIATES, INC. CLEMSON, S.C.

KITTTUFF/QUANDT 8 ELEM
0 & +30 DEG



8-SOURCE ARRAY: HEIGHT/DEPTH IN INCHES - DELAY IN MSEC

NO.	HEIGHT	DEPTH	LEVEL	DELAY
1	28 0	0	1	0
2	20 -14	0	1	0
3	12 -29	0	1	0
4	4 -43	0	1	0
5	-4 -57	0	-1	0
6	-12 -71	0	-1	0
7	-20 -86	0	1	0
8	-28 -1	0	-1	0

FREQUENCY :	250	2000
VERTICAL Q:	0.37	0.48

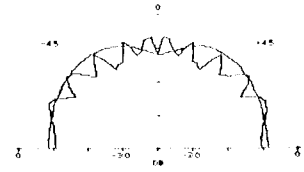
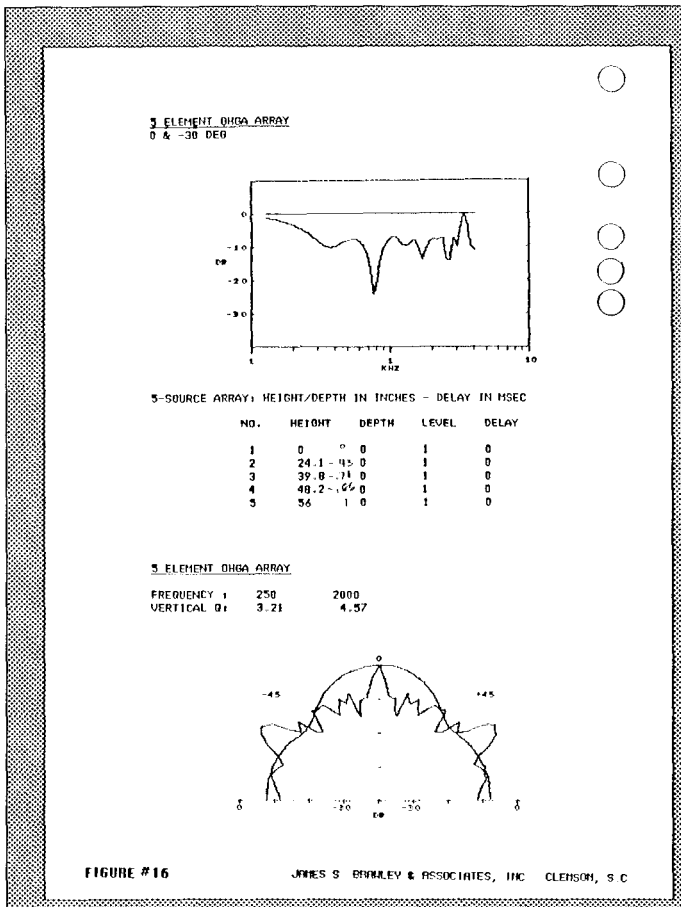
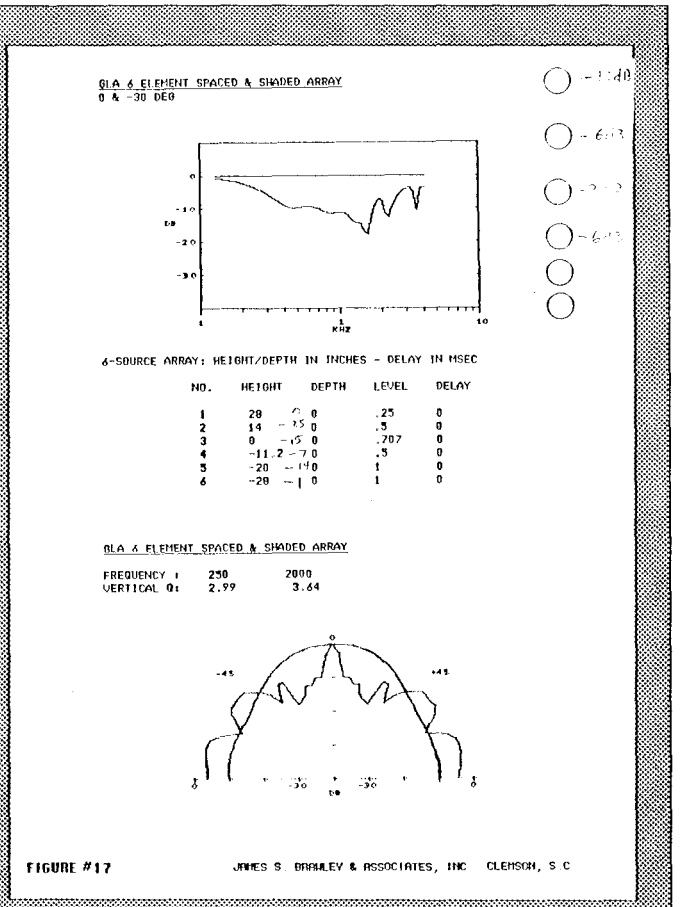


FIGURE #15 JAMES S. BRAWLEY & ASSOCIATES, INC. CLEMSON, S.C.





Earliest Frequency Symbol

One evening I was thumbing through my copy of *Fundamentals of Sound Recording and Reproduction for Motion Pictures* published in 1929 by the Academy of Motion Picture Arts and Sciences. The book is a series of invited papers and bound into a special edition for engineering personnel belonging to Electrical Research Products Inc (ERPI). I noted the use of dv as the frequency label on all the charts. That prompted me to look at the old Western Electric chart for the range of human hearing on Page 61 of *Sound System Engineering*, Figure 3-21, and lo and behold, there was dv again. I finally found it defined in Professor A. W. Nye's article, "The Nature of Sound" as "where dv is an abbreviation for double vibrations per second. This rate is called the frequency of sound."

In the 1931 edition of *Recording Sound for Motion Pictures*, John K. Hilliard wrote Chapter VIII, "Transmission Circuits - Theory and Operation." The decibel is used and explained as is 'gain charts' and 'gain sets'. Patch bays were in use and various pad designs were included. A power level indicator for 0.006 watt and 500 Ω is shown and shielded cables are explained. John was at United Artists at that time as a Research Engineer. Books from this era are becoming rare and the men involved in the period are in their eighties and nineties. Whenever I contemplate the short span of recognition that engineering genius receives compared to mass murders, politicians and the like, I think of General George S. Patton Jr's poem:

Here is honor, the dying knight
and here is truth, the snuffed out light,
and here is faith, the broken staff,
and here is knowledge, the throttled laugh,
and here is fame, the lost surprise.
Virtue, the uncontested prize
and sacrifice, the suicide
and there the wilted flower pride,
Under the crust of things that die,
living, unfathomed, here am I.

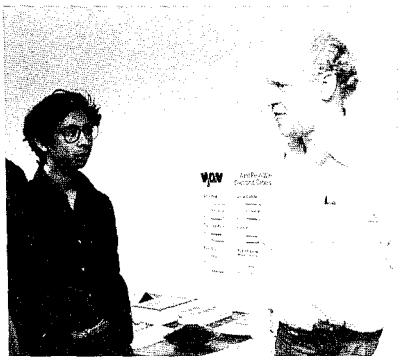
San Francisco Class

Fred Fredericks, then Marketing Director at TOA—now retired to San Diego—invited us to hold our 1989 San Francisco class in TOA's new facility in S. San Francisco. We enjoyed their beautiful facility and everyone made the class feel welcome.

Joel Lewitz, a principal in the acoustical firm, Paoletti/Lewitz/Assoc. in San Francisco, gave a talk to the class on speech intelligibility. He demonstrated the effect of each octave band on intelligibility. Joel was kind enough to give us a copy of the excellent tape he had prepared. We have played back the tape in each of the classes and the members of the class are impressed with the fact that the 1,000 and the 2,000 Hz octave bands and contain so much of the intelligibility of speech -- the octave band centered at 2,000Hz contains 1/3.

The nice part about having the IED computer in each of the classes is that we learn something from each class either about the running of the IED program or about additional programs. Joel gave us a program he wrote, called AI, which allows one to quickly layout a speech privacy system by answering each of the design questions as they are presented. The program gives the intelligibility score and allows each facet of the design to be modified in real-time to see what effect the changes will have on the intelligibility score. The next day after the class we visited the Paoletti/Lewitz beautiful and spacious facility on an ancient one-block long street in downtown San Francisco. There we saw Chips Davis and were able to personally congratulate both Chips and Paoletti/Lewitz on their good fortune to be working together.

Kurt Graffy, also from Paoletti/Lewitz/Assoc was an assistant instructor in the class. He made extremely effective demonstrations of PHD, Joe Mitchell's loudspeaker system analysis program, and the IED computer controlled sound system program. It was Kurt and Joel's participation that helped us see that an assistant instructor at the farm classes would be a most valuable addition to the classes—and so it proved in the April class with Farrel Becker taking half of the instruction. Kurt will be assistant in one of the summer farm classes.



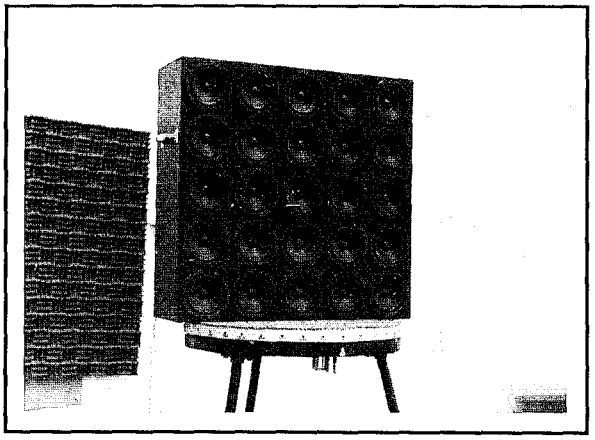
Dr. Don Creevy (R) talking with John Chen. Dr. Creevy's hobby is audio (he has a recording studio and a TEF). He has attended many Syn-Aud-Con seminars and workshops.

Our good friend, Ken Wahrenbrock, drove up to San Francisco to help us in the class and to enjoy San Francisco with us.

5 x 5 Speaker Array

Several years ago Emilar built us a prototype 5x5 Bessel array made of JBL 8" cone speakers (see page 327 in **Sound System Engineering.**) It is heavy and we didn't move it from California to Indiana. It rests in Ken Wahrenbrock's garage.

Mike Lamm surprised us recently with a 5x5 Bessel made with 5" J W Davis loudspeakers and a full manual of measurements.



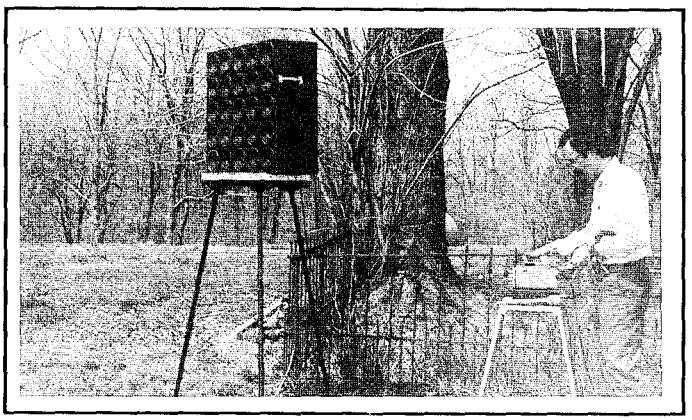
The Bessel at the JW Davis Lab

We have the Bessel at the farm in Indiana now. Mike has built it so that we can switch the 5x5 into 13 different arrangements, for instance: Top switch up will turn on the center speaker only, top switch down will turn on the whole array; Second row, two switches up turns on a simple column, switches down turns on the Bessel configuration, and so on. Switches control one column at a time.

It is exciting to take a class into the field in front of the farm house and demonstrate all the various configurations on speech and music.

Mike Lamm

We are reproducing excerpts from Mike's report here minus all the measurements. If you are interested in talking to Mike about the actual measurements, you can call him at O'Sullivan Industries 804-572-9309 (yes, Mike has left J. W. Davis to become quality control manager at a Tandy company in South Boston, VA—we are grateful for the time that Mike was at J W Davis as he accomplished so much.)



The Bessel at the Farm in Indiana

As Mike says, there need to be lots of measurements made on the Bessel. It saddens us that the Bessel is so slow to be used. We originally saw the 5x5 Bessel demonstrated at AES in Eindhoven by Philips in 1983. Here it is 6 years later and Dr. Patronis is the only consultant that we know of who is consistently using the Bessel configuration in his specifications.

5x5 Speaker Array Report by Mike Lamm

Purpose

I wanted to build a compact and relatively inexpensive unit which would demonstrate the polar properties of both grouped sound columns and Bessel arrays.

Description

The speaker array consists of 25 speakers arranged in five rows of five speakers each. Each individual speaker is a JWD model DS-505/16. This is a five inch speaker with a nominal impedance of 16 ohms and is rated at 10 watts power handling capability. Each speaker is mounted in an individually sealed chamber which is lined with fiberglass and ported for improved bass response. By using small "full range" speakers the whole array is just slightly over two feet square. It is, of course, rather heavy due to both a very sturdy cabinet and the twenty-five speakers. The speakers are mounted as close together as physically possible. Each pair of speaker wires passes through a sealed hole in the back wall of the cabinet into a rear enclosure which houses the wiring, terminals, and switching matrix. A rear door allows access to this area if it is needed.

The switching system and main input connections are located in the rear door on a piece of perforated PC board. There are three rows of switches and at the bottom of the board are two color coded binding posts for main signal input. The binding posts will accommodate bare wire, ring or spade lugs, and single or dual banana plugs. The top switch directs the signal to either the center speaker alone (up) or the whole array (down). The second row (two switches) determines how the vertical sets of five speakers are connected to each other horizontally across the array. The up position connects the vertical sets together in simple series (column style). The down position

connects the vertical sets in Bessel style (the predominately series Bessel wiring arrangement). These two switches must be switched together as if they were a single switch. The third row contains five switches. Each switch controls the wiring configuration of a single vertical set of five speakers. The up position connects all five speakers in parallel (column) and the down position connects them in Bessel configuration (parallel style). A wiring schematic is attached for further clarification.

THEORETICAL CAPABILITIES

Each driver has a nominal impedance of 16 ohms and is rated at 10 watts. Thus, in the full column configuration, the array should be capable of handling 250 watts. If power capacity and increased output were the only considerations, this would certainly be an economical way to achieve that goal.

A five driver line array of 16 ohm speakers wired in parallel results in 3.2 ohm impedance; wired in Bessel (parallel style) results in 4.6 ohms. Combining five vertical line arrays horizontally gives us an overall impedance of 16 ohms for a 5X5 Bessel. However, a Bessel array applies a weighting factor to each speaker. In a 5x5 Bessel there are nine speakers which receive full voltage and put out full rated power, twelve receive 1/2 voltage and produce 1/4 power, and four receive 1/4 voltage and thus produce 1/16 power. Total power handling is therefore [(9) (10) + (12) (2.5) + (4) (.625)]/250 = (122.5)/250 = 49% of a column arrangement. A five speaker Bessel handles 70% of the power of a five speaker column. Actual acoustical output is an even lower ratio because some of the speakers are wired in reverse polarity.

Given this information, one might wonder why a Bessel array would ever be used. It has ability to handle power and to produce output level. The answer, of course, is its coverage pattern. In theory, if all speakers are wired in simple series/parallel such that each receives identical power, the pattern is highly directional in both the vertical and horizontal plane. If all speakers receive a Bessel weighted signal, the pattern should be basically hemispherical (to the extent of that of a single speaker). If the wiring is such that we have a set of five sound columns (vertically) connected by a Bessel network, the pattern should be that of a single column, i.e., hemispherical in the horizontal plane and highly directional in the vertical plane. With the switching system there are many possible combinations available. Here are thirteen examples.

1. SINGLE SPEAKER

	Horizontal	Vertical
2.	Column	All Column
3.	Column	All Bessel
4.	Column	4 column, 1 bessel
5.	Column	3 column, 2 bessel
6.	Column	2 column, 3 bessel
7.	Column	1 column, 4 bessel
8.	Bessel	All Bessel
9.	Bessel	All Column
10.	Bessel	4 column, 1 bessel
11.	Bessel	3 column, 2 bessel
12.	Bessel	2 column, 3 bessel
13.	Bessel	1 column, 4 bessel

In #5 above, these could be arranged C,B,C,B,C or B,C,C,C,B, or B,B,C,C,C, or C,B,B,C,C, etc.

What, if any, difference these permutations might make will have to wait for someone with more time for empirical testing, or someone with a better grasp of the mathematics involved.

TESTS

(Editor's Note: Mike's measurements of Impedance, ETC, EFC, Waterfall, and Polars are over 1" thick. We will not reproduce them here but will include a few of his comments and conclusions.)

The high frequency roll off in a column arrangement is a function of cancellations caused by path length differences. In this array, packed as tightly as possible, there are eight speakers which surround the center speaker at a distance of one foot. The measurements were made at a distance of about 13 feet resulting in a path length difference of 0.093 feet. This is one half wavelength at 6,060 Hz. The closest speakers to the center speaker are four at a distance of 5.25" which could cause problems at 9100 Hz.

The conclusions I draw are:

1. Never use two speakers when one will do.
2. If using multiple drivers covering the same bandwidth, place them as close together as physically possible.
3. If using multiple drivers covering the same bandwidth, place them as far away from the listeners as possible.
4. Even with systems which employ woofer, and tweeter, those drivers covering adjacent bandwidths should be physically adjacent to reduce comb filter effects in the crossover region.
5. The wisdom of the ancients is once again confirmed--a point source is the ideal speaker.

Some random musings—Ever notice how many consumer speaker systems use multiple tweeters or mid range drivers? Or notice how they are arranged both in distance and geometry? I've seen several designs which use two mids with the tweeter located between them. That's fine as long as the listener is directly on-axis. But what is the possible variation in path length as the listener sits or stands? The design that intrigues me the most is the high end McIntosh speaker with 15 tweeters in a line array. McIntosh isn't stupid. What could they have done to eliminate the severe lobing that would result from just a simple series/parallel arrangement? People will spend $500.00 to reduce their amplifier distortion from 0.1% to 0.005%. They would get much more improvement by spending less money on Sonex.

Dr. Bertram Of Hells Bells

Directly after the AES convention in Los Angeles we drove north to San Luis Obispo to visit Dr. Sidney Bertram. He is the man who had been involved with the Hells Bells FM sonar that was the forerunner of Farrel Becker's polar ETC.

Dr. Bertram has a PhD in physics (Ohio State University), a fellow of the IEEE, and has had a long and distinguished career of engineering important projects including measuring terrain altitudes automatically from stereo aerial photographs (some of these measurements have to be seen to be believed. Read Casey's *Patriot Games* for a diluted example.)

Dr. Bertram is now retired—only in the sense that he doesn't report to a company office everyday; such men never retire mentally. He has generated a series of fascinating papers including one called "An Intuitive Model for Electromagnetics." Dr. Bertram, in common with Dick Heyser, feels that some basic errors are present in how "energy" is accounted for. We have sent him the Heyser TDS anthology hoping he can contribute some insight into what Dick was trying to tell us.

While working for Bunker Ramo, Dr. Bertram wrote "Frequency Analysis Using the Discrete Fourier Transform" for the *IEEE Transactions for Audio and Electroacoustic* and "On the Derivation of the Fast Fourier Transform" in the same publication.

Dr. Bertram received his B.S. degree (with honor) in engineering from the California Institute of Technology, Pasadena, CA in 1938 and did his work on the special sonar equipment at the University of California Division of War Research starting in 1942.

Dr. Bertram was awarded a Bureau of Ships citation for his wartime sonar developments.

We sincerely hope that we will be privileged to have many more meetings with Dr. Bertram and to one day include him in a special symposium of men capable of understanding the meaning of energy as defined in the Heyser transforms. ■

Shure ClearVoice™

A really clever idea is one where you strike your forehead and say, "oh, of course."

Shure has really done it with their ClearVoice microphone for cellular telephone systems.

The obvious place to put such a microphone is on the ever present chest belt. So long as the law requires that you wear these "chokers", they should at least have a use. High quality hands free cellular telephony is now realizable.

Shure reports that WGN in Chicago is using six of these units in their reporter's cars. WGN felt a real safety factor had resulted, namely that now the driver can keep both hands on the steering wheel. At the same time the quality improved dramatically. News Director, David Ellsworth said, "The standard hands-free mics made the reporters sound like they were talking from the bottom of a wastebasket." The Shure ClearVoice System offers cellular phone users crystal-clear voice transmission and the safety of hands-free operation.

Our congratulations to the team that thought up this clever idea. It's a winner.■

Dick Heyser's Last Papers to be Published in the AES Journal?

We have heard rumors that Dick Heyser's last paper had been sent to reviewers (Dick had no peers technically and whoever consented to review it has to be an ego-maniac void of any introspection whatsoever). We have heard further rumors that said reviewers were rejecting publication of the article in the AES Journal. I talked to Dr. Fehr, editor of the Journal, and Pat Macdonald, defacto editor.

They confirmed that some anonymous reviewer had indeed recommended against its publication. They were not willing to say what they were going to do about it at the time I talked with them.

I cannot describe adequately the loathing I feel for the reviewers' state of thought who have chosen to defecate on Heyser's technological grave. (Dr. Fehr and Ms. McDonald have, since the above conversation, sent Dick's paper for review to three truly competent peers that Dick himself acknowledged as such. We appreciate the AES's response as a fitting one on behalf of the greatest figure ever to grace the rolls of AES membership.)

There is nothing in life more fleeting than fame - that's a given. But, I sincerely hope that all Syn-Aud-Con grads, all the friends they can persuade, and anyone else they can communicate this outrage to will rise up as one to write, call or march on the AES to publish Dick's last paper in the Journal he chose to honor with his work and that the perpetrators of this infamy are healed of this behavior.

I would remind my readers that even under provocations such as this, what I disagree with is the convoluted thinking of the individuals involved and not their personalities or worth as human beings. Every human has the theoretical possibility of being healed of erroneous thoughts and consequently becoming a changed human being.

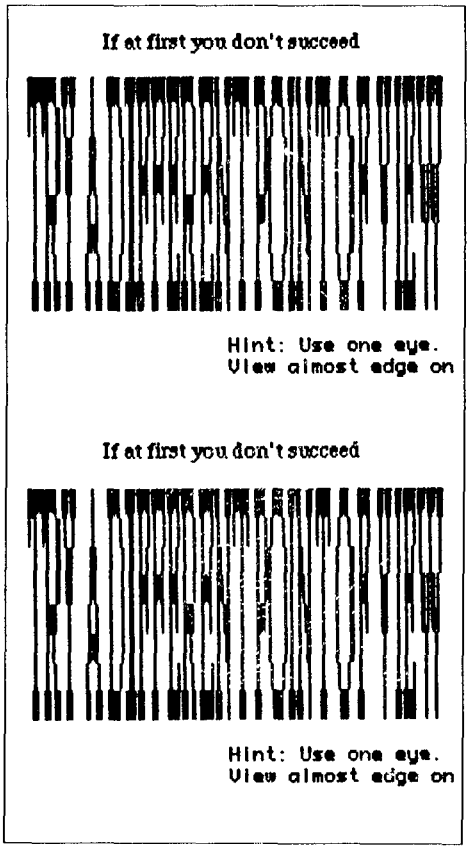
I will stop at this point before I express myself even more forcefully because it would not honor Dick to stoop to the same level as those I have been writing about. Dick once said DGIAPCWAS. I'm sure most of you know what that means.■

"Jesus Saves - but Dr. Millikan Gets the Credit"

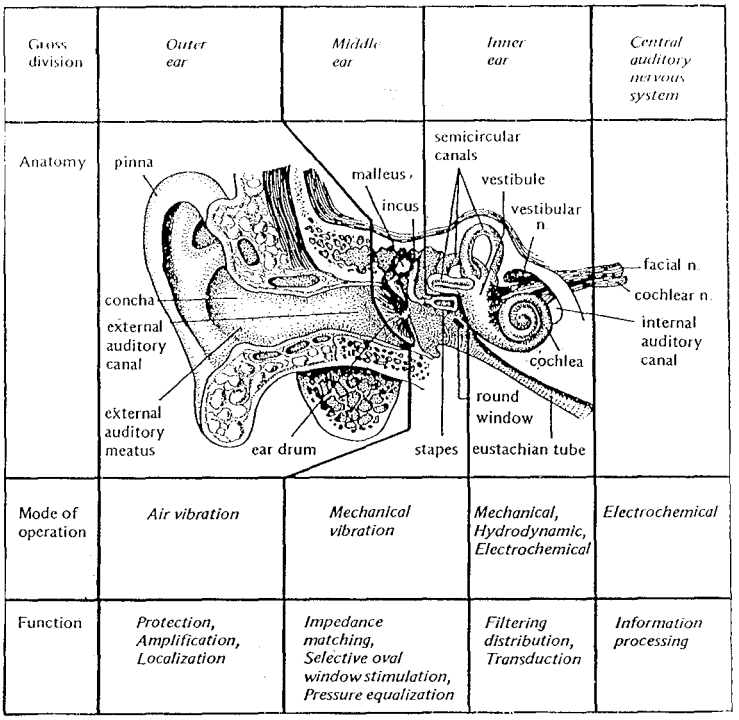
Dr. Milliken received the Nobel prize for the famous Oil Drop experiment which was actually performed by Harvey Fletcher while he was a graduate student under Milliken when they were both at the University of Chicago. In simple English, Milliken stole the credit from Fletcher in order to get the Nobel prize. Fletcher, who never, ever in his long and distinguished career, appropriated anyone's work and was renowned for his allowing his students and co-workers full and generous credit for all they did, was revered by all throughout his career.

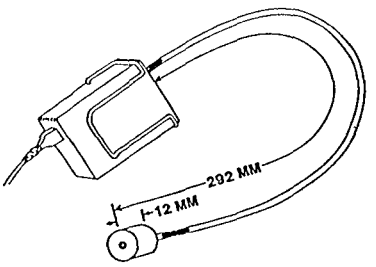
Millikan was at CalTech when Dr. Bertram was there. He, unsolicited, told us this story about Millikan. It appears that a site was being excavated at Cal Tech for a new building. The workmen had dug up a sign that said, "Jesus Saves" and had hung it up at the site. The next morning another sign was beside it which said, "yes! but Dr. Millikan gets the credit."

Dr. Bertram also supplied us with a new version of the optical Hilbert transform (operator). Suggestion: turn the bottom edge by 90 degrees. ■

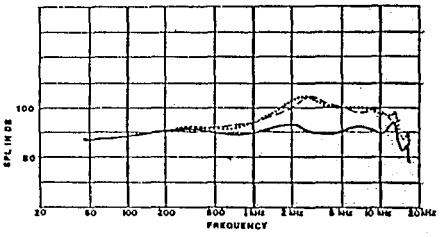


Ear — to — Ear Monitoring





Insert earphone with sound tube and EAR™ plug.



Frequency responses: (.....) Zwislocki coupler response of ER-1 earphone with .316 volt drive; (-----) cardrum-pressure response of the average ear in 90 dB SPL diffuse sound field; (———) diffuse-field referenced response of ER-1 earphone with .316 volt drive.

SPECIFICATIONS

FREQUENCY RESPONSE: 20 Hz - 16 kHz (see Figure 2)
1 kHz SENSITIVITY: 105 dB SPL FOR 1.0 Volt AC Drive
LIMITS: 108 dB Maximum, 102 dB Minimum
IMPEDANCE: 100 Ohms NOMINAL (100 Ohms at 100 Hz, 20 Ohms at 10 kHz)
SAFE OPERATING LIMITS: MAX. CONTINUOUS SINE WAVE DRIVE: 2.5 V RMS
ACOUSTIC POLARITY: + ELECTRIC (SMALL PIN ON CASE) = + ACOUSTIC
DATA SUPPLIED: ZWISLOCKI COUPLER RESPONSE ON INDIVIDUAL UNITS

We are reproducing portions of the Etymotic Research bulletin on their ER-1A tube phones because we believe, along with them, that they "provide the most accurate sound reproduction available today." Note particularly that these "ear" phones can either leave the ear canal resonance peak in or out (i.e., you could make ITE™ recordings with the ear canal resonance, if desired, and then play back the recording ear's resonance rather than the listener's ear resonance.)

Using Etymotic's new, low noise, in-the-ear microphones, an HME wireless intercom and the Etymotic in-the-ear head phones constitutes the ideal remote monitoring system when the console operator can't be where the mix should be made.

In case you missed what I said, I would like to repeat it: Using Etymotic's new, low noise, in-the-ear microphones, an HME wireless intercom, and the Etymotic in-the-ear headphones constitutes the ideal remote monitoring system when the console operator's head can't be where the mix should be made, but someone else's head can be.■

Spherical Heads vs Flat Heads

David Wright, of Electrical Systems Company in Indianapolis, sent us an ad recently for a loudspeaker that produces "Flat waves" and "revives the sound by the same principles as creating natural sounds." Further on in the ad we are told that, "Spherical waves irritate the human cardrums while flat waves approach the ear as more natural sounds." Definitely a flat head wrote the ad.■

J W Davis is Spelled Service

When one mentions the name J W Davis I am sure that one of the first thoughts that comes to mind is Service with a capital S. They want to serve their customers in a very special way and they spend a lot of time thinking up ways that they can.

They feel that an educated customer is a good customer. Their catalog has several pages of technical information divorced from selling a product.

Free Sound System Engineering

One of their promotions that we really appreciate is giving a free copy of *Sound System Engineering* with every order over $1,000 and the price is reduced to $19.95 for $500 orders. Customers ask them if they can get 2 free copies of the book if their order is over $2,000. They can.

J W Davis is primarily a distributor to the small sound contractor. J W stocks Aiphone, Shure, Switchcraft, Telex, Atlas, Panasonic, West Penn Wire, University as well as many products that they manufacture. Now they are a distributor for the TOA 900 and 500 electronic series.

J W Davis has a policy that if an order is received by 2:00 p.m., the shipment is made that day or they pay the freight!

Service with a capital S.■

Time as Distance— Distance as Time

The basic equation is that:

distance (d) = Time (t) multiplied by Velocity (c)

$d = tc$

For sound in air we can generalize a velocity at 72°F of 1130 ft/sec or 344 m/sec. If we make t = 0.000001 sec (i.e., one microsecond) then:

d(in feet) = (0.000001) (1130) = 0.00113 ft,

If we multiply by 12 in order to obtain inches, we get

0.00113 x 12 = 0.01356 in.

If instead we'd like to know how many microseconds there are in one inch, we would write:

$$t = \frac{d}{c} = \frac{1/12}{1130} = \frac{.008333}{1130} = 0.00007s \text{ or } 70\ \mu secs$$

Further, if you found that sound had travelled one foot in 885 μsecs, then

$$c = \frac{d}{t} = \frac{1}{0.000885} = 1130 \text{ ft/sec}$$

This simple equation from the most basic of physic concepts is a continuously useful tool in all kinds of calculations, be it audio or travel.

An alternative way to look at this is to say, if sound travels 1130 feet in one second

$$\frac{1130'}{1 \text{ sec}}$$

Then how many feet will it travel in 0.000001 sec (i.e., one microsecond, symbol μsec)

$$\frac{1130'}{1 \text{ sec}} = \frac{? \text{ feet}}{0.000001 \text{ sec}}$$

(1130) (0.000001) = 0.00113 ft

and multipy by 12 = 0.00113 x 12 = 0.01356"

The April Class at the Farm

When April 13, 1989 arrived, the farm house was ready for the first 1989 class at Syn-Aud-Con's Indiana farm. Farrel Becker flew out from Maryland to be the grad teacher assisting Don. The members of this pioneer basic class were:

SOUND ENGINEERING SEMINAR

NORMAN, IN APRIL 13-15, 1989

Brian Basalyga
5330 W. 138th Street
Hawthorne, CA 90250
213-643-8900

George Cernetig
Interstate Electronics Company
7615 Plaza Court
Willowbrook, IL 60521
312-789-8700

Dale Fawcett
Orchestral Arts
227 Cosburn Avenue, No. 706
Toronto, Ontario
Canada M4J 2L6
416-469-4478

Eric A. Hruza
Shure Brothers Incorporated
222 Hartrey Avenue
Evanston, IL 60202-3696
312-866-2240

James M (Mike) Keyt
Tipton Sound & Lighting
950 S. White River Pkwy. W. Dr.
Indianapolis, IN 46221
317-631-2703

Roy Kressman
Praise Fellowship Church
22 W. 420 E. St. Charles Rd.
Wheaton, IL 60188
312-665-2565

Richard Kunkel
Electrical Systems Co.
P.O. Box 68889
4305 Saguard Trail
Indianapolis, IN 46268
317-298-2975

Michael Lowe
Electrical Systems Co.
P.O. Box 68889
4305 Saguard Trail
Indianapolis, IN 46268
317-298-2975

The informality we were able to achieve is evident in the photographs. What was most heartening to us was the feedback received the week after the class as we received calls from members of the class telling us they had actually used what we taught to solve a specific problem in their own systems.

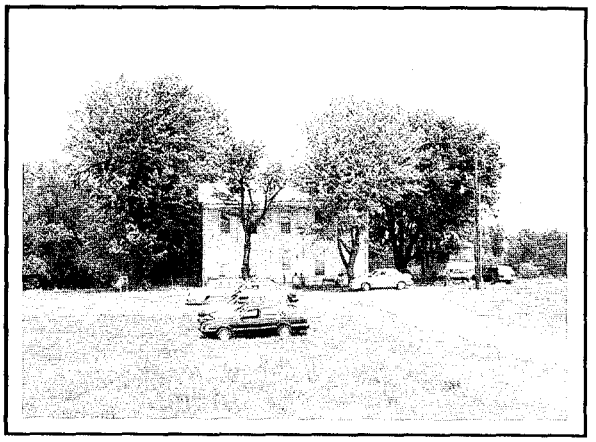
It's time to talk more about the farm. It's an old farm. The first white man on it was a revolutionary war sergeant, Benjamin C. Scott. He was born in 1755 and must have roamed to what was then the far west sometime after the war which ended in 1783 (on Sept. 3, 1783 the peace treaty was signed). The Indiana territory was formed in 1800. The Flinn and Guthrie families, friends of Daniel Boone, built their first campfire on the site of Leesville (just three miles from the farm) on the same night as the battle of Tippecanoe in 1811. They were, in 1813, the subject of the "Leesville massacre." One Micajah Calloway was the main ranger who cleared the area of hostile Indians (i.e., all Indians). For years he travelled in the Indiana lands, leaving an occasional dead Indian to mark his trail. It is said that entire Indian hunting parties would detour their course if they knew this menace was in the vicinity.

One of Carolyn's ancestors, Sally Cummings White—later known as Granny White, arrived on the scene shortly after the Leesville Massacre. Granny White's log cabin is now preserved in the Spring Mill State Park just 20 miles from the farm. Sgt. Scott and many of Carolyn's ancestors are in the ancient cemetery on the farm.

The farm today is a 500 acre site of which Don and Carolyn own 250 acres. Two of Carolyn's brothers own the remainder so it still remains in her family.

Owen Township in Jackson County is in the hilly wooded "Norman Uplands," (featured in National Geographic, March 1976.) This is recreational country because farming it requires a genius to survive. Until after World War II the farm was relatively remote from the remainder of the world and even today strangers are easy to identify as they "talk different and look funny." If you can't tell directions by go past X's farm until you hit Y's creek and then bend up Z's ridge, you can get seriously lost.

The family farm is a threatened institution. If Don had to farm it, it would be a doomed institution. What's neither threatened nor doomed is our love of the farm and our enjoyment of its deep woods, rolling pastures, and freedom to shoot, hike and work without fear of disturbing anyone else.



We are restoring, as rapidly as our resources will allow, the 106 year old house that sits one quarter mile from the gate which we use as a laboratory and classroom. The interior is pretty well completed but the exterior shows the ravages of its age. Our house and office are a quarter of a mile further into the farm. The classrooms are air conditioned and a small (emphasis on small) swimming pool is in back.

The old house is our research laboratory when we are at home. This means that those who attend these 1989 classes will have the opportunity to see and use instruments we can't take to the classes on the road. A rural atmosphere is not for everyone but for those who enjoy the great outdoors along with the intellectual challenge of working in one of the best audio measuring facilities—great because the right questions are asked, not just large sums spent.

If you would like to learn about audio basics with your hands on the tools and a teacher ratio of 1:6 in the secure quietude of a pioneer Indiana farm, then you'll find our summer and fall classes one of the greatest opportunities we have ever offered.

Instructors for the Farm classes will be Don and Carolyn Davis. Farrel Becker will join our staff in May and June. Dr. Eugene Patronis, Mary Gruszka, Hellmuth Kolbe, and Kurt Graffy will take one of the July through October classes.■

History of Syn-Aud-Con Workshops

Our first "grad" meeting was held in 1978. Over 100 people attended. Our staff was Richard C. Heyser, V. M. A. Peutz, James Moir and John Hilliard. We had a full day of wonderful sharing from the marvelous talent present. In the evening we had busses take the group to Wally Heider Studios to demonstrate what we "thought" Ed Long and Ron Wickersham were doing with their Pressure Recording Process. The studio arranged for a live group recording. We were a bit off base but there was enough substance in the demonstration and in a recently published Tech Topic (Vol 7 N5) that Ken Wahrenbrock took the idea and developed the Pressure Zone Microphone.

We were sufficiently thrilled with the results of the "grad" meeting that we started our 3-day Workshop program. The first was "The Twenty" in 1979 with Dick Heyser. The video tapes that we have recently made available attest to the importance of that Workshop. In addition, Clay Barclay was in the Workshop. He declared at the end of the Workshop that they (Crown) could develop an analyzer that would accomplish the measurements that Dick had performed for us during the Workshop. It took a few years and the genius-talent of Gerald Stanley but Crown did indeed deliver. At the end of the three days, we flew the class to Las Vegas to spend the day with Chips Davis at his new LEDE studio; thus was born a new generation of studio designers.

A lot of advances have come out of our Workshops. People attending the Workshops see new concepts work and they go out and push on the manufacturers to deliver (sometimes it takes us two or three Workshops on a given subject to get the idea to work. We felt intuitively that microsecond signal delay would be a significant development but it took us three workshops to prove that it would work.) Certainly D'Antonio's RPGs got their start in Russ Berger's Studio Design Workshop at Dallas Sound Labs. Now, we have something new going on that we think you are going to like—a new way to record and playback, In-the-Ear Recording. It will be getting a lot of our attention during the coming year.■

The JBL Meeting March 2-4

JBL held a meeting for their distribution, consultants, and key industrial contractors in March, 1989. The meeting was an outstanding example of how to put a successful meeting together. JBL "did it" in 1987, the first JBL conference we had attended, and one couldn't help but wonder if they could match the success a second time. Steve Romeo, JBL's mover and shaker for these meetings, as well as their rapidly maturing sound system computer design program, brought together a superb mixture of viewpoints in his chosen presenters.

For Carolyn and I, a gathering of the manufacturer's personnel, contractors and consultants that are doing important sound system work be it JBL, Altec, EV, Community, etc., represents a golden opportunity for us to be with long time friends. We were impressed by much we saw and heard, and especially by the quality of all who attended this meeting. The attendees reads like a Who's Who in Audio.

The new JBL sound system design program, if it lives up to its promise, will be outstanding. With Steve Romeo involved, the highest standards will be sought and more than likely achieved. Certainly Steve's efforts would be fruitless if he were not getting support from an enlightened management team. JBL has got it!

We sincerely hope this type of meeting is fruitful for the manufacturer —it most certainly is for those of us who attended.

Jim Carey sent us a copy of the letter he wrote JBL from which I would like to share an excerpt with you, as Jim has a very special way of expressing himself.

Carey Associates
Systems Consultants

06 March 1989

JBL Professional
ATTN: Steve Romeo
8500 Balboa Blvd
Northridge, CA 91329

Dear Steve

Well, here I am back at my desk (I m sure there s a desk under there somewhere) reflecting on the past week

Boy, I am one tired puppy!

The first three days were a panic trying to get ready to leave town for the '89 JBL Audio Conference Thursday I was up before dawn; hustled to the airport; took a four-and-a-half-hour flight into LA; investd in the Prime Time operation, traversed the California terrain in a covered wagon, swung into Woodland Hills on a rope; wrestled with the baggage; checked into the Marriott; passed out, woke up just in time to attend the conference opening dinner and do-dah; saw ol' friends; smiled a lot; ate too much, and topped it all off with a short night

Friday and Saturday you know th drill

Sunday, repeated the Thursday song and dance schedule in reverse

Now that I m back in the office the obvious question is: Was it all worthwhile? Are you kidding? Is a frog waterproof? Does Don Keele run around in circles? Has Deane Jensen been transformed? Does David Klepper go to church? Does Peter D'Antonio go off in all directions? Does Bob Reim Negotiate?

Why, YES of course it was all worthwile. It was certainly a privilege and an honor to rub elbows with the leaders in the audio industry The unity of the attendees and their willingness to share information made the 1989 JBL Audio Conference a new benchmark in professionalism This conference served to reinforce my belief that it is only through synergism can one and one ever equal three.

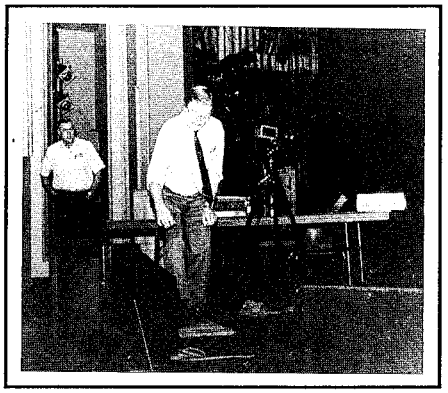
1405 Robert E. Lee Lane • Brentwood, Tennessee 37027 • (615) 377-4900

A Very Special Vancouver Class

We like Canada and the Canadian people: we welcome every opportunity to hold a class there. We have held about six sound engineering seminars in Vancouver so it has become a very special place for us, and we have been skiing at Whistler/Blackcomb five of the six times in Vancouver for a class.

The day after the Vancouver class we held a one-day special workshop on how to listen to and measure a small concert hall.

The Gateway Theater is located in Richmond, a suburb of Vancouver and is set in a park. The facility was able to provide excellent food service and were most gracious and cooperative. The auditorium provided some interesting problems for our group to evaluate, as did the sound system.



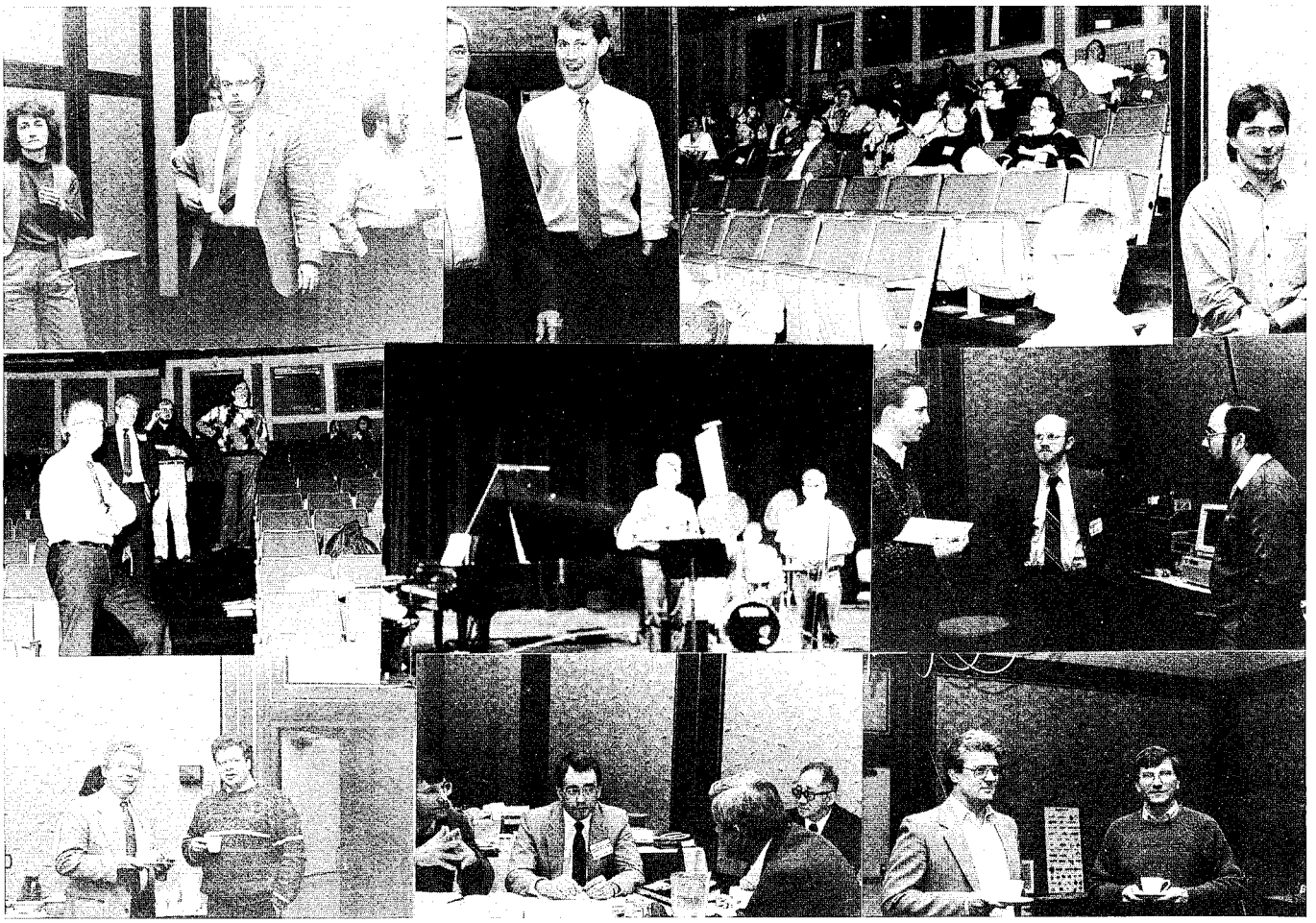
Ken Barron taking the class through a set of drawings

Ken Barron of the consulting firm, Barron, Kennedy, Lyzun, gave a "tour de force" demonstration of how to use the Sabine equation to estimate the RT60 of such a hall, and then had us measure against his predications. At the few frequencies where there were minor divergence, a further examination of the details of the bounding surfaces revealed a logical reason why - like telling Ken that one surface was concrete (very low absorption coefficient) when in actual fact the wall had areas that were highly absorptive. Ken's demonstration was a superb step-by-step example that allowed all present to see how they could start their work from a set of drawings and obtain realistic and useable estimates of RT60.

Vancouver is easily one of the most attractive cities in North America and shouldn't be missed by anyone who knew and loved San Francisco 30 years ago. We wouldn't be surprised to see Vancouver become an important electronics center inasmuch as many wealthy Hong Kong citizens are moving their base of operations into that area.

Peter Soet (C) and Mike Bell (R) who encouraged us to go to Vancouver and "put it all together" for us.

Our 1990 schedule is being planned to include the Calgary stampede, followed by a special workshop in Calgary on loudspeaker arrays. Those of you wishing a superb experience could plan attendance at this workshop followed by travel to Vancouver as part of a tour of Western Canada.



Dorian Recordings State -of -the -Art Recording

Dorian Recordings
17 State Street —Suite 2E
Troy, New York 12180
Tel: (518) 274-5475

In the past when asked to suggest good recordings on CDs I have begged off as really not up-to-date on such matters. Recently Craig Dory sent us a series of his new recordings. We are so impressed that we are listing his new titles here in the newsletter. It's hard to pick the super exceptional out of the totally spectacular but DOR-90117 Mussorgsky: Pictures at an Exhibition and DOR-90109 The English Lute Song—Julianne Baird and Ronn McFarlane (recorded in Troy Symphony Hall) illustrate, devastatingly, how poor the commercial CDs are and how good they could aspire to be. Too much recording work is done by persons whose taste is solely in their mouths. Too much recording engineering is being done by knob twisters who can't even get absolute polarity correct from one piece to the next.

Craig Dory and Dorian Recordings "have all their ducks in a row." Without equivocation the best musical experience and the best technical test records available to the serious evaluator of quality listening rooms. Those who attended the 3L Workshop heard one very high quality loudspeaker fail to reproduce the sound of Troy Hall while another did so faithfully. The English Lute song disc is the acid test of a systems ability to reproduce acoustic subtleties and The Mussorgsky is the acid test of survival for both amplifier and speaker in a truly quality system in a controlled room.

Don't play me "Star Wars" when testing a sound system if you wish me to take you seriously—play me the English Lute Song.

[DOR-90002] **The Dorian Sampler, Vol. II**

Various Artists / DDD

A delightful *potpourri* of selections from the Dorian catalog, this album represents a perfect introduction to the label and its artists. Highlights include music from: **The English Lute Song** [DOR-90109], **MUSSORGSKY: Pictures at an Exhibition** [DOR-90117], **Piano Music of Robert Schumann** [DOR-90116], **Scarlatti Sonatas** [DOR-90103], **The Virtuoso Viola** [DOR-90107], **Christmas in Leipzig** [DOR-90113], and **Christmas with Solid Brass** [DOR-90114]. *Available at a special low introductory price.*

[DOR-90117] **Mussorgsky: Pictures at an Exhibition / Stravinsky: Petrouchka**

Transcribed and Performed by Jean Guillou, Organ / DDD

France's greatest organ virtuoso presents two of the most astonishing musical spectaculars imaginable: popular orchestras masterworks by Mussorgsky and Stravinsky magnificently arranged to exploit fully the limitless tonal resources of the "King of Instruments". This album is the debut recording of the huge newly-inaugurated Steinmeyer-Kleuker organ of the historic Tonhalle of Zürich — an instrument designed by Jean Guillou and which will surely rank among the world's greatest. This recording is perhaps the most challenging high fidelity demonstration disc of all time!

"The organ rippled and sang. It was an inutterably beautiful sound." — *Fanfare* Magazine.

"Perhaps most astonishing is a performance of works by Stravinsky and Mussorgsky on a giant pipe organ in Zürich, Switzerland...I have collected organ discs and tapes for 32 years and have heard nothing that approaches this recording in both the power of its pedal bass and the bright singing quality of its higher pipes." — *Newhouse News Service.*

[DOR-90109] **The English Lute Song**

Julianne Baird, Soprano • Ronn McFarlane, Lute / DDD

A recital of lute songs of the English Renaissance, some unadorned, others with florid ornamentation, all brilliantly realized by America's outstanding Early Music soprano, Julianne Baird. With lute accompaniments and solos by Ronn McFarlane, this is a recording of some of the finest vocal music ever written, some songs originally presented in Shakespeare's plays, performed with sensitive artistry and emotional conviction. Truly a landmark recording!

"Julianne Baird's voice is so stunningly recorded that I was struck by the realization that her voice was not, as we always insist, *captured* by the recording medium; it was instead *set free.*" — *Fanfare* Magazine.

"...*The English Lute Song* presents one of the most delicate and haunting female voices ever recorded." — *Newhouse News Service.*

"...absolutely superb...you can hear the hall literally sing between the performer's notes." -- Synergetic Audio Concepts *Newsletter.*

[DOR-90112] **Jean Guillou • Organ Encores:** Works by J.S. Bach, Handel, Purcell, Haydn, Schumann, Liszt and others

Jean Guillou, Organ / DDD

France's *grand maitre* of the organ serves up an enticing soupçon of familiar and not-so-familiar favorites that have served as encores to his many concerts around the world. Included are a number of showpieces designed to test the capabilities of player and instrument to the fullest. Works by Bach, Haydn, Handel and Purcell are coupled with exciting transcriptions prepared by Jean Guillou and improvisations which never fail to "bring down the house". The album, recorded at Alpe d'Huez in France is a true sonic spectacular, and a must for all pipe organ lovers!

"There are many contenders for the best organ recordings, each with legitimate aspirations. These two CDs [DOR-90110 & DOR-90112] can stake their claim at the very top." — *Fanfare* Magazine.

[DOR-90110] **J.S. Bach: The Goldberg Variations, BWV 988**

Transcribed and Performed by Jean Guillou, Organ / DDD

One of music's timeless masterpieces is given a thrilling new voice — that of the incredible pipe organ of Our Lady of the Snows, Alpe d'Huez, France. Jean Guillou, one of the most extraordinary talents in the musical world, plays his own transcription of this pinnacle of Bach's creative output on a unique tracker instrument of his own design. The performance runs the gamut from virtuosity to spiritual intensity with brilliant arrays of tone color throughout. A release not to be missed!

"...spectacular..." — Synergetic Audio Concepts *Newsletter.*

[DOR-90113] **Christmas in Leipzig:** Choral Music for the Nativity by J.S. Bach

The Bach Choir of Bethlehem and Bach Festival Orchestra, Greg Funfgeld, Music Director and Conductor • Sylvia McNair, Soprano • Janice Taylor, Contralto • David Gordon, Tenor • Daniel Lichti, Bass / DDD

One of the most enduring and respected music festivals in America is the Bethlehem Bach Festival, which is now approaching its centenary. Here, the Bach Choir and Bach Festival Orchestra offer vivid and incredibly powerful performances of some of Bach's greatest music composed to honor the birth of Jesus Christ. Included are Cantatas BWV Nos. 63 and 65 and the *Sanctus* from the Mass in B-minor. Outstanding soloists, an all-star orchestra and thrilling choral singing in a richly traditional style come together in performances of the greatest emotional and spiritual power. A true musical Christmas feast!

"...simply stunning...a complete success, both musically and technically." — *The Globe-Times.*

"The sound of Craig Dory's digital recording is utterly remarkable. This is probably the smoothest, least fatiguing large-ensemble CD I have auditioned so far, and yet the trumpets and strings have excellent bite and presence, the soloists' top notes come through free and easy, and the choir is very palpably 'there,' properly located in a definable space..." — *The Audio Critic.*

"...the recording is outstanding, and the choral movements featuring trumpets are thrilling...this is a most auspicious introduction to the Dorian label." — *Fanfare* Magazine.

"The skill with which the recording is rendered does justice to its ambitious program...The interpretation with its finely balanced tempi and articulation is a joy to hear. The soloists...are simply wonderful. The orchestra playing...is on the highest level throughout." — *The Morning Call.*

[DOR-90116] **Piano Music of Robert Schumann: Carnaval / Kinderscenen / Phantasiestücke, Op. 111 / Gesänge der Frühe**

Antonin Kubalek, Piano / DDD

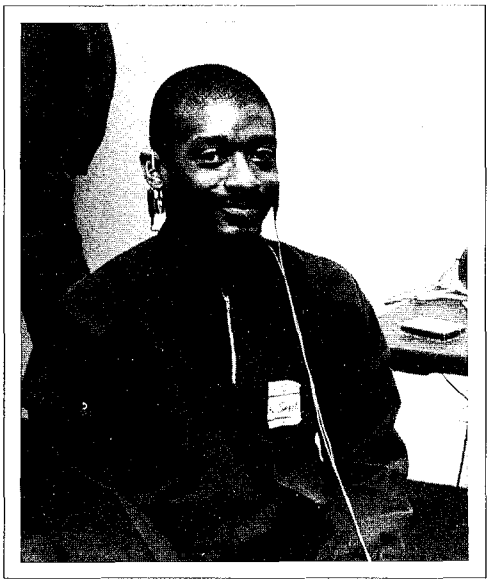
This program features two of the greatest and best-loved works from the Romantic piano literature: *Carnaval* and *Scenes from Childhood*. Antonin Kubalek brings a lifetime of experience as one of the world's most inspired and sensitive interpreters of 19th Century piano music to bear on these most famous collections of miniatures by Robert Schumann. The composer's exquisite *Fantasy Pieces*, Op. 111 and *Songs of Dawn* round out this 70-plus minute album.

[DOR-90120] **The Enchanted Isles:** Harp Music of Ireland, Scotland, England and Wales

Carol Thompson, Harps / DDD

Virtuoso harpist Carol Thompson presents a collection of some of the loveliest traditional melodies of the British Isles, many with a rich Celtic flavour. From haunting, windswept beauty, to lilting lyricism and magical earthiness, the album touches a deep, almost primal emotional chord. An unforgettable recording. Arrangements by Carol Thompson — performed on Celtic, Triple and Pedal Harps.

"In-the-Ear" Recordings



John Smalls

An ITE Progress Report

While we were "on the road" this winter, we demonstrated our in-the-ear (ITE) recording technique to each class. In San Francisco, John Smalls, who was one of the 3L workshop members as well, became one of the "microphones" for us.

Upon our arrival back in Indiana, Etymotic Research was able to provide us with a new pair of ITE microphones with much lower noise level. We have just recently recorded a symphony orchestra, a cellist and some remarkable percussion performances. We are also busy building a new playback system that will utilize a pair of Benchmark's low noise Quad amps modified by Allen Burdick to drive two stereo amplifiers and several sets of headphones. One thing we can report for certain is that ITE listening is definitely habit forming.

Circuit Configurations

When interfacing devices in a sound system, there are four circuit configurations you can encounter. They are:

1. The matched circuit
2. The constant voltage circuit
3. The constant current circuit
4. The unmatched circuit

The Matched Circuit

The matched circuit is rarely encountered in today's systems, but is mandatory when inserting passive devices such as attenuators, equalizers, cutoff filters and crossover networks. The matched circuit is one in which $R_S = R_{IN}$ or, if at the output of the system, $R_S = R_L$.

The Constant Voltage Circuit

This, today, is the most commonly encountered configuration. Typically a mixer's output will be on the order of 130Ω and the device it is "sending to" will have an R_{IN} = 10KΩ or higher. The constant voltage circuit is one in which R_S is one tenth or less of R_{IN} ($R_S << R_{IN}$). The "constant voltage" nomenclature refers to the fact that until the current limit of the device is reached the voltage will not vary with varying loads.

The Constant Current Circuit

This is normally encountered as a method for measuring impedance since it allows a voltmeter to vary proportionally to the impedance changes. Shure's vocal master employed constant current circuits as have other manufacturers. The constant current circuit is one in which R_S is at least ten times greater than R_{IN} (or R_L if at the output of the system. $R_S >> R_{IN}$)

The Unmatched Circuit

These are the circuits where you are nearly matched but not sufficiently different to qualify as constant voltage or constant current. $R_S \neq R_{IN}$ but is less than 10 R_{IN} and greater than 0.1 R_{IN}. The unmatched circuit usually is encountered when devices not intended to work together (i.e., music products with broadcast quality products) have been included in the same system.

Note that Syn-Aud-Con reserves the words "matched circuit" for just that—a matched circuit. Adjusting other impedances, we refer to "appropriate" impedances, and in the mismatched cases it is usually referred to as inappropriate impedances. One sure test of professionalism is the ability to go through a sound system knowing what's appropriate in terms of impedance and able to correct those conditions that are not appropriate.■

Defining Temporal Measurements

Modern researchers in audio and acoustics acknowledge that there are at least two domains:

1. The frequency domain
2. The time domain.

There are other domains such as the "modulation" domain and "the delay plane" domain discovered by Heyser and currently being reinvented by Hewlett Packard, but for the purposes of this discussion let's limit our focus to the first two domains.

Frequency Domain Viewpoint

If, for the sake of our discussion, we limit ourselves to a person talking as our source and another person listening as the receiver, we can then make useful simplifications in our analysis. If we assume the speech range of 100 Hz to 5000 Hz to cover generously the spectrum of interests, we are able to make our first statement about a temporal requirement. In order to have a spectrum from 100 Hz to 5000 Hz we have a 1/f of:

$$1/f = \frac{1}{100} = 0.01\text{sec or } 10 \text{ msecs}$$

Another way of looking at this would be to say that successive speech sounds with spectrums falling within the 100 Hz to 5000 Hz width would require at least 10 msecs of time. It is also evident that speech sounds will typically last longer than this for each sound but the significance of the interval lies in the fact that under impulse testing, for example, 10 msecs should be the longest period looked at for a given energy return.

Frequency Dependency

Almost everything in audio and acoustics exhibits frequency dependent behavior. For instance, if you take a given frequency tone and switch it on for shorter and shorter intervals, it will eventually turn from a tone into a click. The time interval required will vary with frequency, (approximately 1/f at most frequencies). Put another way "there is no such thing as an instantaneous frequency."

Time Domain Viewpoint

The most fruitful area of research today, especially in psychoacoustics, is the careful reexamination of temporal influences on speech and music. The reason this is so is because of the crudity of so many of the measurement techniques used in the past. Because of this, let's start the discussion with a few definitions of what are labeled "impulse response."

Single Frequency Pulse Tests

In this kind of test one frequency at a time is "switched" for a chosen time interval. Forty years ago we often used these tests to try to find the delay between two signals. We recognized at that time that our "pulsing" of a single tone resulted in a spectrum. We had no means of observing it, so confined ourselves to interval measurements.

Dirac Impulses

A "Dirac" impulse is one of infinite amplitude and zero time width. If such an impulse could exist its bandwidth would be infinite.

$$1/T = \frac{1}{\emptyset} = \infty$$

In Cremer and Mullers' *Principles and Applications of Room Acoustics* (page 486) we find the following fascinating sentence.

> "The fact that Schwarze found nearly equal peak levels for all durations ΔT less than $1/\Delta f$ can be expressed by the simple statement that the ear evaluates the loudness in this region of short ΔT according to the peak level, independent of the duration of the impulses."■

Mix Bookshelf Catalog

MIX Magazine Publications, publisher of MIX Magazine, publishes a 67 page catalog of "professional information and high-tech tools for the audio/video/music recording industries". They sell books, audiocassettes, videocassettes, software, sounds, and related products. If you haven't seen a copy, write the MIX Bookshelf, 6400 Hollis Street, Suite 12, Emeryville, CA 94608. (800)-233-9604. (415)-653-3307.

Even if they don't have a book listed that you are looking for, I suspect that they will know how to get it for you. ■

SYN-AUD-CON Belt Buckles

We have had new belt buckles cast. They are gold on a black background and made of solid brass. They fit up to 1 1/2" wide belts and the art work shown here illustrates the design used. These can be purchased for $8.50 plus shipping.■

Successful Solutions to "A Basic Question of Voltage"

Successful answers to the questions posed in Newsletter Vol 16, No. 2, P30 were returned by Lou Flynn, Canby, OR; Phil Nelson, Wichita, KS; Farrel Becker, Gaithersburg, MD; and George Pfisterer, Huntington Valley, PA.

We received variations on the correct answer varying from 0.5V to 0.707V. The formal solution is shown here.

RMS OF SINE WAVE ON A DC

A sine wave on a DC can be expressed:

$$y = C_1 + C_2 \sin x$$

$$y^2 = C_1^2 + 2C_1C_2 \sin x + C_2^2 \sin^2 x$$

The Mean Square (MS) is (note that the sin x term drops out because the integral of a sine over one cycle is zero):

$$MS = \frac{1}{2\pi}\int_0^{2\pi} C_1^2 dx + \frac{1}{2\pi}\int_0^{2\pi} C_2^2 \sin^2 x\, dx$$

$$\text{Since } \int_0^{2\pi} \sin^2 x\, dx = \frac{1}{2}$$

$$MS = C_1^2 + \frac{C_2^2}{2}$$

Thus a sine wave with 1-volt excursion (0.5 sin x) on a 0.5 V DC (Figure 3) has an MS and RMS of:

$$MS = \frac{1}{4} + \frac{1}{8} = \frac{3}{8}$$

$$RMS = \sqrt{\frac{3}{8}}$$

$$= 0.61237 \quad \square$$

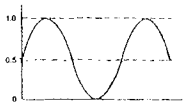


FIGURE3 Sinewaveon a DC

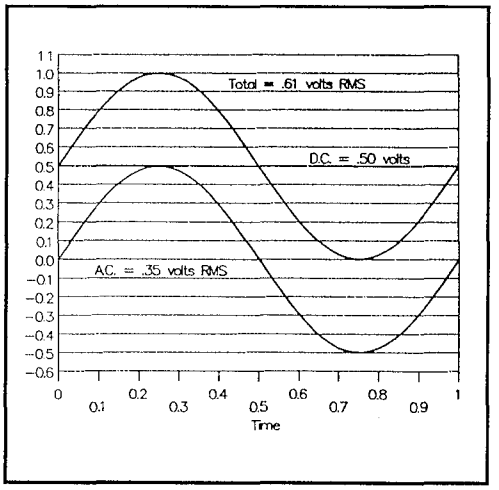
Looked at simplistically, one could reason as follows: The AC signal is a peak excursion of 0.5V. It is offset from its normal zero reference by 0.5V of DC voltage. Since AC RMS values are the equivalent DC heating values, the two could be handled as:

$$\sqrt{\frac{(0.5v)^2 + 0.5v^*}{2}} = 0.61237\ldots$$

*This is the DC voltage which already is the equivalent AC RMS value.

We were pleased to hear from everyone who responded and hope that they have led the way for all of us to better understand the meaning of RMS value.

Phil Nelson sent in a very elegant solution with the following comments: "I immediately thought of you when I saw this program (published in I.E.E.E. Newsletter). Since you took the effort to re-publish it, I thought I should at least take the effort to solve it."



Farrel Becker sent a printout of the voltage chart and a spreadsheet so that we could see how he modelled the problem. The chart is reproduced here.

David Klepper TEF Specification

When we were in New Zealand last June, Chris Day of the Marshall Day consulting firm said that he had heard that David Klepper of KMK Assoc wrote specifications that included the TEF analyzer. I told Mr. Day that I would ask David to send him a copy of the spec. David did and he sent us a copy. Here is the clause that David uses under

"INITIAL TESTS AND ADJUSTMENTS:

B. Test Equipment:

1. Contractor to own all test equipment necessary to perform initial tests and adjustments

2. Contractor's ownership to include, but not limited to, following test equipment: (a) Crown/Techron TEF System 10 Audio Spectrum Analyzer\Computer; (b) Ivie IE30 Audio Analyzer with appropriate pink noise generator; (c) distortion analyzer; (e) sine-wave generator; (f) RLC Impedance Bridge; (g) 5.0 MHz bandwidth or greater dual-trace oscilloscope.

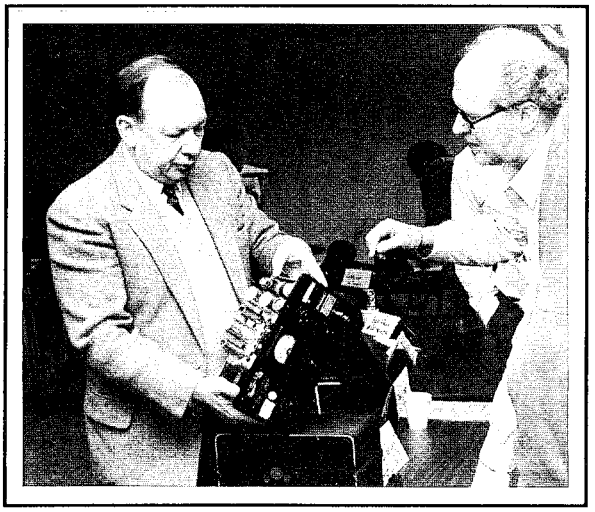
3. List of test equipment to be submitted to owner and architect as part of initial submittal.

David wrote Mr. Day that "delay settings, both between elements in a central cluster and to various types of delayed distributed loudspeakers represent the main use" of the TEF. "In the future we may require use of the TEF equipment to determine Articulation Loss of Consonants and equivalent RASTI numbers, but this will only be done where part of the burden of sound system design is placed on the contractor."

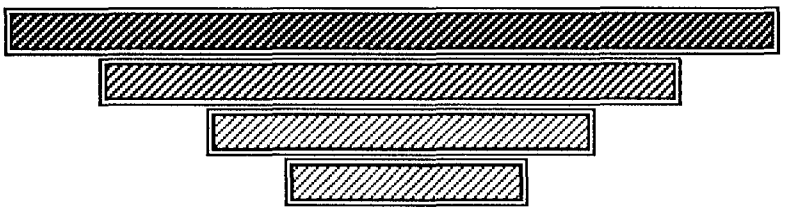
It's coming. Maybe not this year, but certainly by 1990 acoustical consultants will require the measurement of %ALcons in sound system specifications.■

Fred Fredericks

Fred Fredericks is a special kind of guy. We'll not go into his fascinating military career—in electronics and communications—all over the world or into his successes in the commercial sound field. We regard Fred as a good friend and the kind of guy we'd like with us in any tight corner as well as in the good times. Fred has donated to the Syn-Aud-Con museum a very early GenRad RF generator and most recently a first version of the GenRad Random noise generator. He tells us he has an early Daven precision resistance box to add to the list when he comes by this summer. One of my favorite expressions uttered by Fred was his description of a guy trying to give him a hard time and about to lose, "He was deep in the bamboo before he found out the facts." Those fortunate folks attending the farm classes this year will get to see these pioneer items as well as an original ERPI sound level meter given us by Steve Durr and some very unusual meters donated by Posey Bowers.■



Stack and Splay vs Side-by-Side Speaker Arrangement



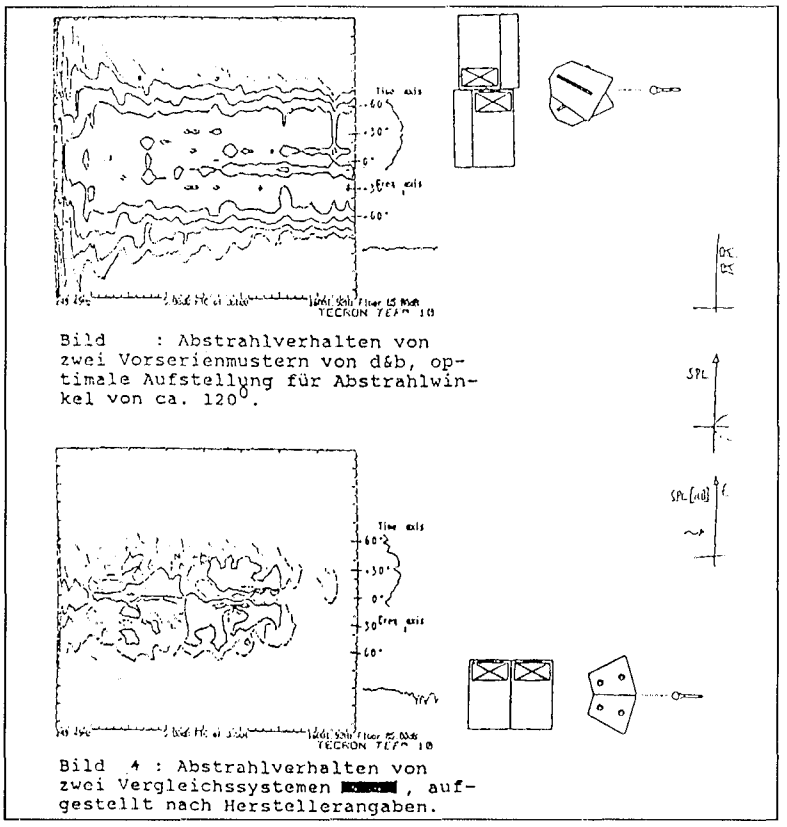


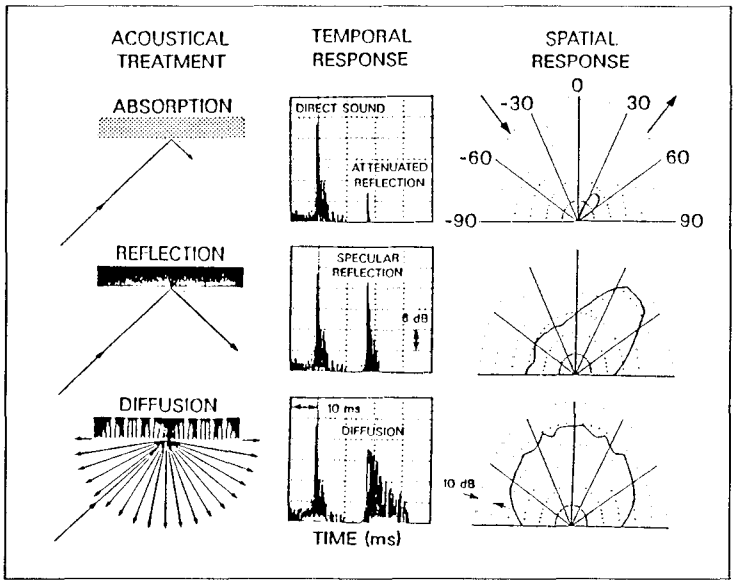
Bild : Abstrahlverhalten von zwei Vorserienmustern von d&b, optimale Aufstellung für Abstrahlwinkel von ca. 120°.

Bild 4 : Abstrahlverhalten von zwei Vergleichssystemen [redacted], aufgestellt nach Herstellerangaben.

Uli Mall of D&B Audiotecknik in West Germany provided us with an interesting frequency vs angle study of a pair of their units stacked and splayed vs a pair of units from a well known American manufacturer arranged as suggested by their manufacturer in their instruction manual: side-by-side.

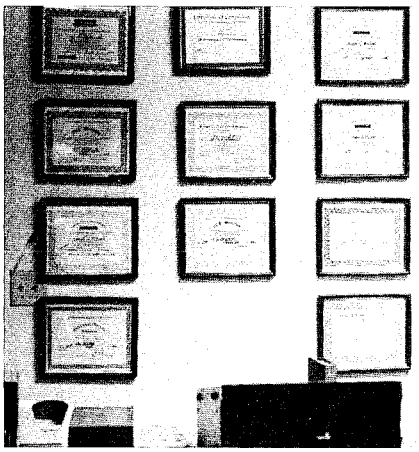
We believe this data is relevant to actual use in the field and present it as such. It confirms what we have been saying, stack & splay is preferable to placing speakers side-by-side either together or separated.■

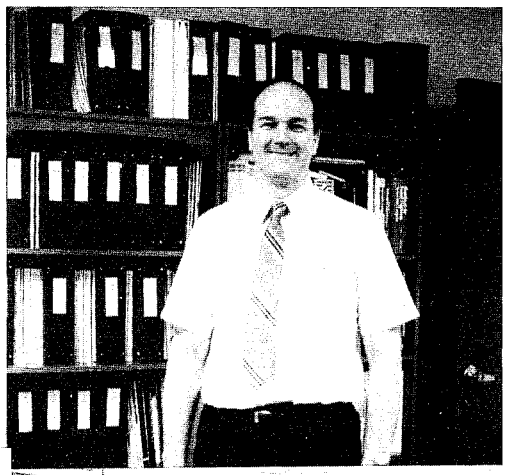
Absorption, Reflection, & Diffusion Illustrated



We invited Peter D'Antonio to talk to our White House Communications class in the Spring. He used the illustration reproduced here. We have seen Peter use the illustration many times in our advanced workshops. Seeing the WHCA response to the drawing made me realize how quickly it conveys the difference between absorption, reflection and diffusion.■

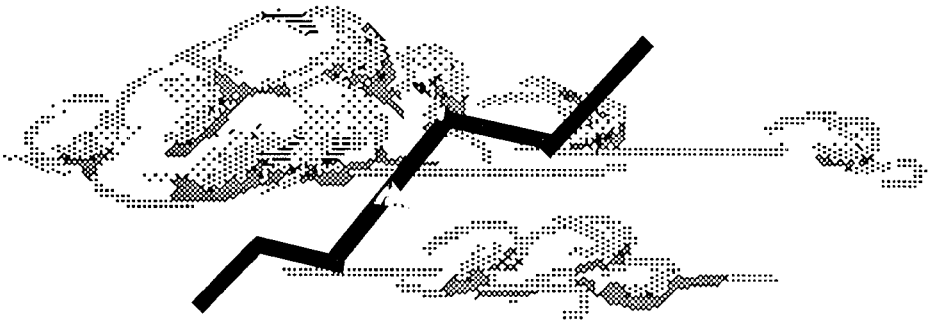
A Good Man in the Syn-Aud-Con Hall of Fame





Joe Mitchell is a man full of the love of life. A true gentleman in every meaning of the word and a quiet deep researcher into the application of spectrum analyzers to every kind of audio measurement. The evening we ended the Chicago class in September we went to the Saint Germain Foundation headquarters (where Joe works) to park our motorhome for the night. Early the next morning before we headed for Minneapolis, Joe showed us his working area and laboratory. Joe got into dual channel FFTs back when we bought our first GenRad analyzer. Later Joe bought our GenRad from us as well. Joe was among the pioneers in TEF analysis and a worker who Dick Heyser knew and respected. Joe has a wall of Syn-Aud-Con certificates and a mountain of Syn-Aud-Con respect, appreciation and friendship.

A Below the Bid Story



It seems that a church hired a low bid painter to paint the exterior of the church. Unfortunately, he soon discovered that the reason he was low bidder was because he had grossly underestimated the amount of paint required to do the job. Using copious amounts of paint thinner, he stretched the paint by repeatedly adding the thinner until he had completed the job.

Just as he finished, a rain storm came up and washed all the thinned paint off of the church.

As a clear sky reappeared, a bolt of lightening came out of the clear blue sky followed by :

"Re paint, Re paint, and go and thin no more!"

Courtesy Joe Mitchell

1989 SYN-AUD-CON SEMINAR AND WORKSHOP SCHEDULE

2-Day SEMINARS

New York Area
October 17-18

Washington, D.C.
October 26-27

Orlando, FL
November 15-16

The on-the-road classes are a rapid fire review of audio and acoustic basics and their use and misuse in current system practices. Unlike our 3-day classes at our farm in Southern Indiana which are intended to develop specific audio skills in a limited number of basic audio tasks, our 2-day on-the-road classes provide a global approach to the areas of audio and acoustics that 40 years have shown us to be important to your success in this field.

Our 2-day classes are an excellent introduction to Syn-Aud-Con, the vocabulary of audio and acoustics, and an authoritative overview of what you may well be missing and need.

3-Day SEMINARS

The Farm in Indiana
June 22-24
July 21-23
August 23-25
September 22—24
October 5-7

3-Day WORKSHOPS

Computers In Audio
The Farm
September 1989

We are planning a computer workshop for those who use IBM compatible computers for designing sound systems, bidding systems, and doing audio and acoustic mathematics.

Our instruction staff will have fascinating and innovative ways to to utilize computer spreadsheets for sound system purposes.

Our Staff is:

Farrel Becker, Audio Artistry, Gaithersburg, MD
Mario Maltese, TSI, Mineola, NY
Joe Mitchell, Saint Germaine Foundation, Hoffman Estates, IL

You can bring your computer if you want. You will learn from us while you share with others. But isn't that what Syn-Aud-Con is about anyway?

In the next three to four years we can expect to have early Cray capacity at PC prices. If that truly comes to pass, then what we put in such machines better be the best we can do and not our first flawed fumbles. The Computers in Audio Workshop will bring us all up-to-date on today's best.

Workshop Registration Fee
At the Farm - $500 for 3 days

Seminar Registration Fee
At the Farm—$500 for 3 days
On-The-Road Classes—$450 for 2 days

Auditory Exorcism

Jim Fullmer, a consultant in Salt Lake City, and Bill Benesik, our rep in Florida, sent us a copy of a catalog put out by Monster cable on their Prolink® line.

I can truthfully say I have never read a more shameless set of lies.

> "Since current density varies with frequency, the higher audio frequencies travelling on the outside of the wire cause the signal to spread out causing a frequency dependent current lag.
>
> "Separate multiple gauge wire networks—one each for the bass, mid range, and high frequencies—are individually wound to maintain the phase integrity of frequencies."

Certainly there is no sales integrity here. Further on we read:

> "A special high-air content dielectric is then wrapped around individual conductors to lessen the distortions that cause compression of high-level signals."

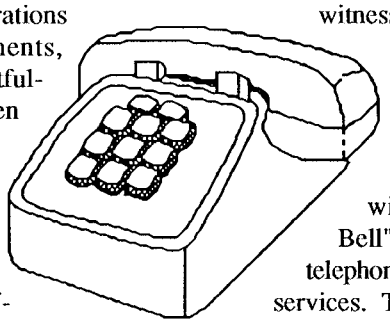
This kind of "hot air" definitely causes compression of one's patience with ignorance (or is it ignorance?).

Barnum says, "There's a sucker born every minute" and the acceptance of these products would seem to confirm his statement, but that doesn't make taking advantage of them a righteous act.

We sincerely hope that all Syn-Aud-Con grads have risen above this kind of medieval witchcraft. The way to exorcise a faulty sound system is to apply an understanding of fundamentals to its analysis and solution.

Rape of Ma Bell

While many large foreign corporations received sizable subsidies and many special considerations from their governments, (and in our mind rightfully so because they then bring in favorable foreign exchange and employ many thousands of workers) our government and especially our out-of-control judicial system contrive to destroy profitable enterprises and weaken our national defenses by acts such as the breakup of Bell Telephone.



There is an excellent new book detailing just how criminal such behavior really is: **The Rape of Ma Bell** by Constantine Raymond Kraus and Alfred W. Duerig. For only $19.95 plus $2 for UPS delivery (New Jersey residents please add $1.20 sales tax this book can be ordered from: Lyle Stuart Inc.,120 Enterprise Avenue, Secaucus, NJ 07094

Well written and well researched, the authors are former Bell Telephone engineers with Mr. Duerig having 37 years of experience with them.

It is said that those who don't read history are doomed to repeat it and knowing what part Bell Telephone laboratories played in WWII and then witnessing that capability being deliberately destroyed is frightening to say the least.

As ordinary citizens, we primarily witness the "rape of Ma Bell" via increased rates for telephone service and degraded services. The United States must at some point find the leadership capable of shaming congress, reining in incompetence in the courts, and educating, if that's even possible, the press.

Few sights are more disgusting and infuriating than watching one newsman who is capable of nothing productive interviewing an equally useless fellow newsman as if he were a respected pundit. Because of the television malady, otherwise thinking human beings have come to accept these untrained, unskilled, often unethical "actors" as men and women whose opinions have meaning when in actual fact they often know less about the subject under discussion than their listener.

As ordinary citizens, we primarily witness the "Rape of Ma Bell" via increased rates for telephone service and degraded services.

We recommend "The Rape of Ma Bell" as an eye opener to anyone interested in depending on the telephone service in their business activity.

Professional Services

Acoustical Consultants may list their cards on this page. There is no charge. The only requirements are that you are a full-time consultant, that you have attended a Syn-Aud-Con seminar, and have an active subscription to the Syn-Aud-Con Newsletter. If you would like to be on our Consultants page, send in four (4) business cards for our file.

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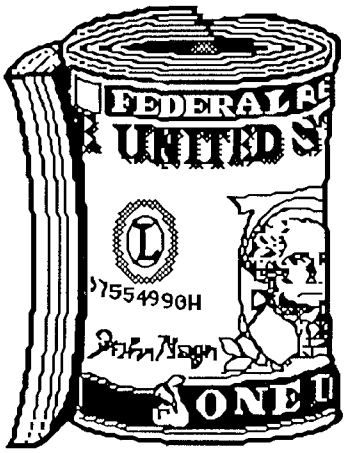
Feedback on the Audio System Designer

We have shipped out a ton of orders for the Klark Teknik Audio System Designer Technical Reference that Klark Teknik has offered to Syn-Aud-Con grads for $25. (Newsletter V 16 No. 2, pp 11.)

We waited for feedback. Farrel Becker called to say that he was terribly disappointed. My heart sank as he is a very knowledgeable person. I asked him why. Farrel said that he was disappointed because if he had had it a week sooner he could have used it over a dozen times in the TEF Basics class that he taught at Techron. Of course, we think that Peter Mapp did an outstanding job, otherwise we wouldn't have suggested to others. It is good to know that others are appreciating it and finding it useful.



Sound System Engineering Price Increase

We heard a rumor that Howard W. Sams was going to increase the price of *Sound System Engineering*. We assumed that they would do it after the 3rd printing (we were told to get the errata in quickly as they were going make a 3rd printing shortly). We called to verify the rumor and were told that the price increase was $10 (a 25% increase) effective immediately on books in stock, and we would not have the opportunity to place a stocking order!! Our order form reflects the price increase.

Apogee to Provide Filters for Sony Digital Machines

Apogee to provide filters for Sony digital machines

Apogee Electronics has been given approval by Sony to provide the series 944 anti-aliasing/anti-imaging low-pass filters for the Sony PCM model 3324. After conducting listening and measurement test, Sony has approved of retrofitting the Apogee filters before delivery or to update machines already in the field.

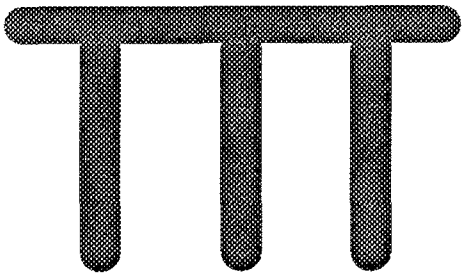
About 1982 we made a measurement of the anti-aliasing filter in a Sony PCM tape machine. It was a brick wall with serious ringing. We assumed that Sony would have discovered their problem and corrected it years ago so we were surprised to read the above news item in RE/P.

Smile from Studio Sound

"... Nelson pointed out that if delay lines are used to align components of a loudspeaker system in time, different delay times will be necessary according to the air temperature and humidity. If physical spacing is used to bring the units into alignment, then they will all shift together."

The only thing I can figure is that he has been reading the Dennis Bohm articles on the effect of humidity on "time" delay. No one could dream up such silliness without some help.

Syn-Aud-Con Management Forum



We were indebted to Jim Fullmer PE, Acoustical Engineers of Salt Lake City for a superb article on Management vs Leadership by Professor Hugh Nibley of BYU. I've excerpted some of the quotes from the article. What made them seem particularly applicable was the announcement that the Soviets were going to send their managers to U. S. business schools. Hah! We've won the cold war at last!

Professor Nibley strips bare management's main excuse for their excesses when he states,

". . . to seek ye first financial independence and all other things shall be added" is (or should be - editor's note) recognized as a rank perversion of scripture and an immoral inversion of values.

It has been pointed out that no one has ever "managed" men into battle. Leaders are movers and shakers, original, inventive, unpredictable, imaginative, full of surprises that discomfort the enemy in war and the main office in peace.

Great leaders have a passion for equality...For managers, on the other hand, the idea of equality is repugnant and indeed, in their view, counterproductive.

There is, necessarily, some of the manager in every leader as there should be some of the leader in every manager. The trick is to achieve balance along with a sense of priority...and not be alarmed that management is running the show - it always has.

If there is one thing that clearly marks the decline and fall of civilizations and corporations, it is the fatal shift from leadership to management. Excellence is a mark of leadership; mediocrity a sign of management.

Leadership can no more be taught than creativity or how to be a genius.

The qualities of leadership are the same in all fields, the leader being simply the one who sets the highest example. To do that and open the way to generate light and knowledge, the leader must break the mold. A ship in port is safe, but that is not what ships are built for."

The USA at one time led the world. We are still capable of doing so if we don't create a society that destroys budding leaders. Help identify and support true leaders in our audio industry. Help stamp out the manipulative phonies that stain the fabric of our business with their false claims and pretentious pseudo scientific prattle. If we fall back into superstitious practices instead of relying on our God-given ability to think for ourselves we will become mental slaves in a very real sense of the word.

Classified

For Sale:
Hewlett Packard 3325A Function Generator, HP 3582A Spectrum Analyzer. Analyzer needs $800 factory repair, otherwise very good condition. Both for $5,000. CONTACT: Paul Tucci, Maryland Sound, 4900 Wetheredsville Rd., Baltimore, MD 21207. (301) 448-1400 or FAX (301) 448-1467.

For Sale:
Apple Image Writer II printer. $150 plus shipping. CONTACT: Syn-Aud-Con, 812-995-8212 or FAX 812-995-2110.

For Sale:
Techron TEF 12 Analyzer. Mint condition may be upgraded to 12 plus for $1950, B&K 4007 microphone, Acoustilog Impulser, Hewlett Packard 3466A DMM. Call Rich Zweibel at 214-392-7800 or 214-492-2244 evenings.

Wanted:
Used TEF 10 or 12 Analyzer. Don Null, Null Engineering, P O Box 150, Topanga, CA 90290. 213-347-0692.

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Personnel from these manufacturers receive Syn-Aud-Con training which provides still another link in the communications circuit between the ultimate user and the designer-manufacturer of audio equipment. They are "in tune" with what a Syn-Aud-Con grad needs.

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