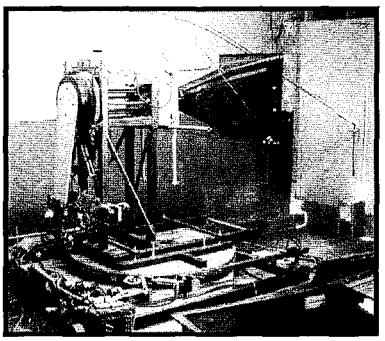
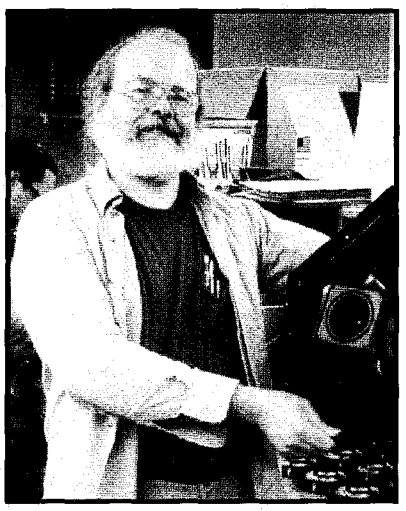
SYNERGETIC AUDIO CONCEPTS

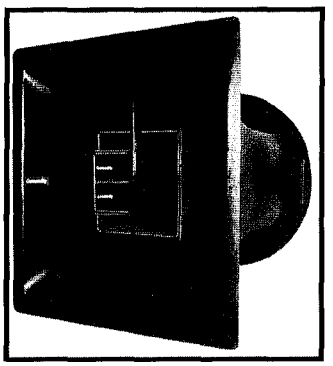
SYN AUD CON

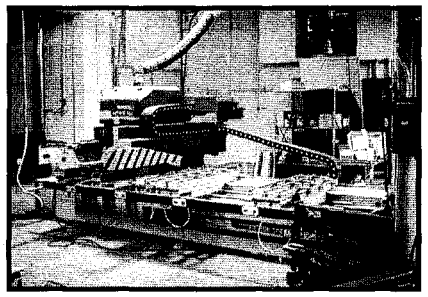
newsletter

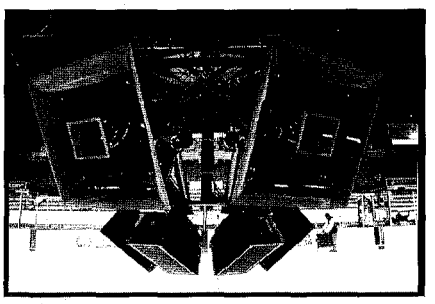
Volume 22, Number 2
Winter 1995
Pat Brown
Don & Carolyn Davis











SYNERGETIC

SYN AUD CON

AUDIO CONCEPTS

EXCHANGE OF IDEAS

I met a man with a dollar
We exchanged dollars
I still had a dollar

I met a man with an idea
We exchanged ideas
Now we each had two ideas

Synergetic: Working together; cooperating, cooperative

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

Editors: Pat Brown, Don Davis, Carolyn Davis,

Design and Layout: Pat Brown, Carolyn Davis

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No. 1 - The Sound System at Holy Cross Cathedral, Boston
The Realization of a Dream

When do I renew? - You can check to see when your subscription will expire by checking the mailing label on the envelope in which your newsletter was mailed. In the upper righthand corner beside the name, a date will appear (i.e., 7-94). This means you will receive your last issue with that quarter's mailing unless you renew. Renewal notices will be sent one month prior to your last issue being mailed. You must renew before the next quarter's newsletter is mailed or your subscription will become inactive.

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About the Cover

On our return home from the Secaucus, NJ "On the Road" class, John Royer and I had the opportunity to visit the Community factory. We had heard much about the progress and success of the company, and our visit certainly bore witness that the reports are true.

The upstart speaker company of a couple of decades ago has developed into an impressive credit to loudspeaker manufacturing. Throughout the facility, innovation and resourcefulness abound in the methods used to turn raw materials into some of the best loudspeaker products available today.

The Community facility, nearly a city block in size, includes a newly renovated building, in the center of which is an open-plan office that serves as the epicenter of the organization. The familiar voices you hear on the phone that serve the growing Community customer base are located here. In this building a state-of-the-art demo room nears completion, and a fully networked computer system provides a common link that allows the staff to work as a team, from sales and support, to graphic arts and CAD.

In the newly renovated woodworking facility, computerized saws and routers produce panels with laser accuracy at production speeds. It is this type of precision that ensures that product quality is high and consistent. Even "T" nuts are installed with an automated press, which helps explain the enormous output of the facility. Attention to detail was evident throughout, much of which the customer will never see, such as extra bracing and dadoed baffle boards, providing the quality one expects from a high-end manufacturer.

From here the wood crosses the street to the assembly plant, where it will be formed into enclosures and shipped to the end user. Five stories in height, the assembly plant houses numerous work stations, each optimized to perform a task essential to the total manufacturing process. In the heart of this facility is the lab where Community loudspeaker devices are born, the place where company president Bruce Howze turns his concepts into reality. It is here that one begins to realize that the creation of a good loudspeaker product is as much an art as it is a science, and that it takes someone who is gifted in both to design a successful product. The shelved walls hold the fruit of many laborious hours, a museum of things that worked and things that didn't, a fascinating mixture of old and new. The philosophy here is that if it doesn't exist we will invent it, and if does exist we will improve it.

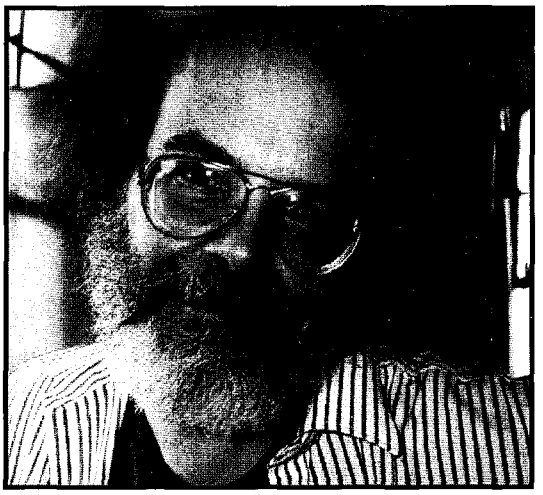
Community is a turnkey manufacturer, producing virtually every part of the end product. From fiberglass molds to passive crossovers, a design project can go from drawing board to demo room and never leave the plant. It is this unique capability that allows the company to keep a finger on the pulse of the marketplace, and respond instantly to the needs of the end user.

There are many ingredients in a successful company, one of which is a willingness to invest in people. In touring the plant, it is evident that the people here like what they are doing. This fact, together with hard work, innovation, and a commitment to "do it right" ensure that these folks will remain...

Pat Brown

a credit to their...

Community



Community President Bruce Howze

Syn-Aud-Con 1995

To our dear friends and grads,

Carolyn and I are very pleased to turn over the day-to-day operation of Syn-Aud-Con to Pat and Brenda Brown. They live a commuting distance from here, an hour away near Louisville. With phone, faxes, modems, CompuServe and overnight mail delivery, they are just an office away.

Pat and I will continue our seminars here at the farm from May through October, write the Newsletter, magazine articles, and the new edition of **Sound System Engineering**. This will take us back to the days when we lived in California, traveled 9 months out of the year, and the office was run entirely without our input. That all changed when we moved to Indiana in 1987. We took a much more active (and time consuming) part in running the office.

The new address for Syn-Aud-Con is.

Synergetic Audio Concepts
8780 Rufing Rd
Greenville, IN 47124
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CompuServe 74032,1356
Internet 74032.1356@compuserve.com

In addition to a Pat's schedule of "On the Road" seminars, we are planning a workshop in Columbus, Ohio in March which we have dubbed Horns II, and a workshop in Nashville in June, "The Theory and Design of Hi-Performance Professional Loudspeakers".

We will retain our present address and phone number. We welcome calls, but when you need information about scheduling, class registration, Newsletter subs and other items, call Pat and Brenda. Carolyn and I need a little more time to "smell the flowers" and to work on a special writing project.

Don Davis

D.B. Davis

"What's Wrong With My Speaker?"

The client's complaint was that the sound system lacked clarity and presence. It was not a difficult space, very low RT_{60} and no significant late reflections. The speaker system consists of three full-range boxes arranged in a small arc, a very popular configuration.

Figure 1 shows the frequency response of a single enclosure (the middle one), a very respectable response (equalizer bypassed). Figure 2 shows the same loudspeaker with an automatic feedback suppressor turned on (the venue leaves it on all of the time). Finally, figure 3 shows all three loudspeakers on, with feedback suppressor on.

The problems with this system are twofold. The designer failed to consider the interaction between devices whose coverage patterns overlap. In the case of box systems, this is a frequency dependent problem, and rarely do all of the devices in a box have the same coverage angles. The design has yielded a system with poor gain-before-feedback. To combat this, a "signal cannibal" was installed in an effort to improve the situation.

The tragic part is that this type of interference is predictable. Figure 4 shows the EASE program's (Renkus-Heinz) prediction of the polar pattern corruption that results from missynchronization of devices. Such programs allow one to model interference patterns in order to choose devices that interfere in the least detrimental manner. Overlap areas can be designed to land in aisles, so as not to cause dead spots in coverage. Figure 5 shows a possible solution, arrived at by substituting different loudspeakers and using some signal delay.

The moral of the story? Don't be too quick to blame the loudspeaker when things don't sound right. Acoustic gain is a problem to be solved at the design stage of the project, not during the system calibration.

P. Brown

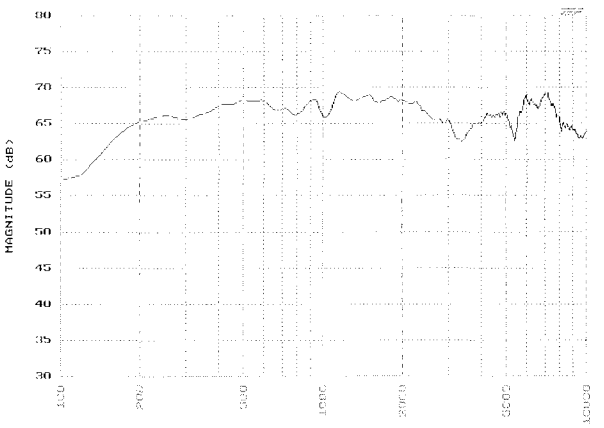


Figure 1

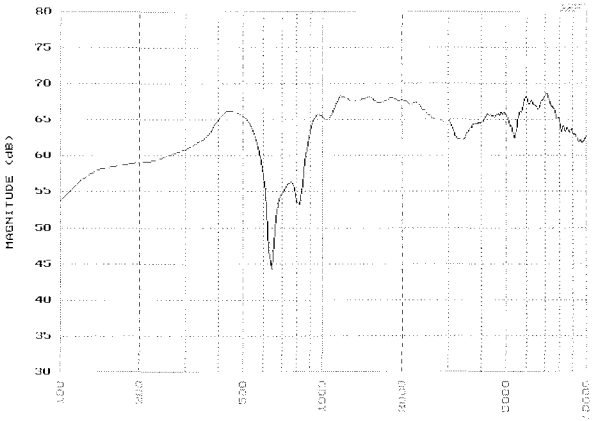


Figure 2

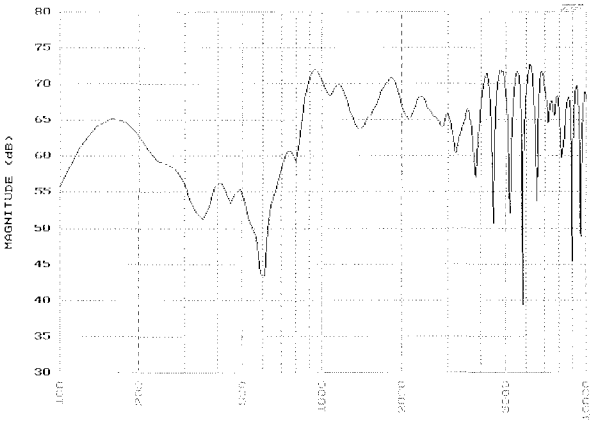


Figure 3

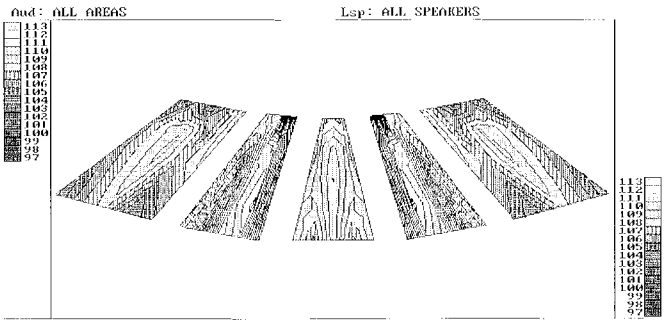


Figure 4

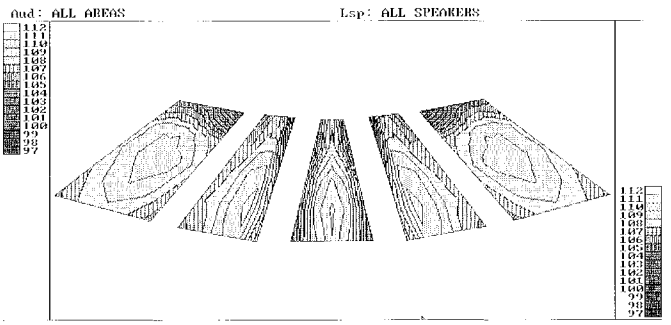


Figure 5

Branch Bend

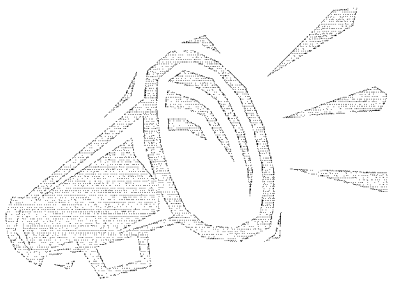
Our house at the farm sits above a sweeping bend in the branch that rises from springs on the east side of the farm. There's a hymn we love that has a line that goes, "Like brother birds that soar and sing and on the same branch bend." So, we call our home "Branch Bend."

Fall is here in all its colors and the leaves have thickly covered the forest floor. Now that we can see through the forest's thinning foliage, we see more wild life. The harvesting of the corn fields in front of the old house has led to conferences of deer twelve-plus in the field between our front and back woods. This field is my favorite as it is completely surrounded by woods except for a single outlet on it's east side. Our new kitten, Callie, watches the falling leaves with wonder from the picture window in the living room as she's not big enough to let out where coyotes and big red foxes play.

Not everyone enjoys the isolation the farm provides, but we luxuriate in it. This will be the first fall we have been home at this time since we came back to Indiana in 1987. We're savoring it to the full. The sun is now to the south as our mudball does it's annual tilt and the quality of light differs both evening and morning compared to the summer angle. An occasional whiff of wood smoke odor from a neighbor's fireplace reminds me of my dad telling me, as a boy, that our forbearers moved whenever they could see the neighbor's smoke. This attitude is probably what put them in the book, "The Pioneers of Missouri."

Each morning here at the farm begins with an acute case of gratitude for the simplicity of our life and the joy we feel in living it. *D. B. Davis*

Packaged Systems



When I was a young boy (the late 1930's) I would look in the Allied Radio Catalog from Chicago and see sound systems sold as packages. The picture would show a multi-knobbed amplifier, several microphones and several loudspeakers. "System A" was advertised as good for audiences up to 200 people. "System B" was good for 300 people, etc.

After WWII, components became all the rage and "package systems" were looked down upon as it was realized that the 200 people were not always arranged in the same way.

In recent years we see packaged loudspeakers being sold in packaged arrays. Some of these are stunningly complex.

What's shared in common by the users of packages is the concept of "design by catalog numbers" rather than performance parameters.

To the non-avid reader of catalogs, a series of product numbers tells little past the political affiliations of the designer. We still prefer hearing the actual max level designed to, the expected acoustic gain, the portrayal of the coverage complexities via CAD programs, and estimates of expected speech intelligibility.

We know from experience that real technical specifications can be remarkably similar and yet the systems sound quite different from each other due to craftsmanship alone.

As these musings testify, I am no longer a young boy - I'm now a "good ole boy" and I await eagerly the next turn of the design wheel. *D. B. Davis*

How Friends Help

The role of dear friends in one's life deserves deep appreciation on the part of the recipient of such friendship. Friends are those who, when away from your immediate presence, hold you in their thought with regard, respect, and consideration for your welfare and progress. A chain of events activated by a series of friends indeed led to my feeling respected, loved for the work I do, and definitely led to my progressing in my understanding of whose shoulders I am standing on.

Dan Fields

It all started when Dan Fields of Thomson Consumer Electronics in Indianapolis sent me a list of out-of-print books he had come across on CompuServe. He thought that I might be interested.

Jont Allen

Jont Allen of Bell Labs, in our recent Workshop on hearing, mentioned the works of George A. Campbell who had published what was probably the first scientific discussion of speech intelligibility in 1910. Jont's regard for this pioneer who had preceded Harvey Fletcher's monumental works on this subject had lodged in my "read only memory" because of my high regard for Jont's historical research into BTL's beginnings. Only rarely do the giants of our industry have their work evaluated by someone of total technical superiority (Jont Allen) who at the same time has a passionate love for his predecessors accomplishments.

Jesse Klapholz

When I called the telephone number on the list of out-of-print books (which included the Collected papers of George A. Campbell - extremely rare), I found myself talking to another friend, Jesse Klapholz. Jesse, it turned out, had acquired extras of some treasured volumes and was offering them for sale. I quickly acquired possession of a number of his books, including the Campbell and a well-worn, but to me, priceless copy of Dayton Clarence Miller's, The Science of Musical Sound. Since these books arrived, I have been back at the turn of the century in the company of the likes of Helmholz, Koenig, Rayleigh, Tyndall, Webster, Steward, Sabine, Heaviside, Campbell and Miller.

Vannevar Bush's Introduction to Campbell

The forward to Campbell's book is by Vannevar Bush who was, during World War II, destined to head all scientific research in the U.S. Bush wrote, "The Industry often scratches about the roots of advancing science, finding serviceable devices here and there, or merely attempts to break off the useful buds of a growing tree, thus retarding future growth." Bush in describing Heaviside's remarkable insights states, *"When Heaviside wrote his electrical papers they were read by only a few, and of these still fewer understood or were willing to recognize (underlining mine) the scintillating bits of thought because these thoughts were mounted in a matrix which was faulty in its rigor. Of those who understood, only two or three grasped the meaning of Heaviside's work to such an extend that they could interpret it, reduce it to a sound basis, and make it truly serviceable."*

What a perfect description of Dick Heyser's work and how our hearts yearn for a "Campbell" to see the genius of it and put it all in order. Bush finishes his Forward with *"Most clearly, however, he (Campbell) stands out as the one whom the telephone art owes the realization of the loaded line, the electrical filter, (underlining mine) and the facile treatment of the transients which pulsate in its networks."*

The genius of Campbell

Campbell also led the way to the acceptance of the international "definitive system of units" and dimensional analysis originally put forth by Giorgi.

Campbell was educated at MIT with five years of advanced study at Harvard, Paris, Vienna, and Gottingen. This background which included knowledge of Maxwell, Kelvin, Weber, and Heaviside let Campbell produce outstandingly useful work as early as 1899 with regard to loaded circuits in the field.

If there is indeed life hereafter, I know the crowd I want to be associated with if they'll tolerate lowly "hangers on". My thought dwells on them in their absence and I think of them as friends.

D.B. Davis

Line Loss: Why Heat the Wire?

For the power from an amplifier to do any work, it must be delivered to the load. When dealing with very long cable runs, this is no trivial task. Consider the equivalent circuit below:

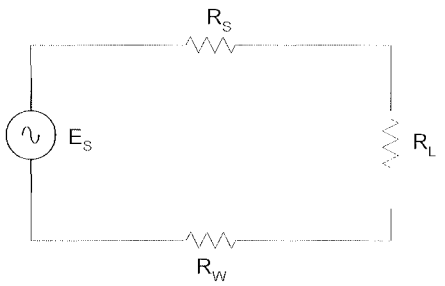


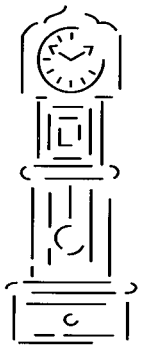
Fig. A

We model our line loss problem as a series circuit, consisting of the amplifier's source resistance (R_S), the loudspeaker's AC resistance (R_L), and the resistance of the wire itself (R_W). We use the loudspeaker's AC resistance (which at audio frequencies is essentially the same as the DC resistance) since this is the minimum value that it's complex impedance can drop to. (See Eq. 1) Our concern is how the output voltage of the amplifier will distribute between the resistances in the circuit. A simple voltage divider equation describes things nicely. From this we can see that for minimum line loss, R_S should be as low as possible (it's built into the amp), R_L should be as high as possible, and R_W should be very small in relation to R_L. Wire is typically rated in Ohms per foot, and the larger the wire gauge (smaller number) the less resistance. Once line losses are reduced below 1 dB, they are virtually inaudible which makes spending lots of money on "battery cable" speaker lines a waste. This is what makes constant voltage distribution so attractive for long cable runs. When we use a transformer or autoformer to "step up" the output voltage of an amplifier, we also use a transformer at the loudspeaker location to "step up" the impedance of the line. This, in turn, increases R_L in regard to R_W and reduces the voltage dropped across R_W. We normally select an R_W that produces no more than 0.5 dB loss in the line. (An inaudible amount). The higher the amplifier output voltage and line impedance is "stepped up", the less the line loss for a given wire gauge. Output voltages of 25 and 70.7 volts find the most widespread use. The transformers used for these lines are even labeled in watts, allowing the installer to select an appropriate tap for the needed power.

$$Z = \sqrt{R^2 + (X_L - X_C)^2} \qquad \text{Eq. 1}$$

$$dB_{Loss} = 20 \log \frac{R_S + R_L}{R_S + R_L + R_W} \qquad \text{Eq. 2}$$

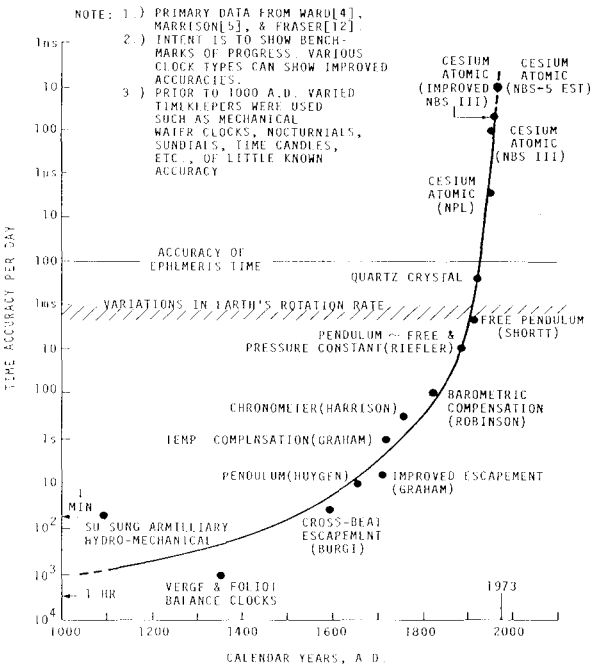
P. Brown



Do You Have the Time?

With today's analysis tools, we talk easily about microsecond intervals in phase. Variations in the earth's rotation are gross by comparison, being on the order of a millisecond per day. Harrison's chronometer made ship travel have a predictable accuracy of position during lengthy voyages.

We thought that as we approach the end of this millennium, the graph in the attached figure would serve as an insight into the history of time keeping. *D. B. Davis*



Syn-Aud-Con Goes to Secaucus

Our "On the Road" class landed in Secaucus, New Jersey in mid October, and as usual, there were lot's of interesting audio people gathered to exchange methods and ideas. The eastern seaboard was well represented with attendees from Boston, New York, Philadelphia, Washington D.C. and beyond. We were grateful for such support and for the wonderful job that the reps (Paul Hanoud and Sam Helms) did in spreading the word. As is always the case, we learned as much as we taught, which is the principle upon which Syn-Aud-Con is founded.

Some highlights from the class included the presence of John Royer, sound man for the Indianapolis Motor Speedway and Indiana State Fair. John was busy in the background, answering questions, offering advice, and sharing his hard-won knowledge from years of experience "in the trenches". John Murray of TOA Electronics was also present, and performed and impressive demo of the new DACsys processor. John kept Pat Brown on his toes, with excellent questions and "what if" scenarios. One discussion about vented boxes sent us all scurrying for the textbooks and telephones. Once again proven that audio is a field of exceptions and conditions in which little can be taken for granted. Also during the evening session, Vinny Macri of Sigmet gave us an impressive demonstration of a fiber optic interface "for the rest of us". It is exciting to see this technology filter down to the mainstream user, with cost effectiveness, ease of use, and reliability all wrapped up in one package. Vinny's demo was excellent and will serve to get the "Fibox" into many peoples hands (and racks). Also on hand were some find loudspeaker products from EAW, which we dissected and scrutinized with the TEF machine during the evening session. When a loudspeaker product stands up under this kind of scrutiny, you can install it with confidence.

We had a great time and look forward to the next east coast class (April and Fall '95). *P. Brown*

Scenes from the October '94 Secaucus class

On the Road Again...

Syn-Aud-Con continues it's commitment to audio and acoustic education with a lineup of 1995 "on the road" classes. Attendees of the 1995 road classes will be exposed to some of the latest technology in audio and acoustics, including:

* A multimedia format that allows interaction between lectures and demonstrations
* Binaural recordings of the acoustical signatures of room parameters
* Automated setup changes utilizing the Crown IQ System
* Demonstration of PC-based test gear, using the TEF 20 and real-time analyzers
* Demonstration of Speech Processors from Communications Company and Hughes
* Overview of sound system design computer programs, including EASE and PHD
* Demonstration of Binaural Auralization with the EARS program from Renkus-Heinz
* Demonstration of the DACSys Processor from TOA

The Core Topics include:

The Ear/Brain System
Basic Acoustics
Loudspeakers
Speech Intelligibility
Acoustic Gain
Microphones
The Decibel
Gain Structure
System Sychronization
System Equalization
Sound System Design
Computers and Audio

During the class, each concept is applied to an actual system design, allowing the attendee to understand both how and why the theory is used.

The study of audio and acoustics is a lifetime endeavor. A Syn-Aud-Con Seminar is designed to be an introduction to this rewarding undertaking. Each topic is developed from the basic principles, giving the attendee an excellent overview, including actual application to system design. The lab manual is a complete and concise guide, and is structured for self-study in subsequent weeks and months after the seminar. For further study, the attendee receives "Sound System Engineering" by Don and Carolyn Davis, a work upon which the bulk of the seminar is based.

Whether you're a seasoned professional or an avid beginner, a Syn-Aud-Con seminar has something for you.

SEMINARS AT FARM SEMINAR CENTER

The Farm - Norman, IN

May 17-19, 1995

July 20-22, 1995

Sept. 21-23, 1995

October 12-14, 1995

3 - Day Seminars
$550

Limited to 12 participants

SEMINARS ON-THE-ROAD

Jan. 18-19, 1995 Anaheim, CA

Feb. 15-16, 1995 Kissimmee, FL

March 7-8, 1995 Gainesville, GA

March 22-23, 1995 Bellevue, WA

April 18-19, 1995 Tyson's Corner, VA

April 26-28 Indianapolis, IN (3rd day Dr. Wolfgang Ahnert)

Fall 1995, Boston Area

2 - Day Seminars
$550

For Registration Information
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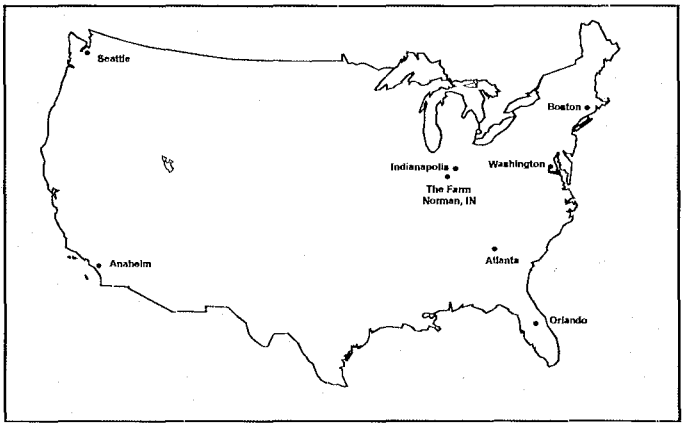


Horns II - The Second in a Series of Horns Workshops

The Ohio Theatre - Columbus, OH

March 29-31, 1995 **Fee: $650**

Staff:

John Murray, Workshop Chairman
TOA Electronics

Kurt Graffy
Paoletti Assoc.

Dave Gunness
Electro-Voice

Craig Janssen
Acoustic Dimensions

Mark Ureda
Mark IV Audio

Theory and Design of High Performance Professional Loudspeakers

Soundcheck - Nashville, TN

June 22-24, 1995 **Fee: $650**

Staff:

Bruce Howze
Community Professional Sound Systems

Don Keele
D.B. Keele Assoc.

Eugene Patronis
Georgia Tech

September 1994 Farm Class

Dear Mom, Send RAM!

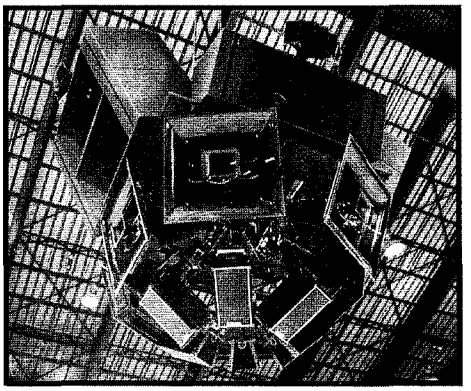
About 15 years ago, I bought my first Apple II computer. It came with 48K of RAM (Random-Access Memory), but it could be upgraded to 64K for a few hundred bucks. My first DOS machine was fully loaded with 640K of RAM, truly state-of-the-art. Next came a Mac Plus with 1 Meg of RAM, a staggering amount which I figured would last me the rest of my life. My next DOS machine came with 1 Meg but was quickly upgraded to two in order to run Windows. Next came a laptop with 5 Meg, which I paid an arm and a leg for. My office machine went from 4 to 8 to 16 and recently to 32 Meg. Our new Pentium has 32 Meg but can go alot higher. Yes, I've become a RAMoholic, and the years of being RAMbroke have lead me to some insights:

You never seem to have enough RAM
If you buy enough you'll be eating SPAM,
RAM makes the computer come alive
but then you'll need a bigger hard drive,
But it's okay, you can now work faster
with extra time for your Sound Blaster,
It's a shame if the money, you had to borrow
because RAM is always cheaper tomorrow.

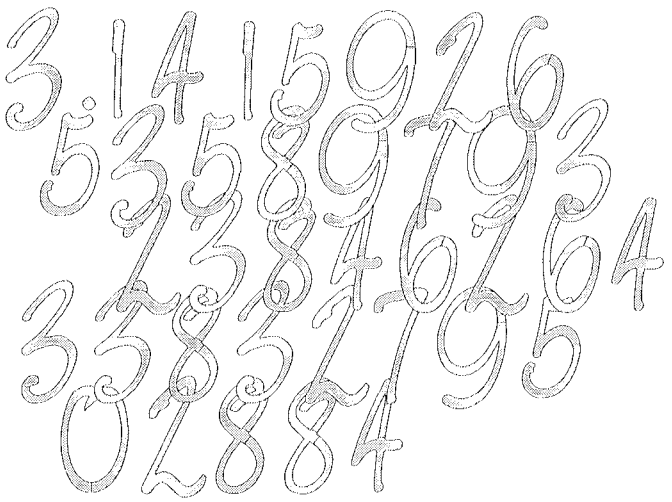
P. Brown

Pattern-Control Tames Difficult Acoustic Environment

Many attending the upcoming NSCA show in Indianapolis will get the opportunity to see and hear John Royer's mammoth cluster at the Pepsi Coliseum at the Indiana State Fairgrounds. The cluster is comprised of Community M4's and RS220's, as well as some vintage Altec low-frequency enclosures reloaded with JBL transducers. It is powered by 14 Crown Comtech power amplifiers and controlled by the Crown IQ system. The 10,000+ seat arena is used for hockey and public skating as well as various farm shows.



October 1994 Farm Class



Math is the Language of Audio

Syn-Aud-Con attendees are sometimes dismayed by the fact that we use some basic math in the sound engineering seminar. It must be emphasized that math is not a new or alternative way to design sound systems, it is simply a supplement to instinct, logic, and artistry. While it is certainly possible to design the entire sound system from the computer or calculator, to do so for an existing building would be to ignore a great deal of important information.

Site Visits

If it is possible and feasible to visit a site and listen to various loudspeakers in that environment, the insight gained can take you much farther than a purely mathematical approach. When you have applied the ear/brain system to the problem, you have already done the equivalent of many hours of complex mathematical calculations. To describe such an endeavor mathematically would require volumes, and even then would inevitably fall short due to limitations of our understanding of the human ear/brain system. Math is a wonderful *supplement* to the listening experience. Once a device is tested on-site, math allows us to estimate what changes may occur with the substitution of a different device. The basic mathematical equations describing such things as reverberation, critical distance, directivity, etc. are well established and serve to focus a project design based on the quantities and relationships that we understand.

The Chicken or the Egg?

It must be remembered that the listening experience preceded the math that we use to describe it, and that the goal of mathematics is to perfectly describe the listening experience. Use your ears when the opportunity exists, and use the math to keep things calibrated and consistent.

One could describe in words the following listening experience:

I placed a loudspeaker in a reverberant room. When I stood close to the loudspeaker, the room did not seem very reverberant, and the direct sound of the loudspeaker was very clear. But as I moved out into the room, the further I got from the loudspeaker, the more garbled the sound became. In the back of the room, I could not even tell where the loudspeaker was located unless I cupped my hands toward it. As I walked toward the loudspeaker, it again got louder and clearer. When I replaced this loudspeaker with a more directional one, I could stand farther from it and understand plainly. But as I turned on more loudspeakers and aimed them at other parts of the room, the room came alive and I had to move closer to the loudspeaker for the sound to be clear.

Another way to describe the same experience is with this equation:

$$L_T = L_W + 10\log\left(\frac{QM_E}{4\pi r^2} + \frac{4N}{S\bar{a}}\right) + 10.5$$

Where:

Q is the directivity factor of the loudspeaker

M_E accounts for the increased directivity of the cupped hands

D_X is the distance from the loudspeaker

N accounts for the additional loudspeakers turned on and not aimed at the listener

Sa is the absorption in the room

Known as the Hopkins-Stryker equation, it is a shorthand way to describe the listening experience in a reverberant space. And, if we can describe it mathematically, we can also understand what will happen if a parameter changes, without having to return to the venue to listen.

Math equations depict relationships, and should not be glossed over like text. Sit and contemplate cause and effect between the variables, and allow your understanding to be shaped accordingly.

P. Brown

Quick Fixes for Feedback

Acoustic distances should be considered when locating system components

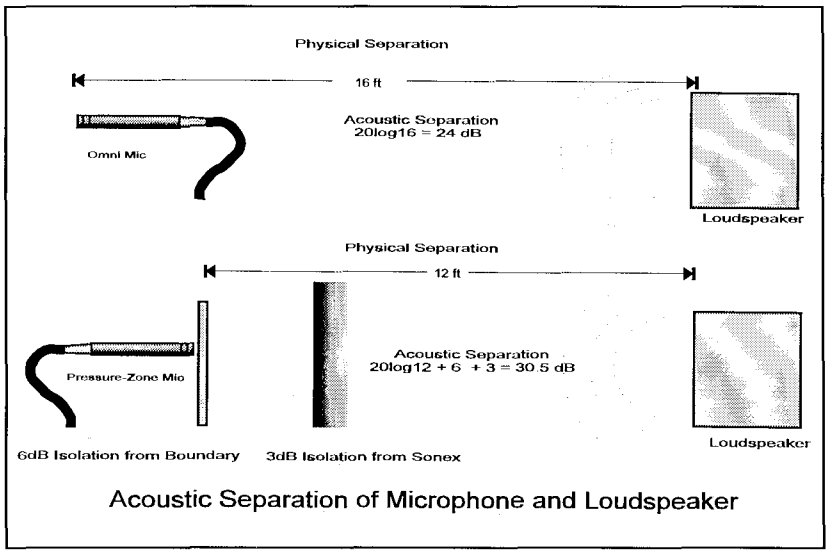
Insufficient acoustic gain is a problem that plagues many sound systems. Unfortunately, solutions often take us all the way back to the drawing board. Increasing the acoustic distance between the microphone and loudspeaker can be difficult once the loudspeaker is installed. But what can one do when it is not possible to redesign the sound system? You have been called in to do the mix in an auditorium, and the show begins in an hour. Here is a logical order in which to proceed.

Reduce the number of open microphones

Feedback occurs when the microphone hears the performer through the loudspeaker louder than it hears the performer. Turning down unused mics will reduce the amount of energy recycled by the sound system. Ten dB is usually sufficient. Acoustic gain can be increased 3 dB for each halving of the number of open mics.

Shorten D_s

This simply means moving the mic closer to the talker. The apparent gain of the system is increased by 6 dB each time the distance between the talker and mic is cut in half. In extreme cases, this can mean having the performer practically swallow the microphone. There is no substitute for good mic placement. A single well-placed microphone will always outperform several mics that are too far from the talker. The microphone can also be moved acoustically closer to the talker by increasing it's directivity. The same principle is used with high-Q horns. If we take an omnidirectional mic and build a suitable boundary to confine it's coverage to one-quarter sphere, we will have increased the mic's sensitivity by 6 dB, even though the mic is used at the same distance as the omni. We can now turn down the mic 6dB to create a more stable situation. Pressure-zone mic techniques are well documented in Appendix VIII of Sound System Engineering.



Acoustic Separation of Microphone and Loudspeaker

Move the microphone

For feedback to occur, there must be an acoustic path between microphone and loudspeaker. Interrupt the path with a piece of Sonex. If it is not practical to leave the Sonex there, then try moving the mic. If the mic is in a lobe caused by missynchronization, then a few inches or feet may eliminate the feedback, or at least shift it to a frequency that we can remove with the equalizer and live without (low bass on a podium mic, for instance).

A word on notch filters

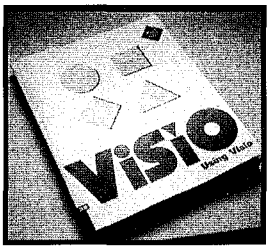
A last resort in achieving acoustic gain in a system with insufficient acoustic distance between mic and loudspeaker is to notch out the offending frequency. While this is not a long term solution, it may get you through the night. It must be remembered that notch filters have very steep slopes, and hence introduce ringing in the system's response. This smearing of the systems transient response should be avoided whenever possible. When using notch filters, use as few as possible, and even then, only after you have exhausted the other solutions prescribed above.

The development of the one-third octave graphic equalizer was one of the more significant events in audio in this half century. When used to smooth the transfer function of a loudspeaker, a response peak that would normally cause feedback is made equal in amplitude and phase to the adjacent frequencies surrounding it. A one-third octave filter cannot correct a time/distance offset between two transducers, and the comb filters that result. Equalizers are wonderful tools, and play a vital role in sound reinforcement work. But relying on an equalizer to provide acoustic gain in a system with insufficient acoustic separation between loudspeaker and microphone will yield disappointing results. *P. Brown*

Visio

a fast, efficient program for technical drawings...

How many times have you worked on a sound system and uttered the statement, "I wish there were drawings?"System drawings are an essential part of each sound system project. Documentation of your work is essential for your future reference, as well as for anyone else that may work on the system.

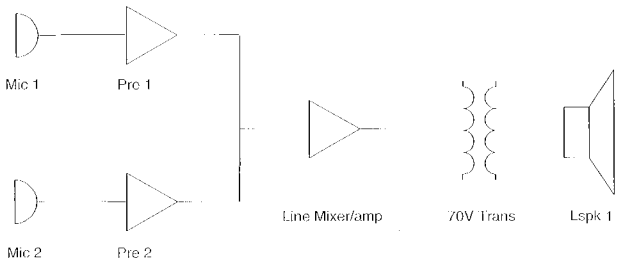


A new software product has emerged that reduces the tedium and time involved in producing excellent system drawings. The product is Visio, and I have found it to be one of the greatest things to come along in quite some time. Visio provides a "drag-and-drop" drawing environment for the system designer.

A "palette" of drawing symbols represented by small icons is displayed along the edge of the screen, next to the actual drawing area. One simply grabs an icon with the mouse and drops it on the paper. When you have all of your devices on the paper, a "smart connect" features allows you to very quickly insert the connections between devices. For a final touch, double-click on a device and a text block pops up for relevant data. I can literally say that a drawing that once took me an hour can be finished in just a few minutes.

The icon libraries are called "stencils" and allow addition and customization of symbols. Visio is a complete graphics environment, so you can create your own symbols if need be. I took the standard electrical engineering palette and created a group of audio symbols to merge with it. It is even possible to import drawings from other applications and save them as symbols, allowing them to be placed into a new drawing with a click of the mouse. Once placed on the page, it is a simple matter to rescale the object to any size.

Visio works as well for flow charts, maps, and many other drawing types as it does for system diagrams. An extensive set of stencils are included with the package. Perhaps one of the best features of the program is the price. The full-blown version is about $125.00, and several "abbreviated" versions are available for around $50.00. Both are available from software suppliers. *P. Brown*



Visio's intuitive "drag and drop" interface makes system drawings a snap.

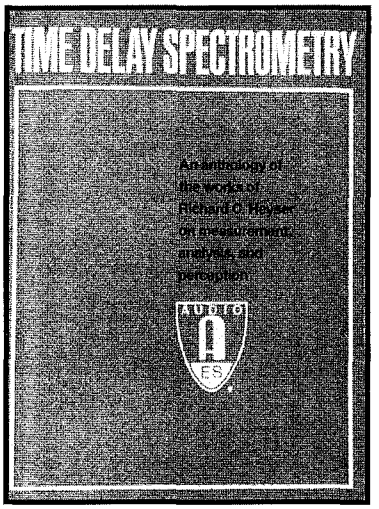
A man is applying for a job as a chauffer. The potential employer asks, "What would you do if another car with armed men came at us doing seventy miles per hour? Exactly what would you do?"

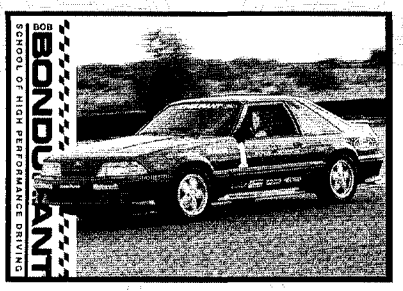
"Eighty," he replied.

Heyser Anthology

A long awaited publication is now available from the Audio Engineering Society. It is entitled "TDS Anthology" and is the collected works of Dick Heyser, the inventor of TEF. In this work you will find a treasure chest of information about the man, his inventions, and his ideas. In addition to his AES papers, the anthology also includes many of his articles for Audio Magazine, in which he gives the reader a peek into the underlying principles of audio, acoustics, and life itself.

The TDS Anthology is available from the Audio Engineering Society, and from Syn-Aud-Con. *P. Brown*





Bondurant's Hi-Performance Driving School

In the desert near Tempe, Arizona lies a world class driving school for those who want to push it to the limit.

It is a heady experience to go to Germany and drive a hi-performance car on the Autobahn as fast as the car will go for hours on end. It's hard to come home and drive the back roads of S. Indiana at 55 mph. So when I needed another adrenal surge, I signed up for Bondurant's hi-performance driving school in Tempe, Arizona.

Just how good is Bob Bondurant's driving school? Well, Phil Hill's 19 year old son has gotten a ride in an IMSA WSC car for the 1995 Daytona 24 hour Enduro but his dad, the first American to ever win the Formula One championship back in 1961, says, "You'll go to Bondurant's driving school first." Derek Hill did well at school and it's reported that Bondurant may take young Hill under his wing and help chart his career.

Some other well known personalities that have taken Bondurant's courses are Rick Mears, Dale Earnhardt, Al Unser Jr.,

as well as James Garner, Paul Newman, Yves Montand, Clint Eastwood, Tom Cruise, and Gene Hackman.

Among the little known personalities is Don Davis. As of November 26, 1995, I took the course using the Bondurant specially prepared NASCAR-like Ford Mustangs. (These are not remotely related to street Mustangs in that they have heavy duty roll cages with four-point belts, Halon fire protection, fuel cells, nets in the driver's side windows, ReCaro seats, special brakes, suspension and steering.)

Bondurant's "skid cars" are remarkable teaching tools. The cars are simple in conception, rigorous in execution, and a lesson in humbleness to the learner. These cars help you gain month's of experience in minutes. They are Ford Taurus SHOs equipped with 4-point belts and outrigger wheels that allow your instructor to provide you with understeer, oversteer, on ice, etc., at the touch of a button on the outriggers. The instructor can cause you to lose adhesion in the chosen wheels.

In my opinion, we could do more to reduce the slaughter of your high school and college age children by providing every driving course with a similar car but then the instructor would have to be skilled as well.

Our favorite saying, "First rate men hire first rate men and second rate men hire third rate men", never applied more than at this school. Bob Bondurant is absolutely inspiringly first rate and his instructors consequently are exceptional. Every new challenge presented is first demonstrated by a ride in the instructor's

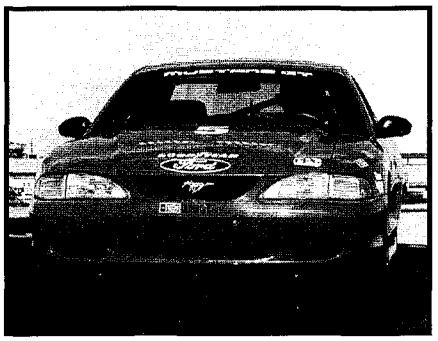
Continued on page 17

Continued from page 16

car. Many of the challenges were things I have done in the past on race tracks by sheer self-taught instinct. But I never executed them with the smoothness and precision these instructors did.

Particularly interesting to me was the intellectual explanation of what my "seat of the pants" had told me to do over the years but never knew why. Bondurant's explanations of maximizing your tire patches via dynamic weight transfer explained volumes about successes won by sheer experimentation in years gone by.

They taught this old dog new tricks, especially one called trail braking. I'll not go into it here but let me say that I have never had such an improvement in my



cornering speed from a single idea. I have a favorite curve marked 25 mph, and discussed in the local newspapers because of the frequency of fatalities it witnesses, that is now a 65 mph curve for me.

Bob Bondurant states that "On the street or on the race track, the capabilities of most cars are way above the capabilities of most drivers. We even that out." Riding around the track at speed in the 12-passenger Ford van with Bob Bondurant driving proved once again that its not the car, its the man when you want to see really fast motoring.

> My instructor said, "Drive a little less competetively."

With the exceptional quality of the cars Bondurant has at his school, you would be "penny wise, pound foolish" to take your own. They average 200 miles to a set of Goodyear tires. One Turbo Porsche owner that took the class with me was startled to find out that the Bondurant specially prepared Mustangs outcornered his Porsche with authority and he was able to run faster and more securely in one of them. After all, race cars are race cars and touring cars are touring cars.

At this point you might legitimately ask who is Don to judge the quality of a driving course. Well, my qualifications start with having acquired an FIA international competition license in 1955. During the season Carolyn and I followed Fangio and Moss from track to track with the Mercedes team. After seeing me drive my Porsche in the pouring down rain against a leading Swiss rally driver, I was offered a position on the Swiss rally team, which I turned down. Five Porsches, three Jaguars, three MG-TDs, one Mercedes, and forty years later I still retain enough vision, reflex, and drive to have my instructor at Bondurant say, "drive a little less competitively."

Being around and sometimes riding with the likes of Fangio, Moss, Hawthorn, Collins, Behra, Clark & Gurney, I feel my qualifications as a totally enthusiastic amateur driver allow me to offer an opinion about a great driving school.

Question! How many Syn-Aud-Con grads would enjoy sharing together a class at Bondurant on Thanksgiving weekend, 1995? If interested, drop us a line and we'll work on it.

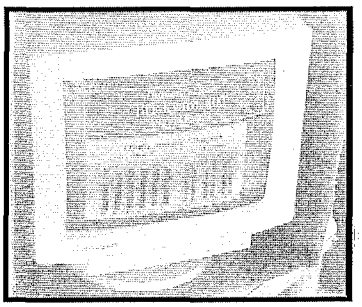
D.B. Davis

Gentlemen, Start Your Amplfiers!

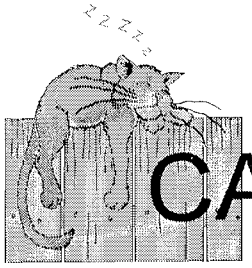
The Indianapolis Motor Speedway holds the distinction of playing to the largest permanent seating audience in the world. Over 350,000 racing fans crowd their way into the Indiana facility to witness a single race. Consider the enormity of the task of delivering intelligible speech to a crowd of this size. While the task may be awesome, the ingredients are simple: Lot's of transducers and lot's of power.

To pad the power side of the formula, John Royer has recently added two more Crown Macrotech 10000 amplifiers, bringing his total to six, for a whopping 60 kW of electrical power to drive the miles of cable and multitudes of transformer/horn combinations. The power figure is even more impressive when you consider that it is only used for midrange. No power sponging subwoofer systems here.

Each Mac 10000 is about the size of a small window air-conditioner. In fact, the amp rack has it's own proprietary air conditioning system to remove the inevitable heat buildup from such a system. While the amplifiers have LCD readouts for status monitoring, John uses the Crown IQ System to channel all of this information to one computer screen. This will be especially useful in the future, when system and tower renovations will seclude the amplifiers from the operator's view.



A computer screen displays current operating status of the main amplifiers at the Indianapolis Motor Speedway



CATPOURRI

Amazing Grace Callie Cat

Cat research at Syn-Aud-Con is best described by our cat hearing test. We open a can of food and if the cats hear it, they eat.

The letter from Michael Pettersen at Shure Brothers gave us a lot of joy and we wanted to share it. We were particularly taken with the cat's full name: Amazing Grace Callie Cat

We are thoroughly convinced that most of the world's social problems would yield if more people owned cats.

SHURE

Shure Brothers Inc.
222 Hartrey Avenue
Evanston IL 60202-3696
U S A

Phone: (708) 866-2200
Fax: (708) 866-2279

MICROPHONES AND ELECTRONIC COMPONENTS

TO: SYN AUD CON DATE SENT: 11-28-94

ATT: CAROLYN

FROM: MICHAEL PETTERSEN DIRECTOR OF APPLICATIONS

SUBJECT: MY CAT "CALLIE"

HAVING SEEN YOUR CAT 'CALLIE' IN YOUR RECENT NEWSLETTER, I HAVE ENCLOSED A PHOTO OF OUR CAT "CALLIE". SHE IS A CALICO THAT WE FOUND AS A STRAY LAST AUGUST. HER FULL NAME IS "AMAZING GRACE CALLIE CAT". "AMAZING GRACE" BECAUSE SHE ONCE WAS LOST AND NOW SHE'S FOUND. "GRACE CALLIE" AS A PUN ON GRACE KELLY. "CAL" BECAUSE OF A FAVORITE BALL PLAYER - CAL RIPKEN "CALLIE" BECAUSE OF HER COLOR. "CALLIE CAT" AS A PUN ON ALLEY CAT.

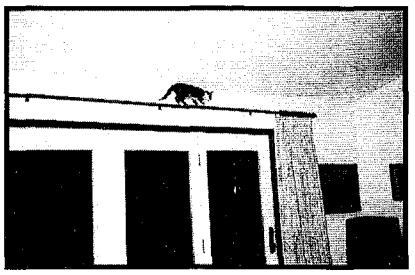
CALLIE IS ABOUT 6 MONTHS OLD AND ALREADY HAS BECOME THE DOMINANT CAT OF OUR HOUSE. (WE HAVE 3 OTHER CATS - A 20 YEAR OLD TABBY NAMED RHETT AND TWO SISTERS, ONE WHITE AND ONE BLACK NAMED BERTIE AND JEEVES.) AS YOU CAN SEE FROM THE PHOTO SHE LOVES WATER. LIKES TO WATCH IT, FEEL IT AND PLAY IN IT.

OUR VET WARNED US THAT CALICOS HAVE UNIQUE PERSONALITIES AND STRONG OPINIONS...LITTLE DID WE KNOW. BUT CALLIE IS THE MOST LOVABLE CAT I HAVE YET ENCOUNTERED. SHE PURRS NOT ONLY WHEN SHE IS PETTED, BUT ALSO WHENEVER SHE JUST SITS BY ME. BEFORE MY MARRIAGE, I WAS NOT A CAT FANCIER, BUT MY WIFE WAS A PACKAGE DEAL WITH TWO CATS. NOW 5 YEARS LATER, I AM AN ENTHUSIASTIC CAT SUPPORTER. THEY ARE FUNNY, UNPREDICTABLE AND VERY AFFECTIONATE. I HOPE YOU CALLIE GIVES YOU AS MUCH JOY AS OURS.

BEST REGARDS,
MICHAEL

High Wire Artist

Our "Callie" doesn't jump up on anything, but boy can she climb. Here's some shots of our "high wire" artist walking the curtain rod after climbing up the draperies. She jumps down fine, just not up.



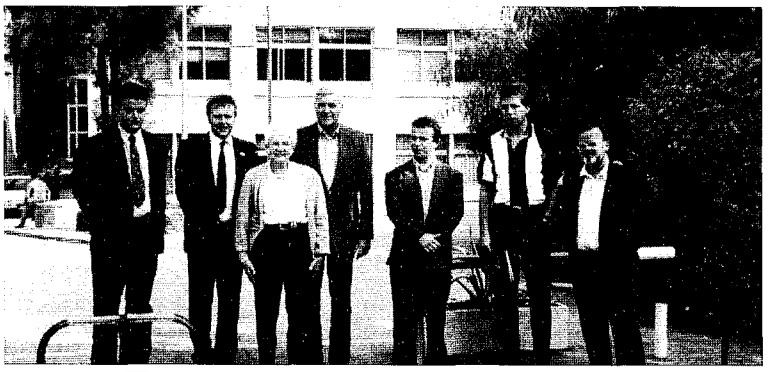
What has all this to do with audio? Absolutely nothing! *D.B. Davis*

Josep Marti

After we did our cover of the last Newsletter on the Universitat Ramon Llull in Barcelona, we had another roll of film developed and discovered that we had an excellent picture of the head of the Acoustics Department, Josep Marti. We thought you would like to see the man responsible for the remarkable Acoustics Department at the University we wrote about in the last issue.

A university was once described in Mark Hopkins' day as Mark Hopkins on one end of a log and a student on the other end. That's still true today. Mr. Marti is at one end of the log and 300 acoustics students are at the other end of his log with a superb staff sitting between them passing along his vision.

Mr. Marti and Don. Consider the lives affected by the careers of these two men.



A few members of Mr. Marti's staff pose with Don, Carolyn, and Pat outside of the university in Barcelona, Spain.

The Dallas AES Conference - A Standard in the Making

The 13th annual AES Conference is Dallas brought together some of the best minds in the audio business concerning computer-controlled systems. When one considers how far we have come in only a few years, it becomes clear that the microprocessor will have much to do with the future of audio. This is a fast growing area, and sound people and manufacturers alike are scurrying to catch up in a business where each new day is a new evolutionary step in this science of audio.

A joint forum on allowed questions to be brought before a panel of industry experts.

The purpose of the conference was to ensure that the audio community as a whole is working together to set the standards by which audio systems can be controlled. While there are a diversity of opinions concerning how things should be done, some common threads that unified participants included:

* The need for compatibility with existing forms of control, such as MIDI.

* The division of the process into layers, which can be modified and refined independently of each other.

* The need for peer-to-peer communication, in that each device on the network must be capable of initiating or accepting control and monitoring commands.

* Strong data typing, which will lead to a large amount of data types but with each optimized for the object that it is intended to control.

* Extensibility. It is impossible to forsee all of the features that future designers will implement into systems. It is important that a standard is adopted that will allow incorporation of new methods and algorithms.

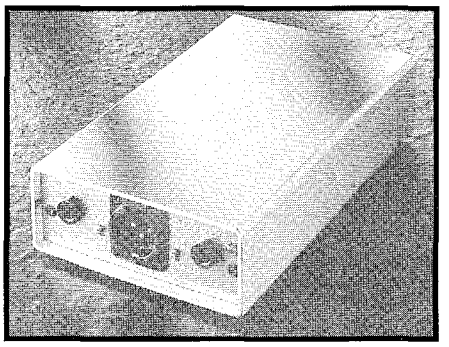
A highlight of the conference was John Murray's (TOA) demo of system calibration via a computer interlink that allows the engineer to sit in the audience and perform precision equalization with a notebook computer.

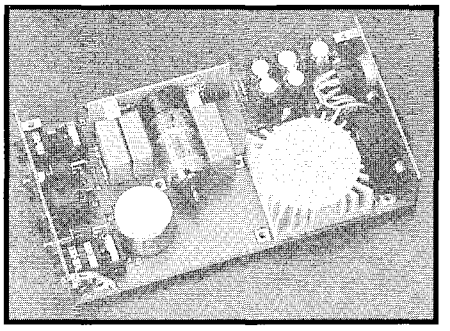
The proceedings from the conference are available from the AES, and make an excellent reference due to the diversity of papers included.

These are but a few of the goals and objectives of a communication standard, but once established, will certainly lead to exponential growth in audio control technology. *P. Brown*

Tube-buffered Direct Injection Box

One of the pleasures of travel is the opportunities one gets to meet new people and learn from them. Our recent visit to Germany offered just such an opportunity. We met a consultant that impressed us with his knowledge of the business and his commitment to excellence. Wolfram Anenhovel is a consultant from Bochum, Germany who, among other things, markets a direct box with all of the right stuff. Recognizing the fact that musical instruments have very high output impedances, and that signal degradation results if these outputs see anything but an open circuit, Wolfram's direct box utilizes a vacuum tube as the input stage, yielding an input impedance in excess of 20 Megohms. This virtually assures that no loading of instrument outputs is occurring. The transformer is a Jensen JT-DB-E, and, as you might guess, the specifications are outstanding. This is definitely a DI for the quality-conscious, and a must for anyone feeding consoles from musical instrument outputs. *P. Brown*





For More Information, please contact:

Wolfram Altenhovel
Auf dem Backenberg 13
4630 Bochum Germany
Fax D(49) (0234) 70 72 40
Phone (02 34) 70 21 90

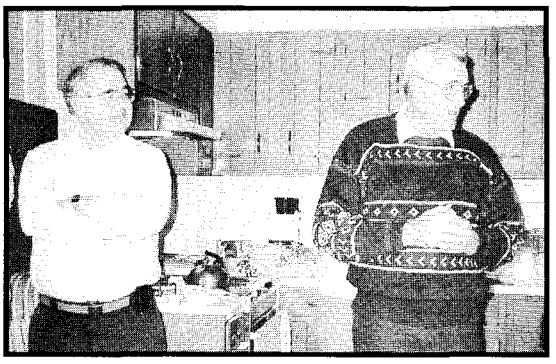
AMB
ACOUSTIC-CONSULTING

Indy Technology Museum Moves South

In the mid 1960's, I was involved in Bell Webb's purchase of a number of 4,000 watt Ling Electronics power amplifiers for the Indianapolis Motor Speedway. These were large five-foot rack-mounted amplifiers utilizing four Eimac 1,000 watt "tubes" in the final. This past year these venerable units were taken out of service by John Royer, Bill Webb's successor, and replaced by a series of Crown 10,000 watt units. The Indianapolis 500 now boosts 60,000 watts of electrical audio power.

Two-hundred volt distribution is used in these large spread-out installations with their literally hundreds of miles of cable. The overawing importance of unquestioned reliability is best realized when you consider that there is only one day to reach 400,000 people clearly and audibly. There's no "we'll have it fixed by tomorrow."

John Royer was chosen by Bill Webb as his backup man and Bill chose very well. Bill was a one-man show. He passed away suddenly the very day that John was to start learning the job. John, working without full knowledge of the very complex systems at both the Speedway and the Indianapolis State

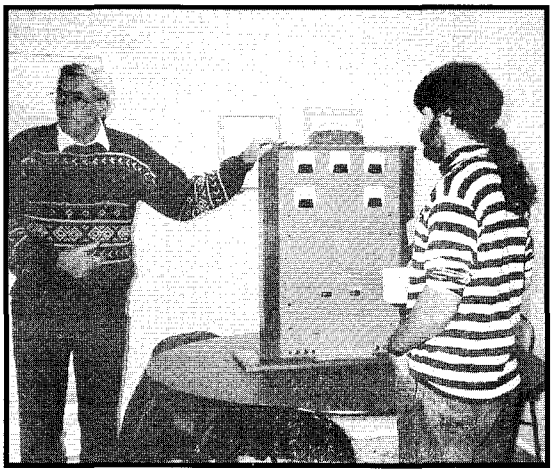


John Royer and Don during a break.

Fairgrounds, kept all systems up and successfully operational. Few men would survive the rigors of John's enforced learning curve.

John has a good friend at the Speedway that has worked with him over many years, named Bob Huey. Bob's background was with Mother Bell and he knows the racetrack inside out. Bob's now retired from the telephone company, but active at the track each year as a valued member of the technical crew. Bob also is a fine artist and we truly admire his work having one of his prints hung at the farm house where we hold our seminars.

John Royer has been gradually upgrading the sound system at the Speedway and the Fairgrounds. We have followed all this closer than we normally would have since each effort results in a van load of prized technical artifacts from these two sites.



Don and his Ling Amplifier

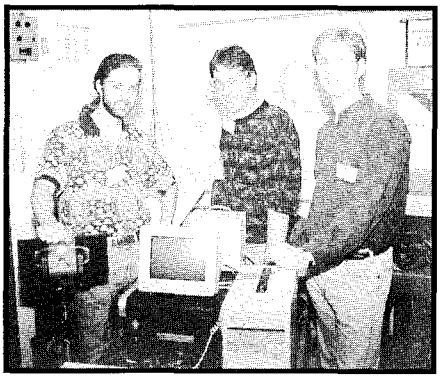
The most recent arrived during the October class. Bob Huey had taken the upper front panel from Ling Amplifier #89 and mounted it on a beautiful wooden framework for display. In the back are four of the 1,000 watt "tubes", a large mechanical circuit breaker that had been mounted on the rear doors and a solid state power supply component.

To place all this in its proper perspective, this gift ranks with Roger Ward presenting me with the car he won Indy with in the 1960's - both are integral parts of a great race track's history. Now Roger hasn't made an offer but John has. This wonderful display will be on view for all future classes at the farm until the day that it goes on display at the Motor Speedway Museum as part of the history of technology at the track. Just a short word on Ling Amplifier #89. It started life as a "shake table amplifier" and was modified (primarily output transformer) for use with a 200 volt audio distribution line.

Ling, at that period, made audio frequency amplifiers with power outputs up to 500,000 watts in this same series. Ling amplifiers were a part of putting a man on the moon and of carrying the greatest spectacle in racing to hundreds of thousands of fans every year for a generation. *D.B. Davis*

Intelligible Speech in a Difficult Environment

Is audio an art or a science? While this question is certainly debatable concerning the recording and playback of music, speech intelligibility definitely



swings to the scientific side. When dealing with speech in a difficult environment, the only criteria for a successful system is whether or not you can understand the message.

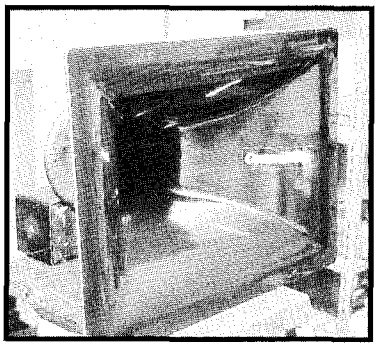
Don Fillers, a 1995 Syn-Aud-Con grad, was approached by a Tennessee defense plant that had a persistent paging system problem. Don invited me and the TEF 20 come down and help evaluate the problem, in order to arrive at a suitable solution. We found that when dealing with speech and communication, much of the technology developed for music playback systems simply has no application. What we need here are the basics of speech communication:

350 Hz to 3.5 kHz bandwidth
Well controlled devices limited to this passband
Adequate signal-to-noise ratio
A clean source of speech information

When these factors are present, you will understand. When they are not, you will not. In many sections of the plant in question, speech intelligibility was not compromised, it was nonexistent. The paging system was just another noise in the cavernous assembly areas.

There is certainly a hierarchy to be followed when attempting to achieve intelligibility in such a space:

1. Establish that communication can take place. We did this by setting up a test rig consisting of a clean speech signal (live talker with hypercardioid mic), a clean signal path (straight-line mixer with bandpass filter and Crown D-75 amplifier), and an accurate speech transducer (Community M200 driver with horn). We found that with this setup we could communicate 80' into this difficult environment without using excessive levels.

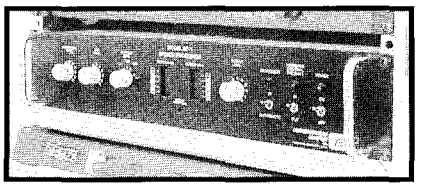


Our ideal speech transducer, a Community M200 driver with pattern-control horn. If this won't work, nothing will.

2. Evaluate the necessary compromises. Once you have established that it can be done, the next step is to consider the compromises. How will the client's system fall short of this "ideal" system? Consider the system we just tested:

Signal source - Our's was a good quality microphone. Even though our test system was covering only one decade (350 Hz to 3.5 kHz), this was an important factor. The customer was paging through a phone system, which TEF measurements showed to have the same bandpass, but not the same fidelity.

Our signal path was pretty much a straight-wire system, and so was the clients, with the exception of a signal delay (about 8 seconds) that was used to prevent feedback.



The CCI SP-1 Speech Processor increased intelligibility beyond the capabilities of the horn/driver alone.

Transducer - The Community M200/ Horn combination that we used approaches the theoretically best specification that a voice device can have:

- One decade pass band with no crossovers
- Extremely smooth frequency and phase response
- High power handling

Indeed, we found this device to be intelligible within 50' in every part of the plant, and at much longer distances

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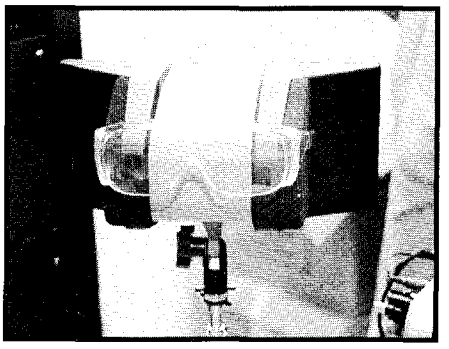


Appropriate eye protection is required at all times in such facilities.

Continued from previous page

in most areas. Intelligibility improved significantly with the use of the SP-1 Speech Processor from Communications Company. This device gave us a subjective 10 dB increase in signal-to-noise without the need of additional amplifier power.

Once these things have been established, the path to implementation of a workable system is a matter of duplicating the required conditions at every local that requires intelligible speech. Attendees of the 1995 Farm and "On the Road" classes will get a chance to hear the DAT recordings and see the data from this project. *P. Brown*

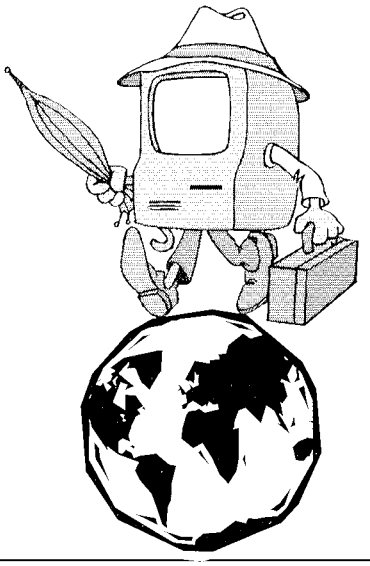
SYN-AUD-CON GOES ON-LINE

Syn-Aud-Con can now be reached via Compuserve and the Internet. One of our goals for 1995 is to enhance the interaction between the Syn-Aud-Con network of grads by promoting e-mail as a way of keeping in touch. This will allow grads to exchange information more efficiently and inexpensively than ever before. We can be reached at these addresses:

Compuserve 74032,1356

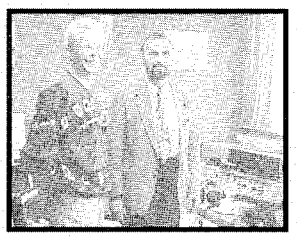
Internet 74032.1356@compuserve.com

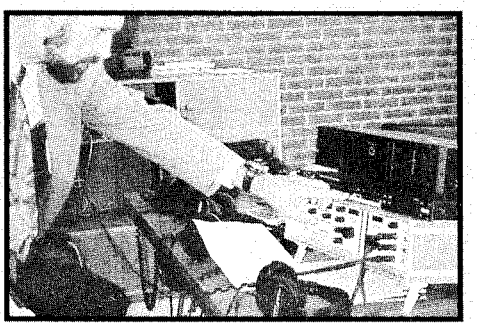
If you are interested in receiving audio news, information, etc. via e-mail on a regular basis, please contact Pat Brown at 812-923-0174 or leave your name and address in our mailbox.



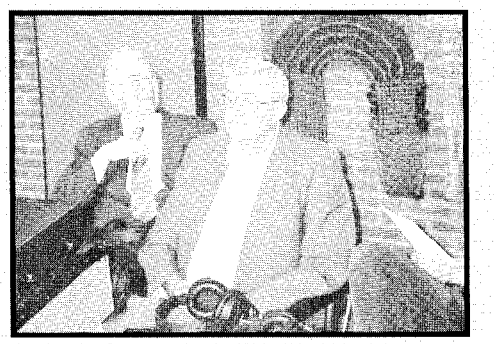
Speech Intelligibility Simulator

On our recent trip to Europe, we had the good fortune of visiting V.M.A. Peutz and Associates in the Netherlands. Mr. Peutz is world-renowned for his work in the speech intelligibility field. Now retired, his work is being carried on by his very able associate Johan van der Werff. During the visit to the office, Johan showed us a device that is used to model intelligibility conditions for clients. With this device, noise and reverberation can be mixed with speech, and the resultant acoustic environments "auditioned" in real time using anechoic program material and headphones. We were quite impressed with this method, since it confronts the client with sound rather than charts and graphs. It also helps the client to understand why noise and reverberation must be controlled in auditoriums. Syn-Aud-Con is currently developing such a system for use in the classroom, and will be demonstrating it during 1995 classes. *P. Brown*





Mr. van der Werff explains the process.



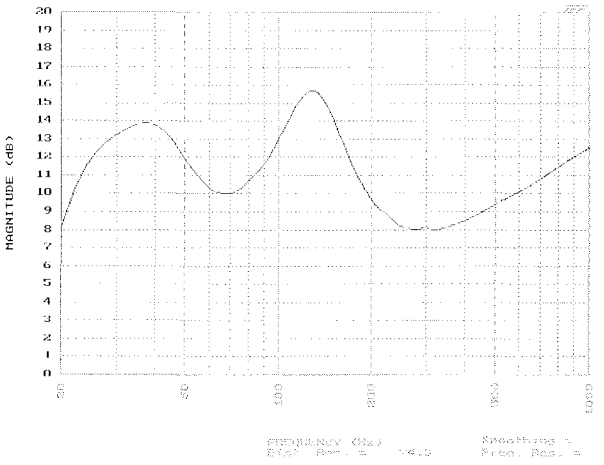
You know it works when these two approve!
Mr. Peutz and Don during the simulator demonstration.

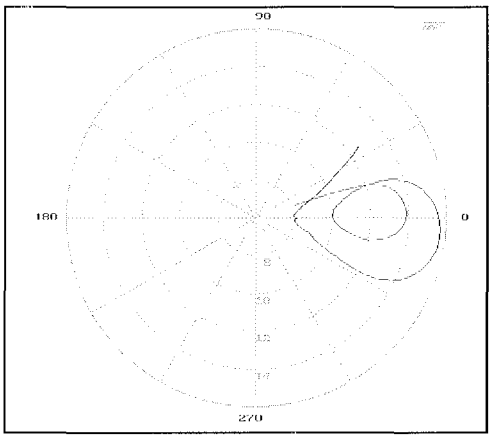
Diagnosing Loudspeaker Problems with Impedance Measurements

What does an amplifier "see" looking out of it's output terminals? Complex impedance measurements tell the story.

Impedance measurements can be a valuable diagnostic tool. Consider an unknown loudspeaker enclosure suspended in a large auditorium. What can you determine about this "unknown" device with impedance measurements?

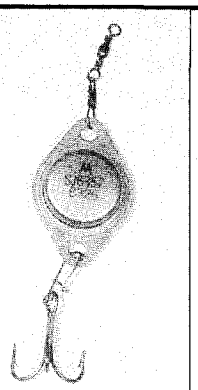
The Nyquist display as viewed on a TEF analyzer reveals a wealth of information about such a device. For instance, a loop will appear for each bandpass filter present in the box. One large loop is representative of the loudspeaker itself (a bandpass filter), and another large loop represents a tuned box (another bandpass filter). Any enclosure leaks (also bandpass filters) will be indicated by epicycles on the display. Panel resonances will be indicated in the same manner, as well as the frequency of resonance. The maximum phase angle will reveal valuable information for choosing an appropriate amplifier. Many amplifers are unstable into capacitive loads, and will oscillate. Crosstalk between low and high frequency devices will also be indicated by epicycles. Other information that is present includes; box tuning, cable capacitance effects, and free-air resonance. Thiele-Small parameters can be estimated using the least squares method. Consider that this wealth of information was obtained without making an acoustic measurement, therefore being less affected by background noise.





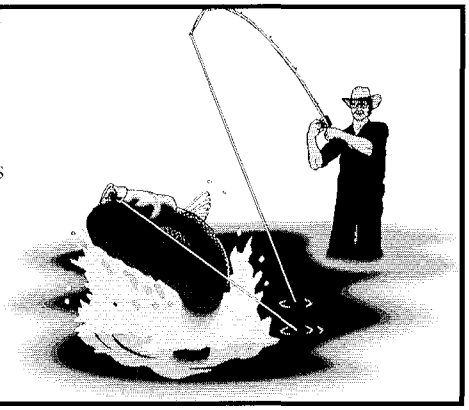
An impedance plot of a loudspeaker allows us to view it from the power amplifier's vantage point, and the information obtained provides valuable insight into optimizing a sound system.

Modern analyzers, in the hands of genuinely interested audio people, will build upon the knowledge and infrastructure handed down by this century's audio pioneers. *P. Brown*



Mister Transistor

Here's one for your audio fishermen. Mike Hedden of db Engineering presented me with one of his favorite baits during the Gainesville, Georgia "On-the-Road" class this past Spring. Mr. Transistor is a proprietary modified TO-3 package outfitted with a treble hook. Mike says that a hula skirt is optional. *P. Brown*

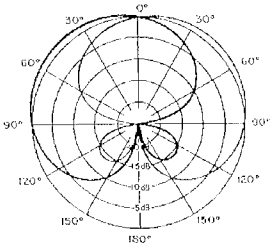


A Renewed Interest in Stereo Microphone Techniques

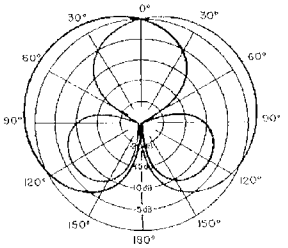
During the past forty years we have been fortunate to be in a position to experiment with the early condenser and ribbon microphones, the in-the-ear, SASS and Aachen Head systems as well as having worked with William Snow of BTL fame along with John Hillard exploring the various ways to make stereophonic and binaural recordings.

One technique we hadn't tried was M-S microphony. What brought our attention to it was the advent of the Shure VP88MS microphone. This is a single point stereo condenser microphone that includes a coincident pair of microphone cartridges. One, a forward facing cardioid and the other a perpendicular bidirectional (figure eight pattern) capable of being matriced, either internally or externally to form left and right stereo signals. The versatility this arrangement allows in changing the width of the sound field received by the microphone either in situ or in post processing is truly remarkable.

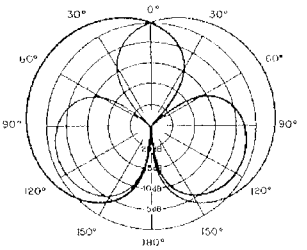
We used our Shure VP88 to record an opera singer, piano recital recently where the recording conditions included a too noisy HVAC and a fairly live room. The control the matrix gave over the pickup pattern enabled us to obtain a full frequency range, extremely low distortion, and thrilling dynamic recording free of the HVAC's room effects. *D. B. Davis*



"Low" Stereo Nominal Pickup Pattern



"Medium" Stereo Nominal Pickup Pattern

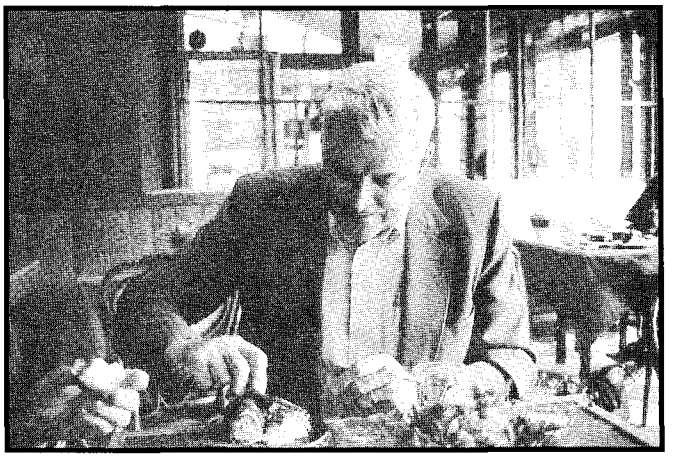


"High" Stereo Nominal Pickup Pattern

Bosha Balls

In 1993 V.M.A. Peutz held a concert tour for Syn-Aud-Con grads wherein we travelled to various concert halls in the Netherlands with the same symphony orchestra playing the same repetoire in each hall. The mornings were spent in Amsterdam with tutorial instruction by Peutz and Associates, the afternoons measuring in the halls, and the evenings at the concerts.

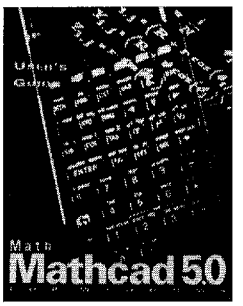
On this tour our first stop was in Den Bosch (full name S'Hertogenbosch) to see and hear a very fine multipurpose hall that was also a most acceptable concert hall. The management of the hall presented the entire class, upon its arrival at the hall, with "Bosha Balls". Bosha balls are immense popover-type objects filled with cream and with an outer coating of really rich chocolate.



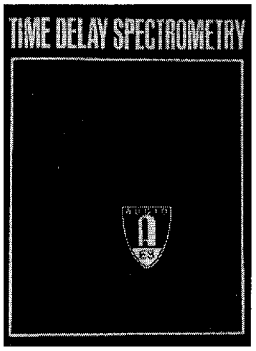
Don instructs in the finer points of Bosha Ball consumption.

Introducing Pat Brown to Europe started with the arrival of a KLM flight in Amsterdam at 7:30 am followed by a fast drive to the ancient center of Den Bosch to see its remarkable cathedral and then to the Bosha Ball place across the street. Don willingly sacrificed, showing Pat how to handle one in spite of his having to drive afterwards. *D. B. Davis*

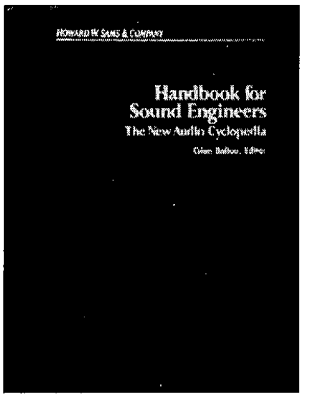
Items of Interest...



MathCad 5.0
MathCad is a useful software product that allows equations to be viewed, manipulated, and solved in much the same manner as they would on paper. Pat Brown's MathCad audio utilities are available from Syn-Aud-Con for $25.00. MathCad is available from MathSoft for $79.00 at 1-800-MATHSOFT.

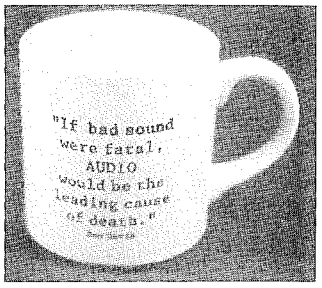


Richard Heyser Anthology
We made the decision to make the Heyser Anthology available after Pat Brown brought it and declared that everyone who owns or is thinking of owning a TEF 20 should read the Heyser papers. So we said okay. If you are a member of AES you can buy it a few dollars less than we are selling it for we have to cover our handling. Price $33.00



Handbook for Sound Engineers - The New Audio Cyclopedia
by Glenn Ballou
Glenn's book is an excellent resource for the professional audio person. Various authors have contributed their expertise and knowledge, making this a must for every serious audio person's library. Price $89.00

Audio Systems Design and Installation
by Philip Giddings
We conducted a 2-day seminar for the International Distribution for Community in April just before NSCA in Las Vegas. Community wanted all attendees to have two books: Sound System Engineering and Audio Systems Design and Installation by Philip Giddings. It is an expensive book. Since we share the same publisher with Philip Giddings, we are able to buy the book at a price that allows us to pass along at $10 savings. Price $50.00



Syn-Aud-Con Coffee Cup
John Royer liked our statement, "If bad sound were fatal, audio would be the leading cause of death," so he had it printed on a Syn-Aud-Con cup and had a gross printed for us to give to people attending our farm classes. They are almost gone, so we have decided to have more made and make them available for $5.

Classifieds

FOR SALE: Etymotic Research ER-15

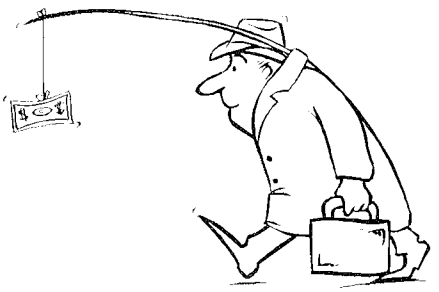
Unique hearing protection has been developed specifically for musical listening (unlike foam, rubber or plastic varieties which have been designed primarily for industrial noise). A patented acoustical damping network uniformly attenuates the sound level across the entire frequency range. Hi-Fi Earplugs are made of soft yet durable, washable and non-allergic polymer which fits securely any size ear. Its vented design greatly reduces the "blocked-up" feeling caused by foam, plastic or wax earplugs. $17.95 (w/keychain case). Also available ETYMOTIC RESEARCH ER-4S Stereo and ER-4B Binaural canalphones. List $330.00 Now $280.00. EarWear (TM), 21 Millay Place Mill Valley, CA 94941 Phone (415) 380-8273 Fax (415) 380-9414

"Arguing with an audio consultant is like wrestling a pig in the mud, after a while you realize the pig really likes it."

Jim Carey and Associates

"There are two kinds of failure - Those who thought and never did, and those who did and never thought."

William Feather



"Incentive"

Geode Frenzy

Why is this man smashing things down in our creek bed? It's called Geode Frenzy. Southern Indiana is blessed with abundant geodes, some of which have beautiful crystalline interiors. Summer classes enjoy going down to the streams in the woods and finding geodes. Once found, the desire to know what's inside can be overwhelming. It takes skill to break them as only another geode can break a geode. This is why Syn-Aud-Con farm grads have heavier suitcases for the trip home.

That winning smile on Greg Hockman says, "This one's a keeper."

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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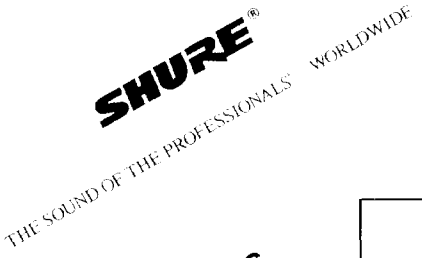

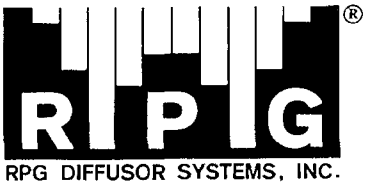

SYN-AUD-CON SPONSORS

Syn-Aud-Con receives tangible support from the audio industry. Eighteen manufacturing firms presently help underwrite the expense of providing sound engineering seminars. Such support makes it possible to provide the very latest in audio technology while maintaining reasonable prices relative to today's economy and to provide all the materials and continuing support to all graduates of Syn-Aud-Con.

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. The are "in tune" with what a Syn-Aud-Con grad needs.

Their presence on this list as a Syn-Aud-Con sponsor indicates their desire to work cooperatively with you in professional sound.

Altec Lansing Corporation	**Innovative Electronic Designs**
BIAMP Systems, Inc.	**JBL Professional/UREI Electronics**
Community	**Quantum Sound, Inc.**
Crown International/Techron	**RPG Diffusor Systems, Inc.**
J.W. Davis Company	**Renkus-Heinz, Inc.**
EAW - Eastern Acoustic Works	**Shure Brothers Inc.**
Electro-Voice, Inc.	**TOA Corporation - Japan**
HM Electronics, Inc.	**TOA Electronics**
IRP- Professional Sound Products	**West Penn Wire Corp.**