

SYNERGETIC
SYN AUD
CON
AUDIO CONCEPTS

newsletter

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SYNERGETIC

Working together; co-operating, co-operative

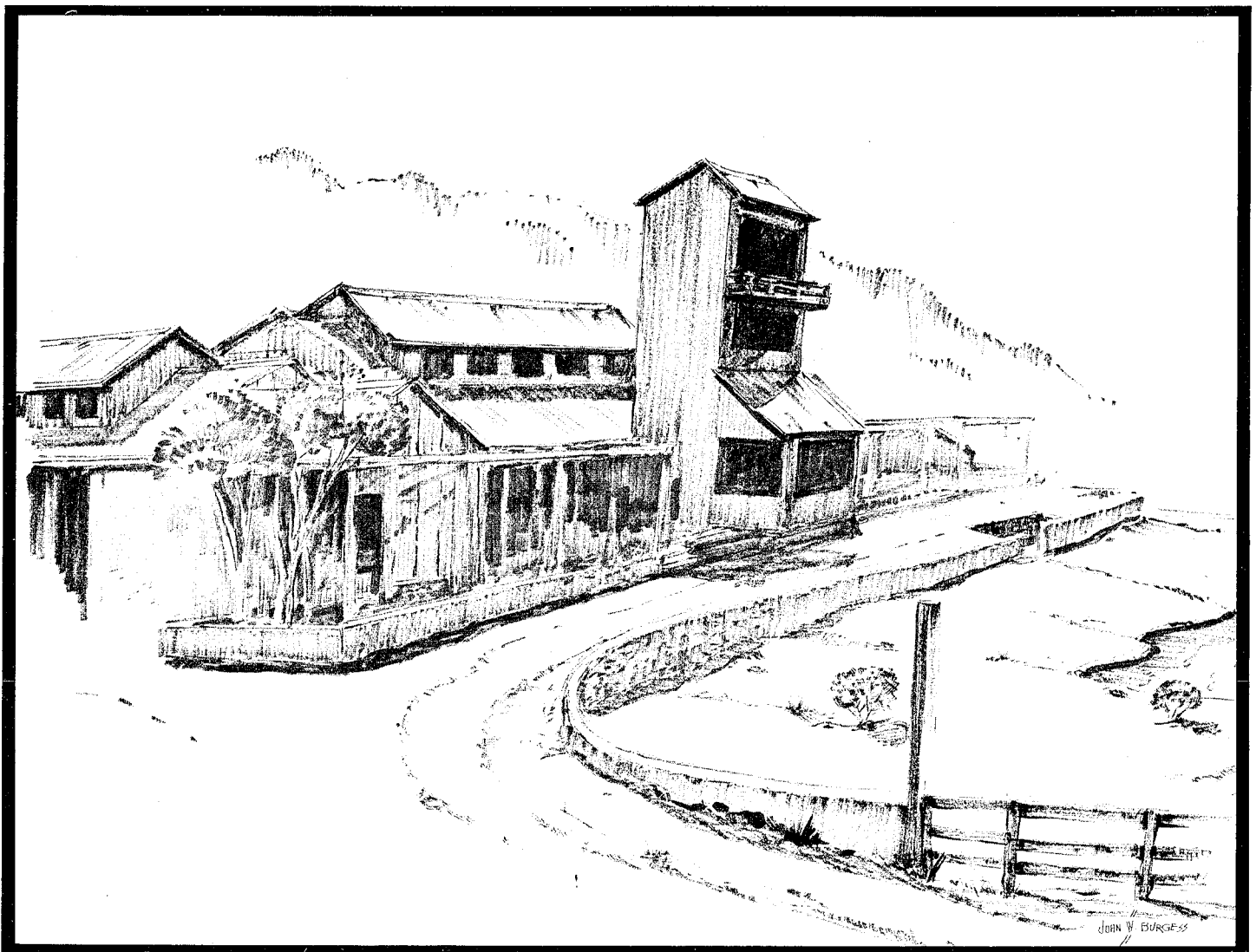
SYNERGISM

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

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



SYN-AUD-CON AUDIO INDUSTRY SEMINAR CENTER

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EDITORIAL

This Newsletter marks the end of one significant era for Syn-Aud-Con and the beginning of an even more significant one. For six of our first seven years we traveled, by Airstream, throughout these beautiful United States.

While the 1979 fuel crisis called our attention to a re-evaluation of our travel plans, our understanding of the political origin of the shortages would have led us to return to travel early that fall.

What did occur that Spring of 1979 was the opportunity to build our new seminar center. If a million dollar investment was to be undertaken, we had to know that *you*, the Syn-Aud-Con participant, were ready to recognize the benefits of traveling to us rather than our traveling to you.

We have now completed a full year of the new limited size California seminars in Dana Point, CA. These classes have encouraged us to fully complete the new seminar facility which will open for its first class in November, 1980.

Having a Seminar Center has released us from the restrictions on the amount of equipment we can have available in our classes (formerly the carrying capacity of our truck). We plan to have more special seminars for graduates to allow them to zero in on special topics with the direct assistance of an expert in that particular field.

We are grateful for the remarkable projects Syn-Aud-Con has been privileged to have a leading part in such as TEF™ measurements, Time Align™ loudspeakers, PZM™ microphones, LEDE™ control rooms, and the remarkable proliferation of 1/3 octave real time analyzers such as the IE-30 and the exceptional Crown-Badap eight color, eight memory computer analyzer selling at an unbelievably low price for the functions performed.

Syn-Aud-Con's graduates and Syn-Aud-Con's sponsors have clearly become a powerful innovative force in the creative use of audio equipment and techniques.

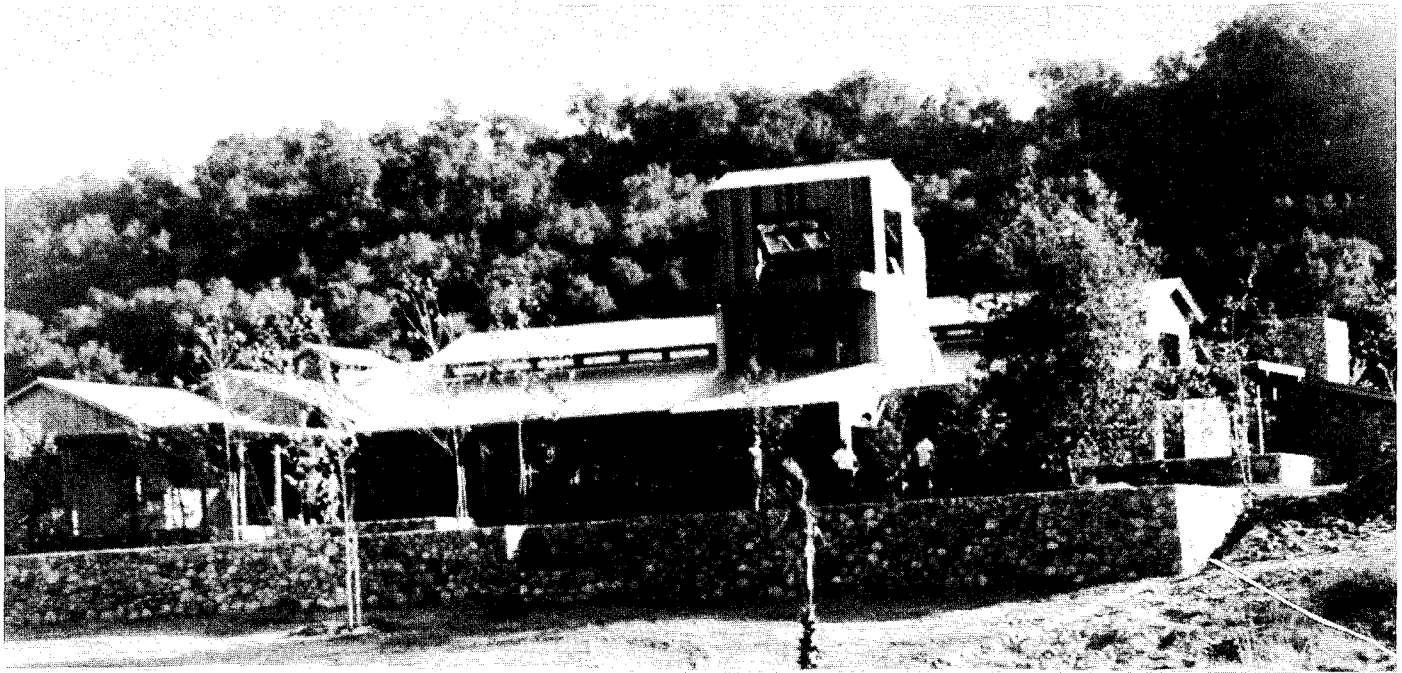
Syn-Aud-Con has been the earliest and most extensive user of scientific electronic calculators, working with such gifted individuals as Tom Osborne, JERRY STANLEY*, and CLAY BARCLAY*. Our leadership in this area stemmed from our belief in the need for mathematical "literacy" *now* and in our faith that every Syn-Aud-Con participant *can* master these powerful tools. We have been overwhelmingly justified in our faith during these past seven years.

Syn-Aud-Con has proven that the word Synergy in its name is an operative term. Many of our graduates have made meaningful advances in their jobs through identifying opportunities to do so in a Syn-Aud-Con class.

The decade of the 80's is destined to witness staggering advancements in computer calculators, audio signal processing equipment and, most of all, in real relevant insights into the acoustics of both small and large volume spaces. We'll be there pushing on the outer envelope. We hope you'll be there with us.

Therefore, this issue is different from a standard Newsletter in that we have assessed the past and are excited by the promise of the future. Come share our vision with us.

*Syn-Aud-Con graduates are capitalized throughout Newsletter



SYN-AUD-CON AUDIO INDUSTRY SEMINAR CENTER

The title, "Syn-Aud-Con Audio Industry Seminar Center" is quite a mouthful but it does express our true hopes for this magnificent facility.

Location

Our Seminar Center is located in the heart of the 40,000 acre San Mateo Canyon Wilderness area (formerly a part of the Cleveland National Forest) in the Santa Ana mountain range.

It is a privately owned 35 acres valley at an elevation of approximately 2500 feet. The valley is seven miles from the nearest public road and the private road from our gate on the historic Ortega Highway to the Ranch valley is one of the most scenic drives in S. California.

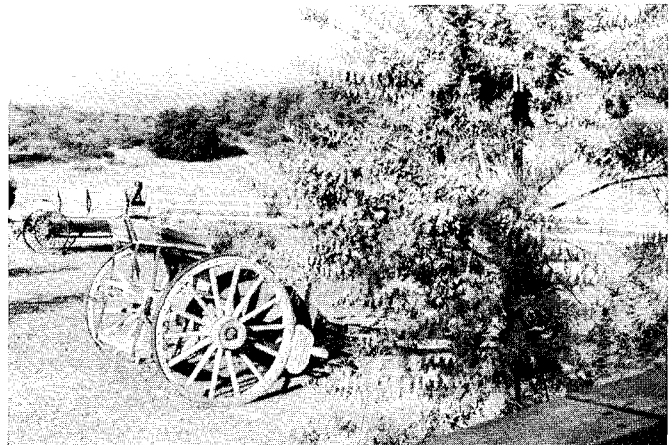


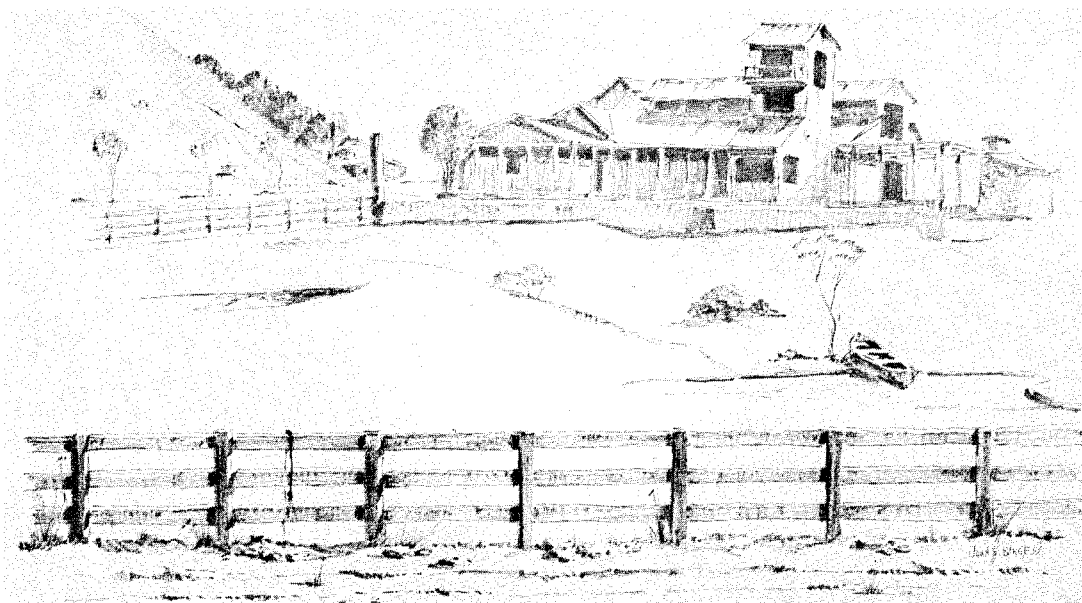
The lights of downtown Los Angeles are visible from our elevation and lay like a diamond carpet out on the horizon. The Valley's inhabitants include deer, coyote, wild cats, quail, rabbits, dove, and mountain lions; in fact, a completely representative group of S. California flora, fauna, and wildlife.

15 miles to our West is the historic town of San Juan Capistrano with its ancient mission and just beyond it, Dana Point with its exceptional Marina area.



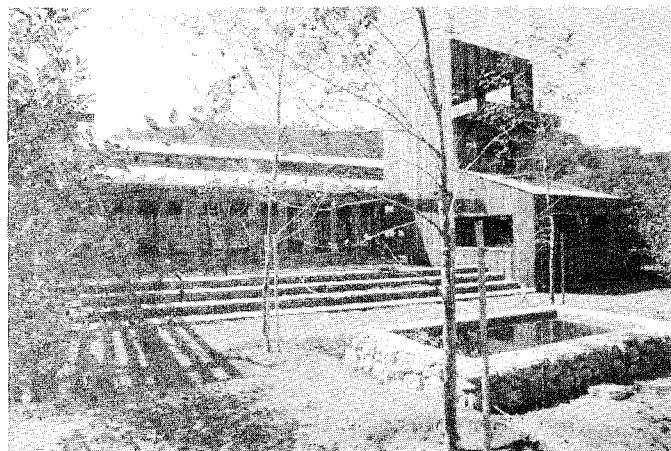
Just 15 miles from the ocean, a clear day provides spectacular views of Santa Catalina Island 35 miles to sea and San Clemente Island 60 miles out at sea.





Artist drawing made during construction, prior to glass installed and trees planted. The pictures were taken after trees planted but before glass installed.

We feel that our efforts in providing this exceptional Seminar Center reflect accurately our desire to serve those of you in the audio industry who have supported us in the past seven years and we look forward to sharing many more memorable audio experiences with you.



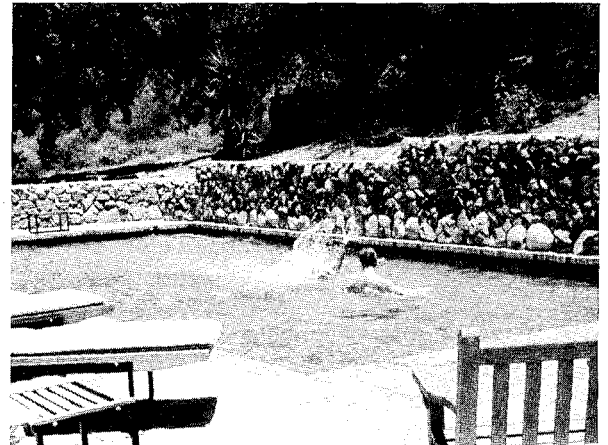
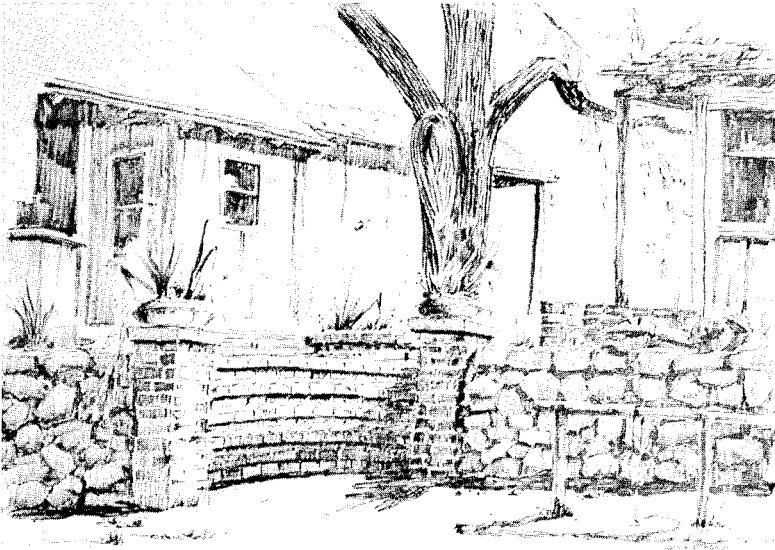
January 1981 marks the beginning of Syn-Aud-Con's 8th year of seminars and this Seminar Center is tangible evidence of the heartfelt desire of our graduates to support meaningful, relevant continuing education in our industry.

Even more impressive than these buildings and facilities is the knowledge structure constructed by our 4,000 graduates during the past seven years and the synergy of sharing that vital, living, growing structure with those of you ready to participate in the Syn-Aud-Con experience during the next seven years.



Facilities

Within this 35 acre natural paradise are three ponds, one complete with large palm trees, a swimming pool, tennis court, horse stables, large patios for cook outs, an authentic California ranch house and bunk house where you can relax between seminar sessions.



The Seminar Center is a large 80x80' structure offering test spaces from the size of small church to offices for Syn-Aud-Con.

The original Ranch buildings were built during the Twenties. The new and remodeled buildings have been *custom* designed and built by one of Southern California's leading architects, Edward Lohrbach.

The valley and its facilities are valued around \$1,000,000.

First Seminar in November, 1980

Starting with our November 11-13, 1980 class, all Syn-Aud-Con seminars will be held in this new facility.

Participants will stay at the Marina Inn in Dana Point and limo service will be provided each day between the hotel and the Seminar Center. No private vehicles are allowed on the private road or at the Seminar Center under an agreement Syn-Aud-Con has with other users of the road.

Lunches are served at the Seminar Center and dinners are eaten together at one of the excellent restaurants adjacent to the Marina Inn in the evening.

This is truly a unique first in Audio history. Won't you be a part of it by attending one of the first year's seminars and signing in the Seminar's participants book that will record those privileged to have experienced the excitement, beauty, and intellectual challenge of Syn-Aud-Con's Audio Industry Seminar Center?



Special Seminars Sponsored by Syn-Aud-Con

We will hold our special Heyser-TDS seminar at the new facility.

We have included "Audio Industry" in the name of our facility because we are prepared to offer to qualified manufacturers our assistance in their use of our facility for those special meetings of sales, technical, or administrative personnel they would like to conduct in such a rewarding environment.

SYN-AUD-CON 1980-81 SCHEDULE

OCTOBER 14-16	MARCH 17-19
NOVEMBER 11-13	APRIL 7-9
DECEMBER 9-11	MAY 7-9
JANUARY 27-29	MAY 19-21
FEBRUARY 17-19	JUNE 23-25

SPECIAL SYN-AUD-CON WORKSHOPS

Over the years we have had requests for special seminars and different formats of the Sound System Engineering seminars. Now is the time to let us know what you would like. We are scheduling 1981 now. It is our plan to hold one regular Sound System Engineering Seminar each month and one special seminar.

A few ideas we have:

- STUDIO DESIGNERS WORKSHOP (4 days) with CHIPS DAVIS and ED BANNON
- PZM™ WORKSHOP (2 days) with KEN WAHRENBROCK and 3 special assistants
- SOUND INSTALLERS SEMINAR/WORKSHOP (3 days) with RON STEINBERG
- INSTRUMENTATION WORKSHOP (3 days) with Richard Heyser
- DAY OF BASICS (1 day) with FARREL BECKER

Don and Carolyn will host and assist in each of the special seminar/workshops.

Each of the special seminars will be held in our new Audio Industry Seminar Center with possibly one day on location.

We have printed this page of the Newsletter in looseleaf and included an extra copy so you can return it to us with your ideas. If you want, sign your name and we will contact you when the workshop/seminar you are interested in is planned. Or just mark your interests without your signature so that we have a feeling of your wishes.

NAME _____

COMPANY _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

PHONE _____

Month of the year good for you: _____

If we haven't listed your special interest or a project leader that you would like to work with, please list here:

SYNERGETIC AUDIO CONCEPTS, P. O. Box 1115, San Juan Capistrano, CA 92693.....Telephone: (714) 496-9599

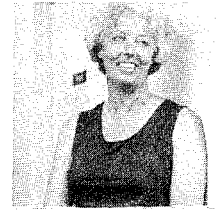
SYNERGETIC AUDIO CONCEPTS
RANCHO CARRILLO BEANS

One event destined to become a Syn-Aud-Con tradition is the steak cook-out with overflowing salads and a habit-forming bean dish that Jan Kreitz makes called Rancho Carrillo Beans -- baked beans, lima beans, kidney beans, brown sugar, and quantities and quality of cheese.

Rancho Carrillo Beans

1 large can Pork & Beans
1 medium can Kidney Beans - drained
1 small (or medium) can Lima Beans - drained
Brown sugar - 1/3 1 lb box or more - to taste
Catsup - 1/3 to 1/2 bottle - to taste
Approximately 1 lb bacon

1 large or 2 medium onions - diced
Garlic powder - to taste
Dash of Season Salt - to taste
Dash of Worcestershire Sauce
2 drops of Liquid Smoke (optional)
1 lb Cheddar Cheese



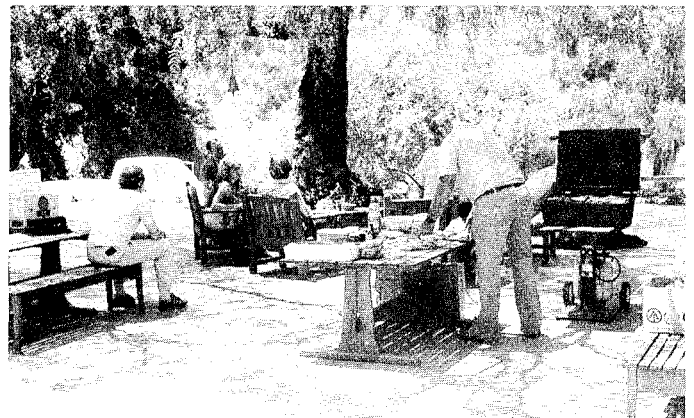
Fry together bacon and onion. Drain fat and add beans and balance of ingredients. Simmer until thick (2-3 hours). Just before serving, add Cheddar Cheese that has been cut into cubes.

Visitors to the Seminar Center (we invited limited numbers of graduates up for the day to help us assess the impact the valley would have on them) ate these beans until we ran out of all reserves, indicating to our trained eyes, ears and stomachs that they would have eaten more had it been available.

It's hard to properly describe the "Century ago" atmosphere of the old ranch house, patio and bunk house area and its relaxing air of complete peace as you sit there, cool drink in hand, eating steaks fresh off the grill, and finding you are powerless to stop eating while anything remains available.

The fresh, unbelievable clean air washed by the tens of thousands of acres of chapparral and Spanish Oaks, the deep well water so pure it requires no treatment, and the dazzling, constantly changing display of sunlight on the steep wooded hillsides of the valley cause all of your senses to draw in the primitive joys of man.

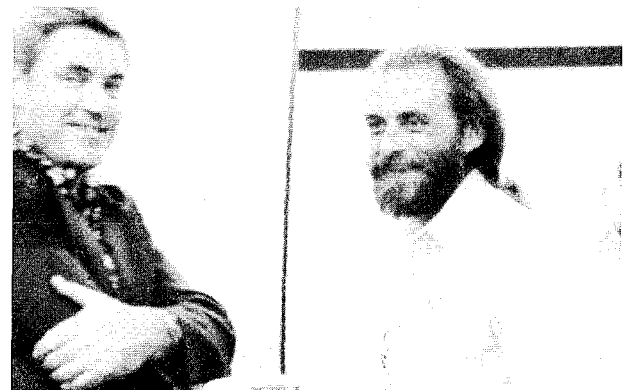
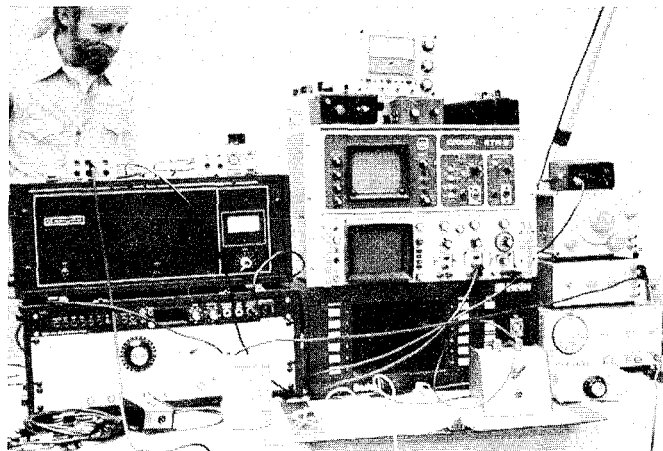
This is the West at its best - good companionship, good food, good environment, in a totally private oasis of beauty - all dedicated to letting you relax in a totally free "learning" atmosphere.



CHIPS DAVIS AND ED BANNON JOIN FORCES

ED BANNON and CHIPS DAVIS have joined forces to handle studio and control room design and installation.

Ed's talents are manifold but he approaches genius in his ability to track down basic, fundamental flaws in consoles and other control room electronics. Ed recently went through Chips Davis's original LEDE™ control room with a fine tooth comb for electronic improvement possibilities. Chips tells me the end result of a week of Ed's work was nothing short of phenomenal. Syn-Aud-Con finds that easy to imagine as Ed's skill with the TEF™ equipment is considerable and we have witnessed him cutting through the technological haze to an excellent solution a number of times.

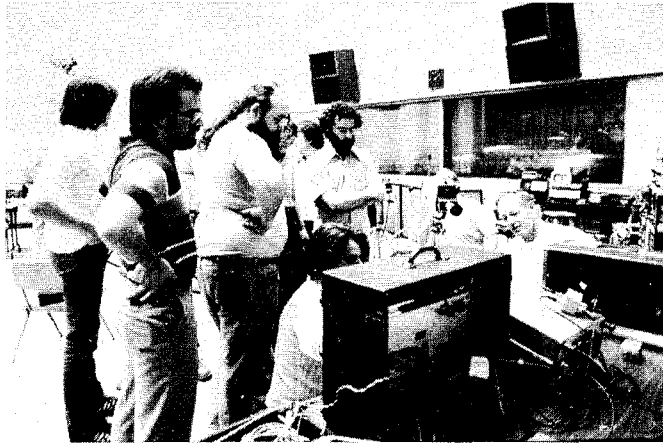


Fortunate indeed are the studio owners who benefit from Chips' and Ed's services. The kind of problems Ed corrects are not service problems but built-in design problems that the manufacturer built in carefully.

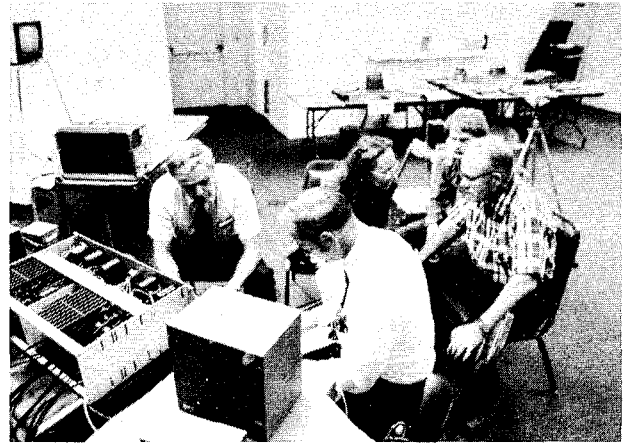
In Chips' LEDE™ room, where the normal masking by acoustic faults are removed, we are sure that the correction of these design problems are indeed quite audible.

SYNERGETIC AUDIO CONCEPTS
FEBRUARY TEF™ CLASS

The third TEF™ class will be held the week of February 10-12, 1981. This class, like the previous two TEF™ classes, will be taught by Richard C. Heyser, inventor of the TDS process and easily the most prominent and qualified authority on audio measurements available today.

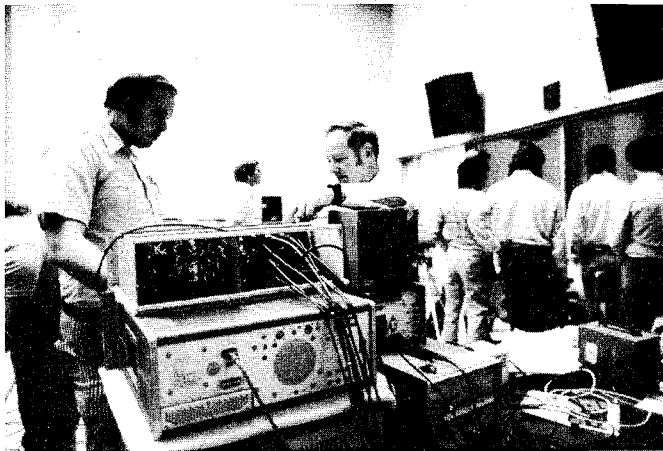


Heyser - TDS Class May, 1979



Heyser - TDS Class November, 1979

The February TEF™ class will also include the first public showing of the Crown dedicated TEF™ analyzer which, in our belief, is destined to literally revolutionize the audio measurement systems of today.



CLAY BARCLAY, TDS class May, 1979, gathering ideas from Dick that Crown used to develop the dedicated instrument which will be shown in this February, 1981, class.

The Crown dedicated TEF™ instrument is not only the first dedicated unit but is incorporating significant advances in the ranges of available parameters. Both logarithmic and linear displays will be incorporated. EFC, ETC, FTC, and phase display will be normal with calibration in terms of energy density in dB, time, distance, and degrees of absolute and relative phase angle. We'd have to use this entire Newsletter to even begin to adequately describe the genuine advances in TEF™ technology incorporated into this first-of-its-kind dedicated instrument.

The usual support personnel will be on hand - Don and Carolyn Davis, KEN WAHRENBROCK, and others. This class will be held at our new Audio Industry Seminar Center near San Juan Capistrano, California, which allows a unique opportunity to measure large "church sized" volumes as well as small recording environments.

This TEF™ class is limited to 21 attendees. The price is \$750 per attendee and includes all lunches and dinners, coffee breaks, and hotel rooms. Only TEF™ licensees are eligible for this special class.

TEF™ classes are a unique and privileged opportunity to share three days with Dick Heyser in an unbelievably creative atmosphere. You will emerge from this class with a humbler view of your own needs but with a dazzling view of the infinite possibilities towards which you have a remarkable head start.

NEWSLETTER SUBSCRIPTION AVAILABLE TO ALL

We get many requests to subscribe to the Syn-Aud-Con Newsletter and Tech Topics, which we have refused over the years as we "subsidize" the Newsletter for our graduates (haven't increased our price in eight years).

Now we have made the decision to make the Newsletter subscription available at \$50/year to non-graduates. However, that \$50 will be applied to the registration fee should the subscriber register for a Syn-Aud-Con seminar during the year of the subscription.

This answers another request we often get -- to have an opportunity to study the Newsletters and Tech Topics in advance of the class.

If you have friends that would like to subscribe, a subscription form is enclosed in this mailing for you to pass along to them.

TEF™ LICENSEES

We said it so well in an earlier Newsletter that we will repeat it: These licensees are true pioneers who are rapidly pushing back the acoustic measurement frontier and, like all pioneers, learning that only those who have been there really know what it's all about. As is always the case with major new concepts, it's hard to realize that this is but the baby steps and that this is a unique opportunity to be in at the beginning and grow step-by-step rather than later trying to play "catch up" when it's even more involved. I can see getting 10 more on this list.

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Mr. Tom Gandy
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Portland, OR 97209

UZZLE UTTERANCES

Part of TED UZZLE's "Ted Faces Life" adjustment to the West Coast is that a "spade" is becoming an "excavation tool."

Lurking underneath a nomenclature of Brand X, Y, Z is the cutting edge of the Eastern Uzzle. Syn-Aud-Con looks forward to the day that an Uzzle Utterance starts out "Wal, pardner, it's thisaway."

In the meantime, back at the ranch, Uzzle is giving an invited ASA paper at the November ASA 1980 meeting, an SMPTE paper November 13th at their 122nd Technical Conference which, along with his May 1980 AES paper, gives him a technical paper "triple crown."

Always examine their teeth before betting.

UZZLE UTTERANCE: SPECMANSHIP

Constant directivity horns are an idea whose time has come. Happy the lot of today's sound system designer who has not one, not two, but three competing lines to choose among. Besides, they're all about the same, aren't they? Aren't they? The listed specifications show coverage to be the same within a couple of degrees, the Q to be the same to within a couple of points, and the sensitivity to be the same to within a couple of dB. How is one to choose among them?

Let's look at the spec sheets just a bit more closely. To avoid commercialization of this Newsletter (and apoplexy among the manufacturers) let's call them brand X, brand Y, and brand Z.

Brand X lists a minimum recommended crossover of 800 Hz, and all the listed specifications are dutifully quoted over the band 800 Hz to 16 kHz.

On the spec sheet for the brand Y $40^\circ \times 20^\circ$ horn, they list a recommended minimum crossover frequency of 300 Hz. Yet, the horizontal coverage angle is given over the band 400 Hz to 16 kHz. Curious. The vertical coverage angle is quoted over the band 2 kHz to 16 kHz. Curiouser and curiouser. How do you cross over the horizontal angle at one frequency and cross over the vertical angle at another frequency? Polarized radiation? Or perhaps polarized capacitors in the crossover? Perhaps even bipolar capacitors. Does brand Y offer such a crossover, or suggest the user build it himself?

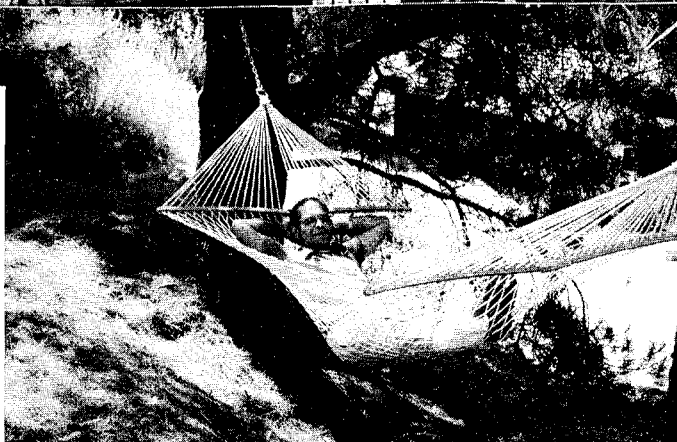
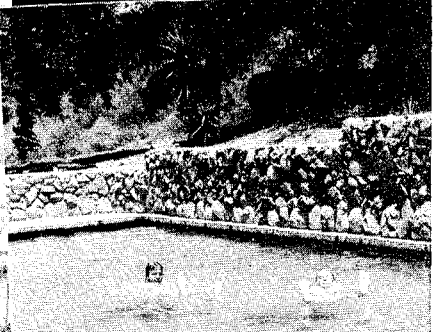
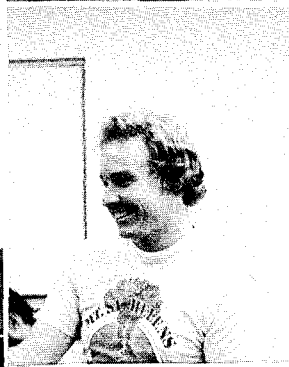
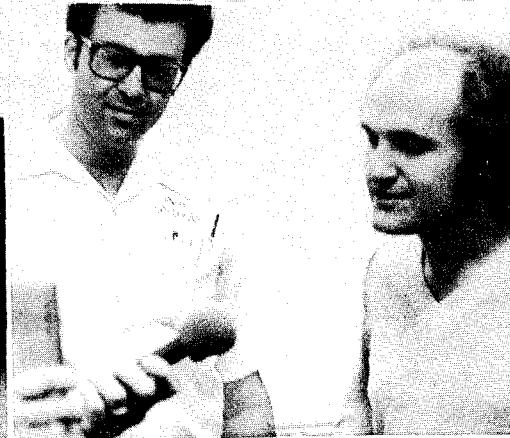
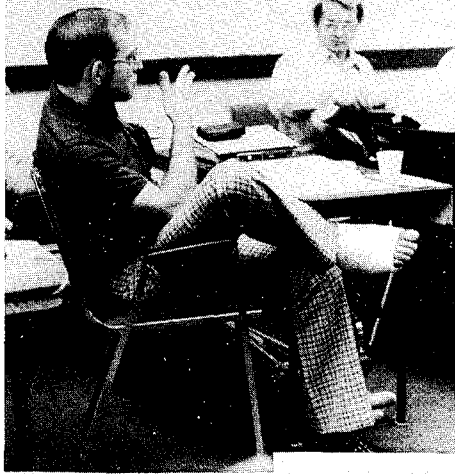
When we come down to the claimed Q, it really gets interesting, because Q is cited over the band 1.25 kHz to 16 kHz. Perhaps between 300 Hz and 1.25 kHz it doesn't *have* a Q. Perhaps the horn designer took it with him when he left. Let us be brave and look at the sensitivity of the recommended driver when on this horn: 800 Hz to 2.5 kHz! Apples and oranges? Here in *one* manufacturer's *one* spec sheet for *one* horn, we have all these specs quoted in all different bandpasses. Apples, oranges, kumquats, prunes. Do you realize that only in the band 2 kHz to 2.5 kHz do they quote all four basic specifications?

Brand Z is more consistent in describing its $40^\circ \times 20^\circ$ constant directivity horn. The minimum recommended crossover frequency listed is 500 Hz or 300 Hz, depending on the driver selected. This time, the vertical and horizontal crossovers are only an octave apart: horizontal is quoted from 500 Hz to 16 kHz, while vertical is quoted from 1 kHz to 16 kHz. Much less exotic. Glory be! Q is quoted over the same band as the vertical angle. Sensitivity? Gasp! 630 Hz to 4 kHz! Where did *that* come from?

Here you have three horns whose basic specifications are almost identical: coverage, Q, and sensitivity. Brand X publishes all specs over the entire claimed usable bandpass, and they also publish full polars and charts of Q over frequency, etc. Brand Y juggles bandpasses for *each individual* basic specification. To their credit they also publish a double page of full polars and other graphs. Brand Z quotes four specifications over three different bandpasses, but they do not publish polars, and no specification is quoted from the usable low frequency limit.

All three lines of constant directivity horns are of excellent quality, and the reader is welcome to his own preference among them. Their spec sheets do show, however, that two very reputable manufacturers with excellent products are not above specmanship and playing games with the fine print. Perhaps the rigorous new AES standard for loudspeaker specification sheets is worthwhile. Even so, who knows what evil lurks in the hearts of loudspeaker companies?

JULY CLASS AT DANA POINT, CA



BADAP I UPDATE

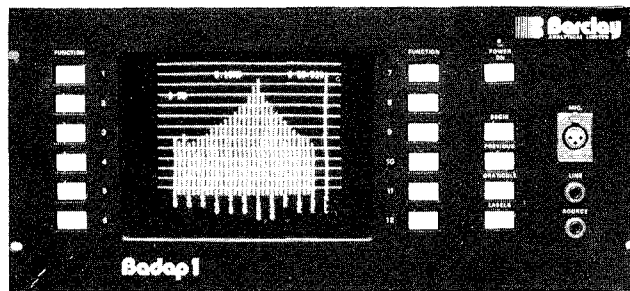
The presence of the inimitable CLAY BARCLAY in our September class served as a training opportunity for Syn-Aud-Con personnel in the use of the Crown Badap I.

An Outstanding Feature

One feature we had not appreciated before Clay's demonstrations is the value of 8 memories in 8 different colors. Even our large GenRad real time has only one memory, and the ability of color to separate a series of intertwined spectra is spectacular.

Display in a Class by Itself

There is no question that the Badap display makes analyzers costing *three* times the price of this analyzer look like someone's electronic game at the local department store: Clean, clear, sharp, large and able to be calibrated, re-calibrated and annotated at the operator's whim.



What's Negative About Badap?

It's humbling to try to "learn" an analyzer with such a myriad number of possibilities (actually a plus once it's overcome).

The Badap I requires an AC power source (not battery operated) but we'd have to concede that in almost every conceivable case we'd not be willing to swap the display quality for battery operation.

It's heavy, but it is "heavy" in terms of total capability and unmatched today except for analyzers costing up to three times its price.

Self-Calibrating

Here's a feature, so far as we are concerned, that places this unit in a category completely separate from anything else in audio measurements: Completely automatic, computer controlled, constantly repeated during each measurement, precision calibration. The Badap will tell you when it needs a trip back to Crown for adjustment -- our unit seems to be telling us that will be a long time yet, as it calibrates itself in a matter of seconds no matter where we use it, what sort of AC power we feed it, or any of the many variables that have caused electronic dyspeptic in past analyzers.

We are taking our Badap I much more seriously and suggest that those of you seeking a rugged, reliable, versatile, and extremely precise analyzer for the measurement of 1/3-octave amplitudes, RT₆₀, and similar functions do the same.

Priced about \$5,500, we can envision a complete acoustic measurement system embodied in a Badap I and Crown's new dedicated TEF™ analyzer when it becomes available in 1981. When we say "complete" we mean far more complete than any of today's laboratories costing up to \$500,000. That's not just wishful thinking; it's honest fact. Such a turn of events will have unbelievable impact on our industry, literally lifting it out of the expensive "dark ages" of unsatisfactory test spaces into the freedom, accuracy, and potential of Time, Energy, Frequency insights, coupled to the best and most relevant of the traditional tools.

PRAISE FOR PROFESSIONAL MANAGER??

I can personally attest to having upset many a professional manager by exuding enthusiasm for something, yea, anything. If I had defecated on their office rug, I sincerely doubt their faces would have assumed a more disdainful look. So it's with relief and gratitude that I read the following out of "Mechanix Illustrated" sent to us by TED UZZLE.

The auto industry in this country was built by car enthusiasts who were dreamers, artisans, engineers, pitchmen, artists and pirates. They were not necessarily lovable and it's doubtful any one of them ever won a popularity contest. They owned the store, however, and their individual decisions determined whether or not the store stayed open for business; they were lucky and resilient, or they faded away. The successful ones made a great deal of money, but as age thinned their ranks, the reins passed not to a vigorous and equally-dedicated progeny, but to professional managers, men whose principal concerns were to line their pockets and protect their backsides.

Professional managers, as a rule, are involved emotionally only in the profession of management, not in the enterprise they happen to be managing; Harvard Business School-type thinking discourages any such unseemly enthusiasms. So they don't really care what comes out the end of the pipe, just how the numbers dance on a balance sheet. In Motown, such dry detachment is the very antithesis of the business. Thus, when confessed car nut Lee A. Iacocca was named the main man at Chrysler, an executive of the beleaguered company remarked, "Well, at last we've got a guy who likes cars."

What we're saying here is that the auto industry--like just about every other enterprise in this country (including the government)--has allowed itself to become smug, bland and slow-on-the-uptake at the hands of crispy administrators, accountants and lawyers with slide-rule minds. The industry's would-be innovators have been discouraged as rockers of the corporate boat, mavericks best muzzled, defused, or, more simply and directly, shown the door and ultimately the pavement.

Just as a sword in one form or another eventually does in killers, it would be to the advantage of all of us (considering our economy) if the men calling the shots in Detroit really understood that he who lives by the balance sheet is destined to die by the balance sheet.

PICKING A SURVIVAL RETREAT

Last year more than 17,000 people paid \$125 each for a California survival expert's "Personal Survival Newsletter." That's \$2,125,000 per year income for at least one man whose worked out his means of financial survival at least. This "expert" consoled his subscribers to arm to the teeth (over \$10,000 for the suggested arsenal) to have elective surgery on potentially troublesome organs that might cause trouble while you are hidden out in a retreat (i.e. the appendix) and gave them the following list to study before choosing a suitable retreat to await the end of organized civilization.

1. Locate at least 200 miles from any major city.
2. Avoid areas with a population density of more than ten people per square mile.
3. Choose a site at least 20 miles from any major highway.
4. Avoid established farming/ranching areas. *They will be targets for looters.*
5. Avoid resort areas for the same reason.
6. Avoid military bases and nuclear power plants.
7. Avoid presumed nuclear target areas and sites within their fallout patterns.
8. If possible, choose a location with a reasonably mild climate and preferably two growing seasons.
9. Don't rush into the purchase of a retreat.



COLIN BRADBURN, EVERETT STARKENBURG, and MORRIS FOSSE with Don and Carolyn after giving them an excellent book: *VOLCANO: The Eruption of Mount St. Helens* published by Longview Publishing, Longview, WA, and ash samples.

This "expert" along with his victims carefully planned, stocked, and fortified their retreats guided by the above criteria. Where did they end up? You guessed it:

East of Mount St. Helens!

We no longer hear this expert's "advice" as he is in the midst of coping with what *his* fears sowed. He no longer is published in the national magazine that supported him for the past 4 years, and we suspect lawyers are having a field day.

We were pleased to receive a marvelous book on the eruption of Mount St. Helens as well as dust samples of the two major explosions to date from COLIN BRADBURN, MORRIS FOSSE, and EVERTT STARKENBURG in the July class. We were further fascinated to discover that all those California residents who fled to the Northwest to be as far

from nuclear contamination as possible are now assured by the government that the entire molten core of Mother Earth is a nuclear furnace and that Mount St. Helens is one of its chimneys.

Among the most pathetic manifestations are those citizens who expect the government to "do something" about Mount St. Helens -- perhaps a volcano licensing law.

ERRATA

A bit late getting the information to you, but you need to correct Volume 6, No. 17 Tech Topic, page 3, the Δ_{125} ... formula left out π . When properly placed, it reads

$$\frac{5}{4\pi(125)}$$

Page 4 of the same -- instructions for the HP 21, line 8 (following π) add:

PRESS
4

DISPLAY
4

This makes the answer come out correctly.

NEW WORKSHEET

Carolyn, GLEN BALLOU, KEN WAHRENBROCK, and GINA and FARREL BECKER have spent a great deal of their time refining and improving the Syn-Aud-Con Sound System Design Worksheet.

As a result, we now have two documents - one an instruction manual for using the worksheet; the second a new easier-to-use professional worksheet suitable for use right in front of your client should you choose to do so.

It is our belief that this improved worksheet is a splendid starting point for a greatly improved HP41C program (using 4 memory modules) wherein N, M_e , M_a , and other variables can now be included. There should be branches for reverberant, semi-reverberant, and essentially anechoic rooms wherein the classical reverberation equations are used for reverberant spaces, the Peutz modified equations are used for the semi-reverberant, and the combinational equations for early sound field in the essentially anechoic rooms.

We'll look forward with great interest to any programming stimulated by these new worksheets as flow diagrams.

You may order the worksheet and instruction manual separately and in quantity at 50¢ each. Add \$1.00 for postage.

WHEN NOT TO MAKE REVERBERATION MEASUREMENTS

The use of the term "Reverberation Time" is nearly ubiquitous today among recording studio designers. It seems almost everyone is familiar with the definition of reverberation time as

"The reverberation time of a room is the time, in seconds, that would be required for the mean squared sound pressure level therein, originally in a steady state, to decrease 60 dB after the source is stopped." From the "Handbook of Noise Measurement," by Peterson and Gross, GenRad.

A basic requirement of this measurement that is almost universally overlooked in the overwhelming enthusiasm for making measurements is that you are supposed to be measuring *the time it takes the diffuse far reverberant sound field to decay*. By this is meant that there is sufficient reflected energy *mixing* in the enclosure, wherein the measurements are being made, that they:

1. Add to the *total sound field*, L_T , a measurable increase in level at some distance, D_X .
2. That this reverberant sound field level, L_R , is greater than the ambient noise level, L_{AMB} , present in the enclosure.

This means that the intention of the measurement is that *you measure* the level change with time of L_R . This, of course, means that you first move far enough from the sound source so as to minimize the influence of the direct sound level, L_D .

CAUSE AND EFFECT IN THE REVERBERANT SOUND FIELD

L_R is dependent upon the total acoustic power, L_W , of the source used and the total acoustic absorption, S_a , of the room boundaries and furnishings. The directivity factor of the loudspeaker, Q , does not enter in except in the limiting case wherein the restriction of the sources output is such that it falls entirely into an area of infinite absorption. We can write that:

$$L_D = L_W + 10 \text{ LOG} \left(\frac{Q}{4\pi(D_X)^2} \right) + 10.5^*$$

and:
$$L_R = L_W + 10 \text{ LOG} \left(\frac{4}{S_a} \right) + 10.5^*$$

This combines into the textbook Hopkins-Stryker equation

$$L_T = L_W + 10 \text{ LOG} \left(\frac{Q}{4\pi(D_X)^2} + \frac{4}{S_a} \right) + 10.5^*$$

* D_X in ft and S_a in ft^2 L_W ref to 10^{-12} watt

As we learn in Syn-Aud-Con classes, this equation predicts a reverberant sound field beyond a point known as critical distance, D_C , derived from the above equation,

$$D_C = .141\sqrt{QS_a}$$

We further learn that as S_a is substantially increased significant deviations from the expected level beyond D_C occur. V. M. A. Peutz has filled this void with his ΔdB equation

$$\Delta\text{dB} = \frac{.221 \sqrt{V}}{h \cdot RT_{60}}$$

SYNERGETIC AUDIO CONCEPTS

Reverberation Measurements, cont.

We have had the theoretical means to sense the difficulty for many years.

MEASUREMENTS IN ROOMS WHERE THE $\Delta dB \geq 6$ dB

It has been common experience that small studios and control rooms did not depart from inverse square law level changes when 1/3 octave bands of noise were used as source material. This observation was largely ignored by the few that took the trouble to measure it and assigned to "the room is sure dead," etc., type of comments.

Observe the energy time curve, ETC, measurements made in a standard control room. The only two reflections of any significance whatsoever occur in the early sound field and there is no late or reverberant sound field present.

If we were to assume for the sake of this example that the $L_D = 90$ dB, then reflection No. 1 is

$$(90-18) = 72 \text{ dB}$$

and reflection No. 2 is

$$(90-19) = 71 \text{ dB}$$

Their effect on L_T becomes

$$L_T = 10 \text{ LOG} \left\{ 10^{\left(\frac{L_D}{10}\right)} + 10^{\left(\frac{L_{R1}}{10}\right)} + 10^{\left(\frac{L_{R2}}{10}\right)} \right\}$$

or

$$L_T = 10 \text{ LOG} \left\{ 10^{\left(\frac{90}{10}\right)} + 10^{\left(\frac{72}{10}\right)} + 10^{\left(\frac{71}{10}\right)} \right\} = 90.12 \text{ dB}$$

Thus, at the measuring point (the mixing engineer's head position) the *only* reflections with any significant level whatsoever contribute approximately 0.12 dB to L_T .

Therefore, we are not guessing or making theoretical assumptions when we say that in most of these rooms the measurement of reverberation *time* is a totally meaningless exercise, when a reverberant sound field in a meaningful measurable sense does not exist.

IF NOT REVERBERATION TIME, WHAT?

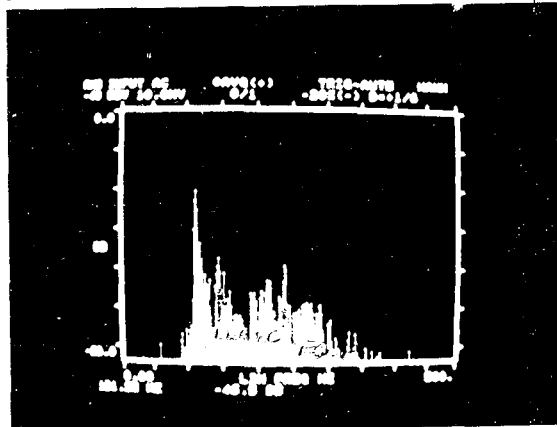
First of all, let's stress that RT_{60} measurements are valid in "live" rooms (very roughly, rooms with ΔdB 's of 5 or less).

What, then, is the secret of a well-designed, small, well-damped room?

- No. 1: $L_D \geq 20$ dB above L_R
- No. 2: L_{R1} from $L_D \geq 10$ msec < 25 msec
- No. 3: $L_{R2}, 3, 4,$ etc., spaced at 5 to 10 msec intervals and at levels less than L_{R1}
- No. 4: Elimination of comb filters in L_D and prior to combinational possibilities of $L_{R1}, 2, 3,$ etc.

Rooms that satisfy the "secrets" listed above are considered in subjective terms as "clean," "able to hear the sound of the studio," "colorless," and other similar terms that remind us that the design problem is not and never has been a need to know relative levels but a need to understand and manipulate critical temporal relationships fundamental to the aural judgment of acoustic environments.

ETC OF CONTROL ROOM TDS SWP = 10 KHZ/SEC



FST = 50 MSEC CONSOLE COVERED

PZM COGITATIONS

BRUCE JACOBS has shared the results of his TDS-EFC measurements of the effect of a PZM™ small plate microphone when used away from a large boundary so that the small plate is the only effective boundary.

We'd be interested in any comments, experiences, or other measurements those of you using PZM's might have. Bruce's photography certainly makes the task of reading the data easy.

"I am ready to answer one of the questions that I raised in my last letter regarding the PZM's. The question I refer to was the one regarding the effect of plate edge-to-mike distance on the frequency response. I have included an explanation of what is happening which you might include in one of your publications. I feel the concept is quite important for all PZM users to understand. What happens to a PZM is directly analogous to what the edges of a loudspeaker cabinet do to the response of mid and high frequency drivers.

"Eric Rudd first questioned the advisability of placing a PZM equidistant from the edges of a small plate. He had read work of Harry Olson in the 1969 Volume 17 No. 1 edition of the JAES, pages 22-29. Olson had studied and measured the effect of cabinet edge reflections for several different cabinet shapes. He found the circular plate to be the worst, with 10 dB variations in frequency response. The sphere seemed to be the best alternative to the infinite baffle.

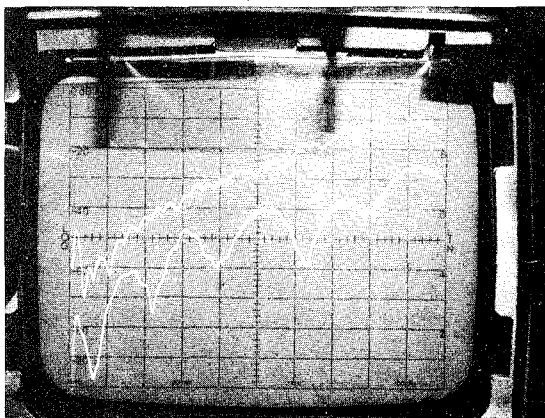
"I decided to measure the effect of the circular plate on the PZM response to hopefully verify that the resulting frequency response is the same as that measured by Olson.

"I did not want my source of sound to have response irregularities like those I was looking for in the PZM/plate, so I used a dynamic mike as a loudspeaker. This is almost a 'point source' and has no cabinet whose edges might alter the response. Unfortunately, a dynamic cardioid mike driven with a constant voltage does not have flat frequency response. Its response is, however, a fairly uniform rising curve. When looking at the pictures below, simply compare the PZM/plate response to that of the calibrated microphone on top.

"The round plate used was a recording of the Polk County Bicentennial Celebration. I felt it only appropriate, since I engineered the recording and find it to be one of my least treasured recordings, due to the nature of the performance.

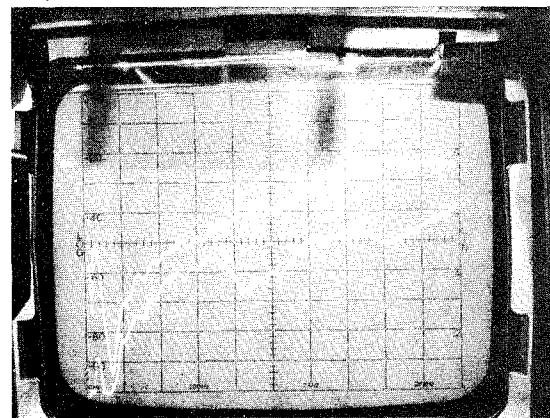
"The PZM/plate was placed 3 ft. from the source and directly on the axis of the source. The angle of the plate was adjusted to place the source directly on the axis of the PZM/plate. TDS was used to measure the frequency response with a 3 ft. window so that both the direct sound and the edge reflections would be well within the window. The location of the window was adjusted to put the two signals in the center. The absence of undesirable room boundary reflections was verified. The TDS was set for 0-10 kHz sweep. The vertical scale was 5 dB/major div. (I have modified the 1 dB/div. scale for 5 dB/.)

5dB/div 10kHz/1s, .1s/div 30Hz



Picture #1

5dB/div 10kHz → .1s/div 30Hz



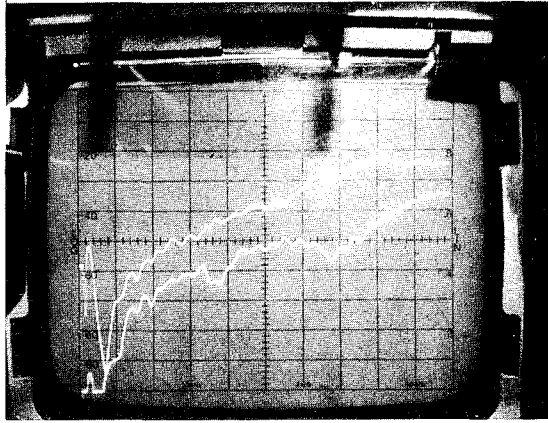
Picture #2

"Picture #1 shows the response of source+reference mic. on the top trace and the response of source+PZM/plate on axis on the lower trace. Notice the severe dips in response of 8-10 dB every 2 kHz. The wavelength at 2 kHz is 6.8 inches, close to the 5.9" radius of a 12" LP. I account for this difference two ways; partially in the frequency shift of the TDS set-up, and partially in the distance differential between source-to-PZM and source-to-edge distances due to the close proximity of my source to the PZM/plate.

"Picture #2 shows the response of the system 45° off the axis of the PZM/plate. Notice that the irregularities are smeared, shifted in frequency, and reduced in amplitude.

PZM...Bruce Jacobs

5db/dv ← 10/Hz → .1s/dv 30Hz



PZM on 24x28 Plate

"Picture #3 shows the system response with the PZM instead on the center of a 24" X 28" plate.

"To show what is happening, I have drawn a grid below with the lines spaced at a distance equal to 1/4 wave-length. I made the distance from PZM to edge equal to 1/2 wavelength, a ratio at which a boost in response was measured. (See Picture #1 at 1-1.5 kHz.) On each intersect, I have placed either a "+" if the pressure is at its peak above atmospheric, a "-" if the pressure is at the peak pressure below atmospheric, or a "o" if the pressure is equal to atmospheric. The wave is travelling down towards the plate from some source miles away. To save space on the page, I have not shown the right half of the wave and plate. Each succeeding figure below is later in time by 1/4 the period of the wave.

Picture #3

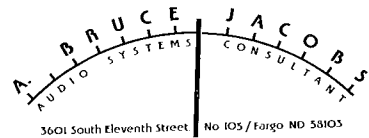
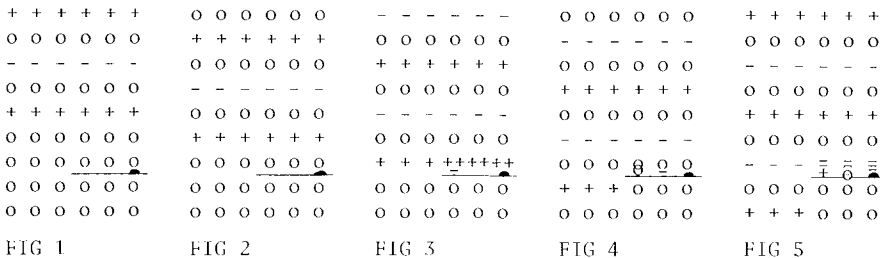
instead, the pressure builds to twice the normal peak pressure. This not only makes the PZM read 6 dB hotter, but also sets a new wave in motion back to the source. For sake of clarity, we will not show this wave superimposed on the forward wave. If you do, you will see what creates a standing wave.

"Notice that in Figure 3 that at the edge of the wall, there is a single plus with a double plus right next to it. This causes molecules between the two to start moving to the left. This lowers the pressure at the ++ which sets up a negative wave moving to the right. This wave reaches the PZM just as the direct sound minus do. The two add, leading to a pressure even more negative than a double minus. So, when radius r = 1/2 wavelength λ, the response will be higher than that of an infinite baffle.

"If r = λ, the minus sideways wave will reach the PZM just as the direct sound plus, resulting in a drop in response. This series of peaks and dips repeats with dips every f_d (Hz) where:

$$f_d \text{ (Hz)} = \frac{1130(\text{ft/s})}{r(\text{ft/cycle})} \quad r = \text{distance from PZM to edge of plate.}$$

"The results of this experiment suggests that if you must put a PZM on less than a very large boundary, stick with a square or preferably rectangular plate. This shape insures that the value of r varies for different directions. Better yet, mount the PZM slightly off-center. Perhaps a round plate with jagged edges would produce an effect similar to the rectangle."



PASSING PARADE OF POTPOURRI

Mrs. Stockham, wife of the digital recording authority, Dr. Stockham, was overheard remarking to a friend how she felt about her husband and his work: "I worship the air he walks on."

STEIN VAN DER BERG came from South Africa for our August Syn-Aud-Con class. He shared the following metric triumph with us, a 2x4 is ordered: 2"x2"x__m.

OVER 100 SBA SYSTEMS IN USE

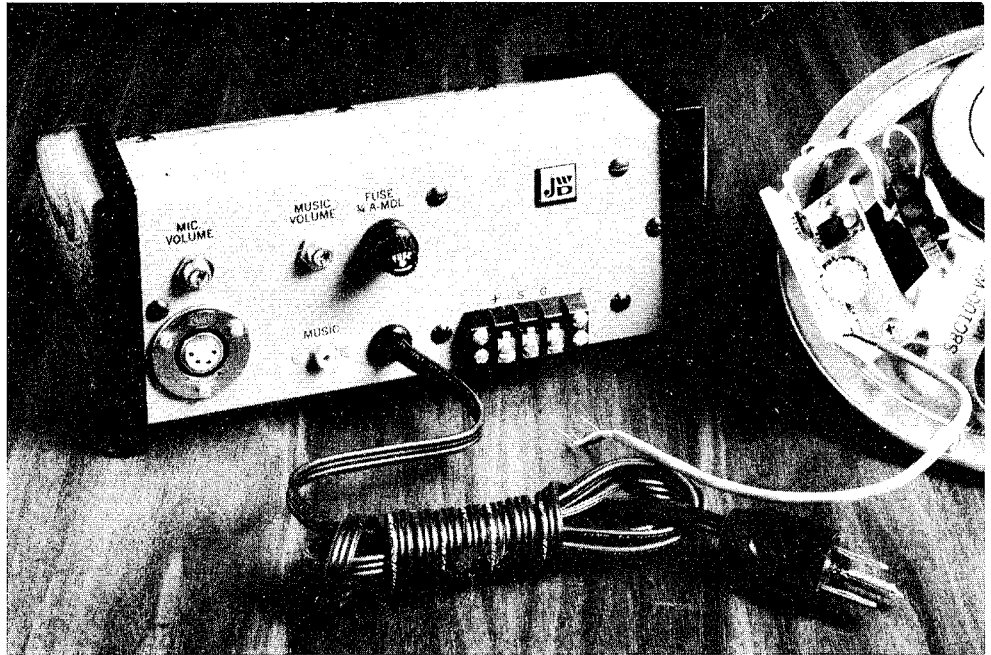
The J. W. Davis Co. reports that over 100 Signal Biasing Amplifiers (SBA) systems are now in operation with more being planned every day.

It is increasingly evident that Syn-Aud-Con has not over-estimated the fundamental importance of SBA to the background music, life safety, low-level paging industries.

Richard Heyser's SBA "much more quality" for "much less cost" and complexity is the very "productivity" the business magazines are so concerned about in American business.

SBA is a vastly superior *American* audio system that allows you to completely outperform any competitor not only price-wise but solidly quality-wise.

SBA contains the very essence of what the original HP35 had when it destroyed the Japanese hold on hand calculators. SBA does far more with far less in a price conscious segment of the audio industry. It is easier to service, install and adjust. It keeps your dollars at home and frees you from having to swear fealty to an Audio Shogun.



Peter Drucker defines productivity in his new book, *Managing in Turbulent Times*, Harper and Row, as:

- A. Doing more with less (SBA)
- B. Innovation (sloughing off the old)
- C. Increased commitment on the part of all workers
- D. Avoiding major mistakes, among which can be aligning yourself with the wrong foreign supplier

To have even the slightest chance of earning the *cost* of staying in business, which is never *less* than the current cost of capital, you must increase productivity above that of the people you compete with. SBA qualifies on all four points. That's why we're so excited about the SBA.

The J. W. Davis Co., P O Box 26177. Ph 214-651-7341.

SOUND CONTRACTOR'S TRADE ASSOC.

TERRY HOFFMAN of Johnson Controls is one of the principals involved in forming a sound contractors association. We have had years of association with most of the people on the Steering Committee and know that an organization that they are involved in has the highest motives and that the organization has a good chance of accomplishing the goals set forth.

We are reproducing the Press Release sent to us by Terry.

**NEW NATIONAL TRADE ASSOCIATION FOR
SOUND AND ELECTRONICS SYSTEMS CONTRACTORS ANNOUNCED**

The formation of a new trade association, for sound contractors and electronics systems contractors, has been announced by Robert F. Ancha, Ancha Electronics, Elk Grove Village, IL, the group's President pro tem.

To be known as the National Sound and Communications Association, the new group is being formed to provide a vehicle for evaluation, analysis, communication, and exchange of ideas on matters of common interest to sound and electronics systems contractors; to conduct marketing conferences for such contractors; and to engage in other activities to foster better business practices for sound and electronics systems contractors.

Pro tem officers and directors of the new association serving with Ancha also include Ed Knight, Industrial Communications Company, Oak Park, Michigan, Vice President; TERRY W. HOFFMAN, Johnson Controls Inc., Milwaukee, Wisconsin, treasurer; and directors Harold B. Lander, Signal Communications, Inc., Seattle, Washington; Arthur C. Smith, Sound and Inter-Com Systems, Inc., Phoenix, Arizona; SAM BRIDGES, Electronic Design Company, St. Paul, Minnesota; and GARY E. VENABLE, B&H Electronic Systems, Kansas City, Missouri.

Continued

Sound Contractors....cont.

The formation of the association is an outgrowth of the First National Sound and Communications Conference, held in May in Las Vegas in conjunction with the Electronic Distribution Show. The new association is expected to be involved in the planning for the second National Sound and Communications Conference, to be held next May in Atlanta, Georgia.

An industry mailing will soon be made soliciting memberships from eligible companies. Dues for each member company for the next year have been set at \$10 per employee, with a minimum of \$100 per company and a maximum of \$200. Eligible companies are those which sell and install sound and communications equipment and electronics systems as part of the regular course of their business. In addition to public address, intercom, and related sound systems, the association also hopes to attract installers of telephone interconnect equipment, burglar and fire alarm systems, CCTV and security systems, Mr. Ancha said.

Manufacturers and sales representatives are not eligible for membership in the association, but may contribute financially to the association and be designated as contributing sponsors.

Further information about the new association is available from Mr. Ancha at Ancha Electronics, 189 Gordon Street, Elk Grove Village, IL 60006, 312-437-7712, or from the association offices at 222 S. Riverside Plaza, Suite 1606, Chicago, IL 60606; Telephone (312) 648-1140.

EXPOSURE OF INJUSTICE

Peter Drucker defines one meaning of the word "paranoid" as "a group that refuses to admit that it could possibly be wrong or could possibly use the wrong means to its end. If the results are not what it expected, that is only additional proof of the powers of evil. It is never taken as an indication that the group might have been wrong."

Drucker goes on to say

"The rest of us are sane precisely because we know that the world *is complex* and that there is no one ultimate value, except perhaps one that is not of this world."

We are dedicating this Newsletter to the discussion of a series of events that could best be categorized under the *New* Golden Rule -- "He who has the gold makes the rules."

The attack on CHIPS DAVIS' LEDE™ control rooms by the "old school" without regard for the already published facts; the treatment of Dr. Diamond by the *AES Journal* (perhaps due to commercial interests threatened by his work); and the double standard of the same *Journal* with regard to an MIT professor's borrowing are all items we'd like to expose to fresh air and daylight's purifying influence.

New ideas that possess merit frequently are viewed as threatening by individuals using "cook book" technology minus the ability to reason from basic premises, to relevant measurement, to enlightened understanding. If, indeed, the "cook book" viewpoint has a basis in fundamental error and has been financially successful, the investigator who uncovers the error can expect to be attacked from many quarters.

We normally enjoy the give-and-take associated with such attacks and, as we have gained experience, we have discovered that they usually come from the same group of individuals who are characterized by:

1. Rejecting as absurd any new idea from us.
2. Fight it with innuendo and indirect editorial efforts.
3. When it is fully accepted, they explain that they were part of its discovery.

Normally, they provide some humor and continue on their own sterile technical pursuits.

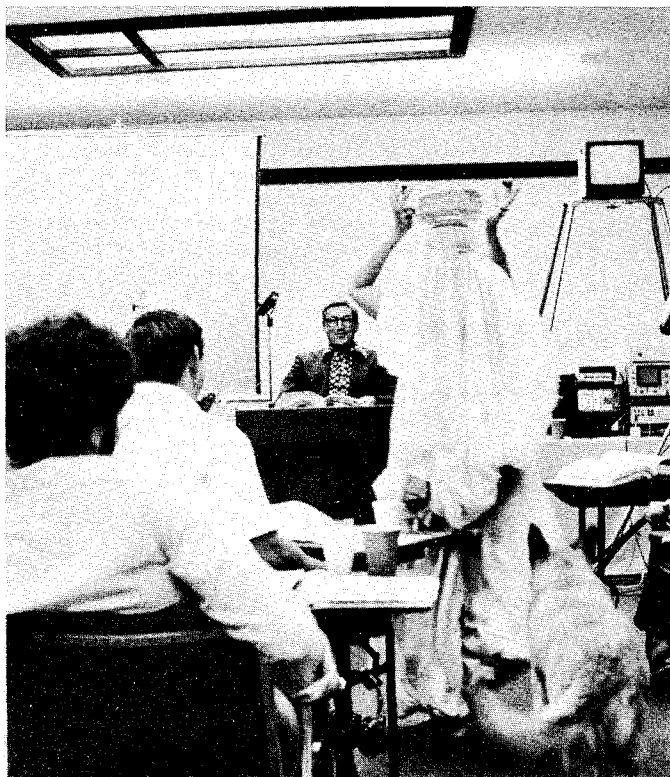
We are not so amused, however, when an editor of an industry magazine takes an article by us and *alters* one illustration and removes another *key* illustration. Coincident with this, another editor solicits an attack on LEDE™ by a senior technical writer who, fortunately or unfortunately, doesn't know a thing about the theory he is asked to attack and calls me on the telephone for suggestions.

Neither Syn-Aud-Con nor CHIPS DAVIS represent advertising revenue to magazines serving the recording industry. Those being threatened by LEDE™, which includes not only studio designers and builders but several equipment manufacturers as well, spend a great deal of money with these periodicals. Syn-Aud-Con is content to rely upon its graduates to help keep the record straight.

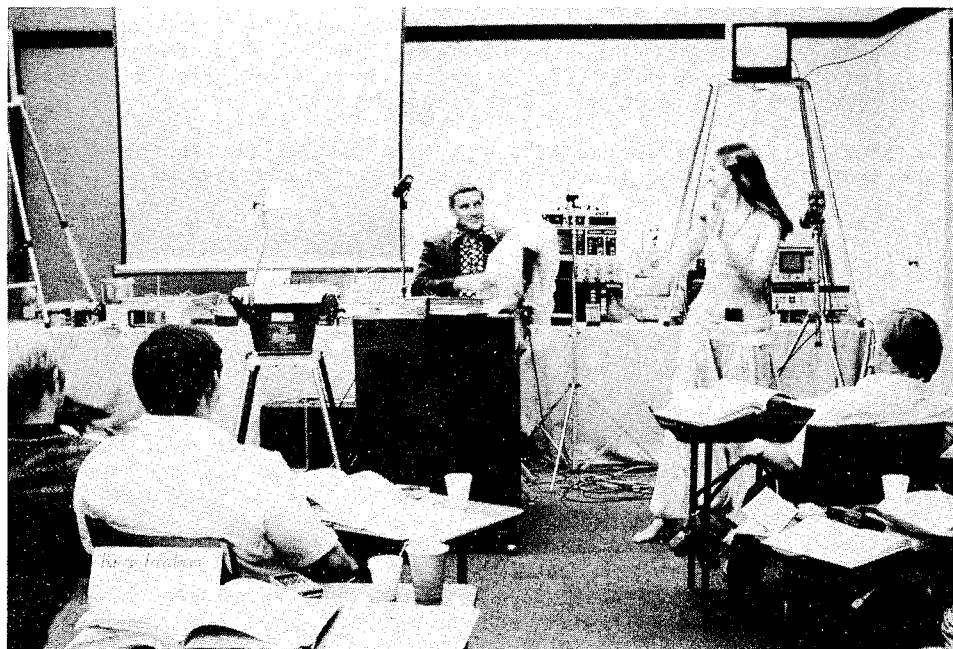
Finally, we'll point out again that Syn-Aud-Con has *given* the LEDE™ concept to the industry and asks only that rooms using the term meet the criteria. Time will handle the rest.

MEASURING AMPLITUDE AND RATE OF A BELLY DANCERS POSTERIOR

On the second afternoon of the August class, KEN WAHRENBROCK suddenly came into the rear of the room, went to his tape cassette player, hurriedly slammed in a tape, and turned it up to a loud volume right in the middle of an abstruse portion of how to obtain "good coverage."

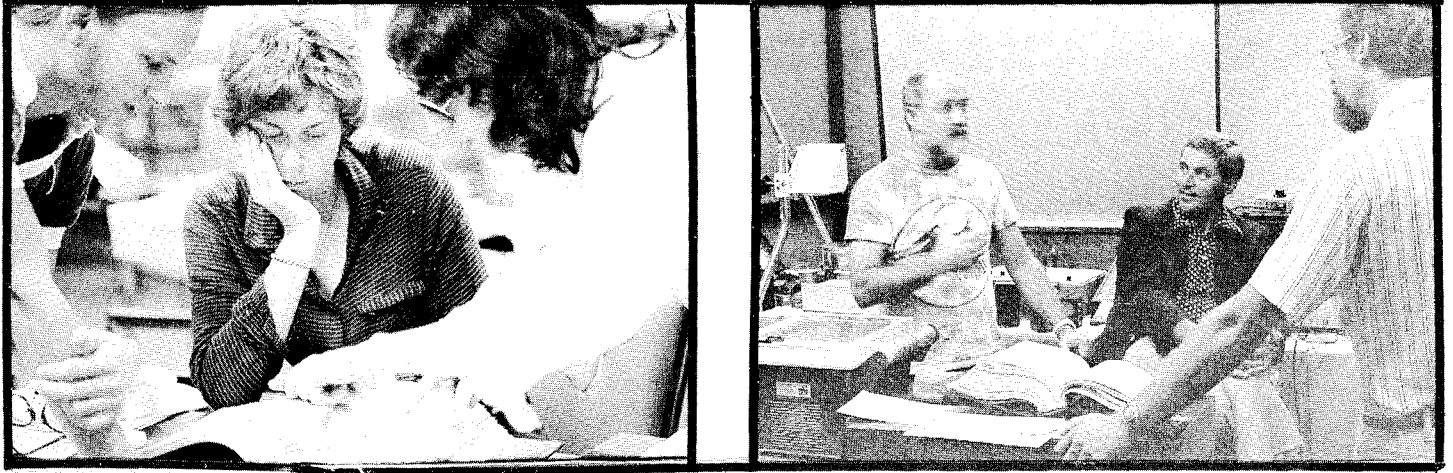
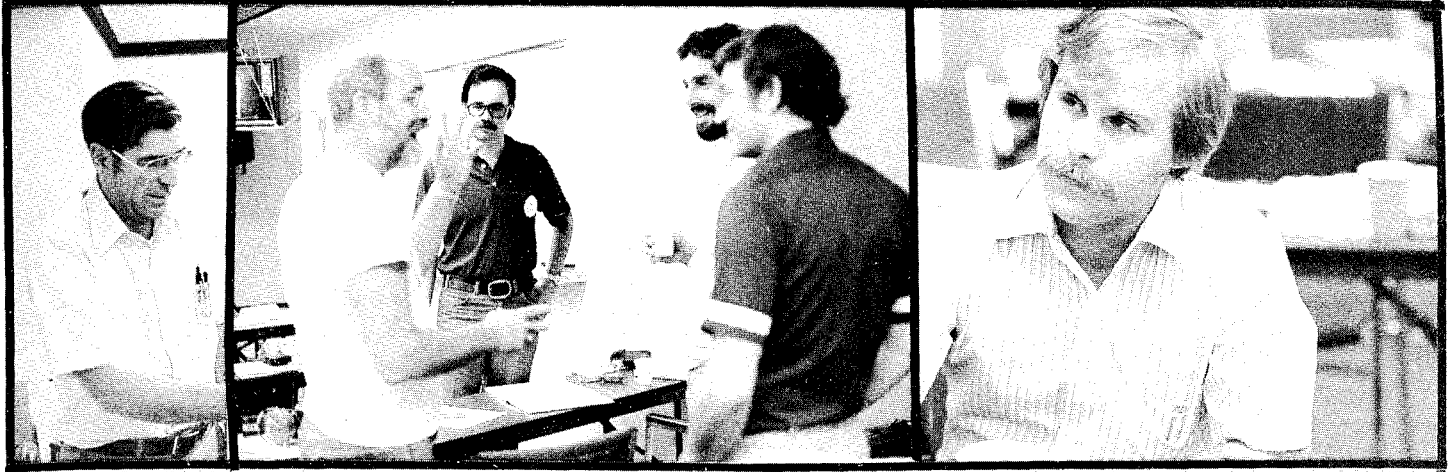


Before I could even open my mouth to ask what was going on, I next saw a bare arm held ahead of a swaying body and up the center aisle came SANDI WAHRENBROCK (Ken's youngest daughter) dressed in her belly dancer's costume and carrying a chocolate cake on her head. (Notice that Judy, our German Shephard, thinks this ought to be checked out too.)



Sandi proceeded to take off six of the seven veils and do a first class belly dance. (The degree of quality was determined, so I'm told, by the depth of the red color in my face.) The small black object at her waist was a solar powered calculator she then presented to me for my 52nd birthday. One lesson learned from all of this is that when Sandi shows up to assist Ken at Syn-Aud-Con classes, I'm going to quit introducing her as a belly dancer.

AUGUST CLASS AT DANA POINT, CA



CALCULATING RESONANT FREQUENCIES

BILL KESSLER, Kessler Assoc. of Gainesville, FL, is a successful professional engineer with a devoted interest in audio engineering.

The use, if not the understanding of the resonant properties of jugs, bottles, and similar containers dates back to Greek amphitheaters in the 300 to 400 BC era. These resonant absorbers can be made considerably broader band by adding a resonance damping material into the neck, or, to a lesser extent, into the cavity.

Usually, since the opening is small and the unit has a high Q (resonant Q, not directivity Q) factor there is very little damping without adding material. Consequently, the resonance peak is very sharp and narrow and falls off rapidly on each side of the resonance frequency. When damping material is used to broaden the bandwidth, the absorption at the peak frequency is lessened as well.

The equation most in use today is

$$f_r = \frac{C}{2\pi} \sqrt{\frac{S}{(L+1.7r)V}}$$

Where: f_r is the resonance frequency in Hz
 C is the velocity of sound in m/sec (344.42 m/sec)
 S is the surface area of the neck or port in m^2
 L is the length of the neck or port in m
 r is the radius of the neck or port in m (treat rectangular openings as equivalent circular areas and solve for r)
 V is the volume of the cavity in m^3

Converting Bill's data into the metric system yields

$$f_r = \frac{344.42}{2\pi} \sqrt{\frac{.00051}{(.1016+1.7(.01274)).0083}} = 122.39\text{Hz}$$

This is in excellent agreement with his measured and calculated values for the same bottle

$$F_0 = \frac{2126\sqrt{.79}}{\sqrt{50.85(4+.5(\sqrt{11.79}))}} = 121.1\text{ Hz}$$

Since Bill's equation is set up for English measurements (which incidentally are a lot easier to handle than meters for objects as small as bottle resonators) we are delighted to have his input.

We are reproducing his letter in toto as we feel the serendipities expressed reveal the true joy of asking yourself, "What's really going on here?"

Recently I had a need to calculate the frequency of a Helmholtz resonator. Years ago when I used to build large critically-damped vented speaker enclosures which appeared to be reasonably free of the well-known "boom box" characteristic of many bass reflex enclosures, I was using an equation of unknown genesis which appeared to be reasonably accurate. Not being able to locate the equation immediately, I began searching my limited home library and was able to locate only one equation for the Helmholtz resonator which appeared on page 123 of *Acoustical Designing in Architecture* by Knudsen & Harris. The equation given by Knudsen and Harris is as follows:

$$F_0 = 2160 \frac{A}{\sqrt{vV}} \quad (1)$$

Where A is the port area
 v is the duct volume
 V is the total volume
 all in inch units

The above equation was modified as follows:

$$F_0 = \frac{2160\sqrt{A}}{\sqrt{VD}} \quad (2)$$

Where A and V are as before; and,
 D is the depth of the duct.

The application of the above formula did not seem to yield results consistent with some previous calculations made a number of years earlier. Therefore, I continued searching my files and finally located the original Helmholtz resonance equation which is given below:

$$F_0 = \frac{2126\sqrt{A}}{\sqrt{V(D+\frac{1}{2}\sqrt{\pi A})}} \quad (3)$$

A comparison of equation (3) with the modified Knudsen & Harris equation shown as (2) above reveals that equation (3) contains what appears to be a correction term $1/2\sqrt{\pi A}$ added to the duct depth D .

In an effort to establish which equation was the correct one, I decided to resort to an experimental procedure. This procedure consisted of blowing across the opening of a bottle with a short neck to excite the primary resonant mode and establishing the frequency of the "bottle tone" with the help of an electronic organ. The bottle used in the experiment happened to be Windsor Canadian fifth with about 6 ounces of the contents remaining. Now if I had been really smart, I would have consumed the contents with a suitable mixer and forgotten the whole thing! Unfortunately, I prefer to get my kicks pursuing something I don't understand, which is an affliction which pretty well keeps me out of mischief!

RESONANT FREQUENCIES, cont.

Blowing lightly across the opening of the empty Windsor Canadian bottle produced a tone which was readily matched with B natural, one half tone below C, one octave below middle C on the electronic organ. This corresponds to a pitch of 120.75 Hz. The next step was to measure the pertinent dimensions of the bottle, calculate the area of the bottle opening and the bottle volume and substitute the values into both equations to determine which calculation agrees more closely with the experimental results.

Measurements of the bottle yielded the following values:

Neck opening area	.79 sq. inches
Neck length	4 inches
Bottle volume	50.85 cu inches

Substituting the above values into both equations yielded the following results:

Equation (1) (Kundsen & Harris):	134.6 Hz
Equation (2) (with 1/2 A term):	121.1 Hz

The calculated resonant frequency of 121.1 Hz yielded by Equation (2) is in close agreement with the experimental result which yielded 120.75 Hz. Consequently, I am tempted to conclude that the equation which includes the $1/2\sqrt{\pi A}$ term is probably the more correct one.

This letter is written on the assumption that you and perhaps some of your alumni may find my experience of some interest, and could guide me to some references which deal more completely with the theory of Helmholtz resonators or the origin of the equation which includes the $1/2\sqrt{\pi A}$ duct depth correction term. It is, of course, possible that the close agreement provided by the equation (3) with the experimental results described can be attributed largely to the particular shape of the bottle used. Your comments and those of your alumni would be appreciated.

Best regards,

W. J. Kessler, P.E.

EDITOR'S NOTE: Send your comments to Syn-Aud-Con and we will share them in the Newsletter as well as sending them on to Bill Kessler.

TRIANGULAR BAFFLE SOLUTION

Lee Irvine, Acoustical Engineers, Inc., Salt Lake City, Utah, is one of the senior acoustic consultants in the United States. He felt he couldn't leave our triangular corner baffle solution unresolved and submitted the following thorough and quick solutions. Just more evidence of the wealth of talent friendly to Syn-Aud-Con.

Solution No. 1

Vol = 1/3 Area of Base x Height 1/3 BH
 Face of pyramid is the baffle = Base
 Area of Base = 1/2 S H Side of baffle and height of triangle

$$H = \sqrt{S^2 - \left(\frac{S^2}{2^2}\right)} = \frac{\sqrt{3}S}{2}$$

$$\text{Area of Base} = 1/2 S \times 1/2 \sqrt{3} S = 1/4 \sqrt{3} S^2 = .4330127 S^2$$

H = height of pyramid from center of face to wall/wall/ceiling

In a plane bisecting face and intersecting top of pyramid --

$$H = \sqrt{c^2 - b^2}$$

c = length of intersection of wall/ceiling from top of pyramid to intersection of face.

$$= \frac{S}{\sqrt{2}} = .707107 S$$

b = side of triangle in plane of face

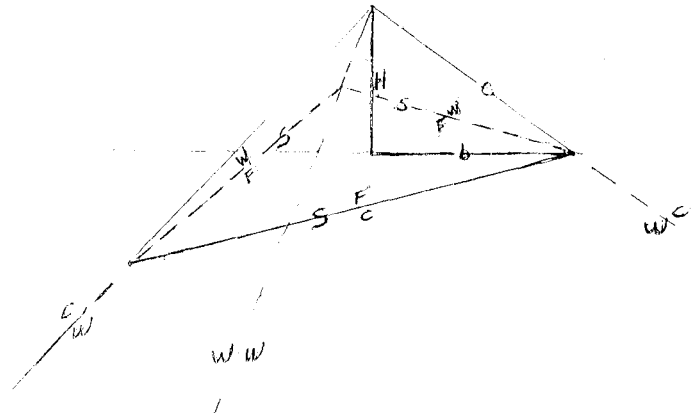
$$= 1/2 S \left(\frac{1}{\cos 30^\circ}\right) = .57735 S$$

$$H = \sqrt{(.707107 S)^2 - (.57735 S)^2} = .408249 S$$

$$V = 1/3 \times .4330127 S^2 \times .408249 S = .058925 S^3$$

in ft & ft³
cm & cm³

$$\text{or} = 3.4100 \times 10^{-5} S^3 \text{ in inches \& ft}^3$$



Solution No. 2

Use the face of the pyramid on the ceiling as a base and the height is the wall/wall intersection from the ceiling down to the bottom point of the baffle face.

Then area of the base = $\frac{S^2}{4}$

$$\text{Height} = S \sin 45^\circ \text{ or } S \frac{\sqrt{2}}{2}$$

$$\text{Volume} = \left(\frac{1}{3}\right) \left(\frac{S^2}{4}\right) \left(S \frac{\sqrt{2}}{2}\right) = .058925 S^3$$

in ft/ft³ cm/cm³ etc

$$\text{or in inches and ft}^3 = 3.4100 \times 10^{-5} S^3$$

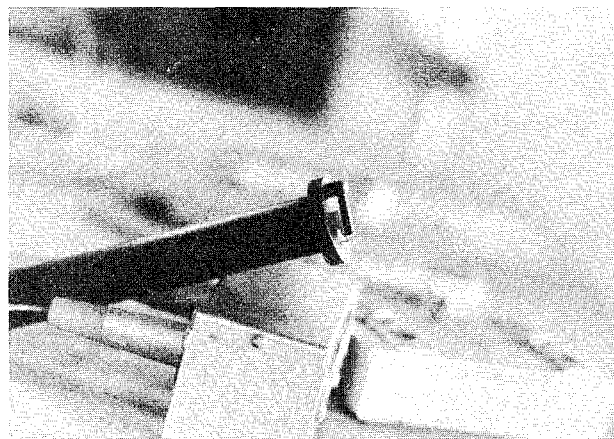
PZM VARIATIONS

KEN WAHRENBROCK's new role with Crown is worth noting by Syn-Aud-Con graduates. Crown International has taken over exclusive rights to the PZMSM microphones under license to Ed Long. Ken now serves as a consultant to Crown on their PZM program as well as operating as a dealer authorized to sell Crown PZM units to Syn-Aud-Con graduates.

In addition to his dual role of consultant-dealer, Ken is also still in the business of building special version PZM's in prototype and limited production versions. A variety of these special units are pictured below.

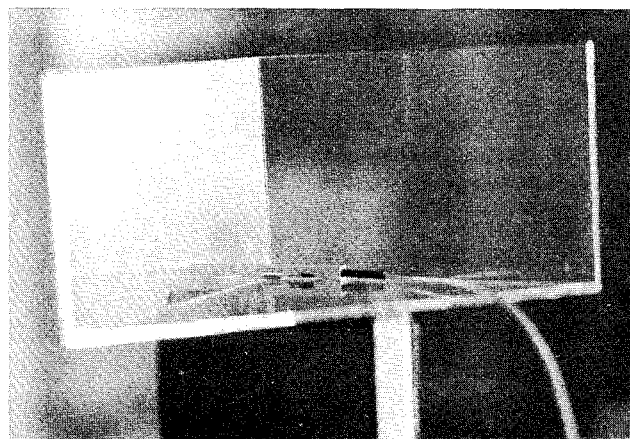
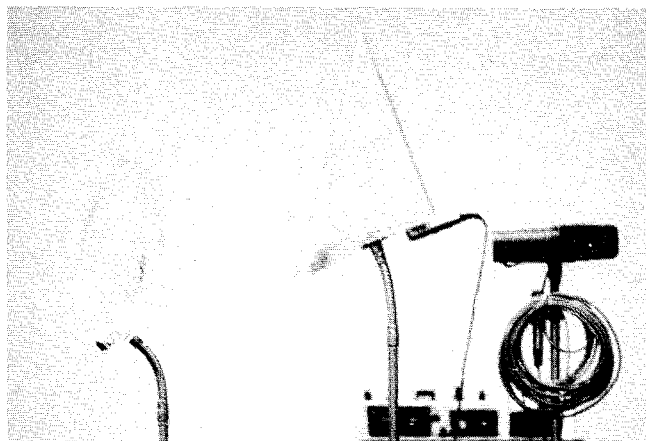


Original prototype



Handheld

The handheld version has a number of unique properties that make it well worth becoming acquainted with it. The special "bubble" units allow interesting directional effects, and the new corner and pyramidal types have immense promise.



As any of these special microphones are adopted by Crown, Ken will cease to produce them. In the meantime, here is your access to the most advanced prototypes in the industry and a chance to discover new techniques in the still pioneering PZM saga.

SOUNDER ELECTRONICS

Hamilton Agnew of Sounder Electronics, Inc., says he will supply the Dymo label for changing the name of their tester to Polarity Tester. He also pointed out an error in our report in the last Newsletter on his very handy tester. The Model 500 consists of *both* the generator and detector which retails for \$495.00 for the set (both units, batteries supplied). The Model 250 was designed primarily for people who have a cassette deck handy. The Model 250 (Detector and Cassette) retails for \$295.00.

Does anyone have a snappy name for the P _____ Checker?

Sounder Electronics plans to exhibit at the New York AES which will provide Syn-Aud-Con graduates a chance to see these units.

Sounder Electronics, Inc., 21 Madrona Street, Mill Valley, CA 94941 (415) 383-5811

SEPTEMBER CLASS AT
DANA POINT, CA



NEW REP FIRM

Where were Reps like this when I had them calling on me? From the calculators on their desk I suspect that they are prepared to do more than look beautiful and provide a hard sell to the customer. Syn-Aud-Con is pleased to extend our congratulations to these young professionals and to wish their enterprise every success.



Eunice Adams and Shelley Brown - Phelan of Sunwest Marketing

Sunwest Marketing is a marketing and sales organization representing professional electronics equipment manufacturers to commercial sound contractors and professional audio dealers.

At present, Sunwest Marketing represents three professional audio lines: HM Electronics Inc., Excalibur Industries, and Wireworks Corporation. Negotiations are under way to add a fourth manufacturer by September 1, 1980. Subsequently, one to two lines will be added every four months, thereby allowing adequate time to assimilate each new product line. The ultimate goal of Sunwest Marketing is to represent 8-10 manufacturers by September 1981 with the current personnel.

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EUNICE I. ADAMS

sunwest marketing
PROFESSIONAL ELECTRONICS REPRESENTATIVES

4401 KRAFT AVENUE NO. 2, NORTH HOLLYWOOD, CA 91602
(213) 506-0615

SHELLY BROWN-PHELAN

sunwest marketing
PROFESSIONAL ELECTRONICS REPRESENTATIVES

4401 KRAFT AVENUE NO. 2, NORTH HOLLYWOOD, CA 91602
(213) 506-0615

WOMEN IN AUDIO

MARY GRUSZKA who chaired the first "Women in Audio" session at AES, wrote: "Did you see that picture of our panel in the AES Journal? Pam Peterson (one of the panelists) commented about that one: 'Six women up there, but look who gets named in the caption'."

Its both funny and painful.

EUNICE ADAMS in writing to tell us about the new rep firm she started with Shelley Brown-Phelan said,

Shelley & I were pleased that the Spring AES had offered a session on Women in Audio. We would like to see more sessions offered at future AES conventions. Perhaps, we can form some type of support group and pattern it after the AES Round Table Discussions, held one Sunday each month.

Eventually, when there are more women working in the audio industry, there would be no need for a separate group for women. However, at the present time, it would be most valuable to have a group where we can share resources, educate each other, and learn from our common experiences. Perhaps we can talk more about this the next time we meet.

These words from Eunice touched me deeply. It was that thought that I tried to articulate when I received so much static for planning the Women in Audio session for AES ("That's discrimination. We don't have a Men in Audio session". It was with Don's encouragement that I continued the session. He's used to swimming against the current.) "However, at the present time....."



Women in Audio among topics discussed at 66th. Don Davis (above left) introduces panel.

PRINTABLE PART OF SKEPTICS SCREAM

"First, regarding Dr. Diamond. As I stated in the papers session, I am a skeptic..... A healthy dose of skepticism is a most important part of a true scientific attitude..... You may remember that, after Diamond's presentation, I stated that Diamond had presented religion, not science.

"Most people of scientific bent would not give Diamond and his beliefs more than a passing glance until and unless he presented some hard, cold facts, not speculation. The uproar at the Convention was caused, in part, by the unquestioning acceptance of this unscientific presentation by a large number of yahoos of the type who also believe in pyramid power, Erich von Daniken, 'Vitamin B1?' and other such pseudo- or non-scientific wishful thinking.

"I am now astonished by your challenge in the latest Newsletter to us skeptics to prove Diamond wrong -- this is a complete perversion of the scientific method! It is not up to us to disprove his thesis; it is up to him and his supporters to document and prove it correct."

Syn-Aud-Con attempts, in so far as it is humanly possible, to respect, understand, and enjoy as many diverse opinions as possible. We recognize that, on occasion, a gross technical error, such as time smear in transducers, may indeed be psychologically soothing to some listeners. We do not subscribe to the class of thought that places itself in judgment over the work of others (critics, skeptics, and other class-conscious endeavors).

When a reader writes us accusing us of contempt for this or that individual, he grossly misunderstands our philosophy. We indeed feel contempt for technical errors, ignorant assertions, pontificating without sufficient knowledge, and all the myriad of problems stemming from an inadequate assessment of one's actual abilities. We do not, however, feel, express or in any way intend contempt for the individuals temporarily supporting such errors. They will, in almost every case, after sufficient rationalization rise above the problem and take a different viewpoint. Therefore, Syn-Aud-Con's comments regarding the behavior of those involved in actions unsupported by the necessary tools are always directed at the actions - not the individual.

Most of you will recall the story I tell in classes of the unstable noise generator and how, when we published the data without naming the manufacturer, we received accusatory calls from manufacturers who happened to make a similar unit saying, "How dare you publish data on our generator."

We hope all readers will measure our comments against the criteria of this philosophy and not attempt to personalize them.

DR. DIAMOND, DIGITAL AND "SCIENCE"

In the middle of the Nineteenth Century the Scottish physicist, James Clerk Maxwell, set down four mathematical equations, based on the work of Faraday and his experimental predecessors, relating electrical charges and currents with electric and magnetic fields. The equations exhibited a curious lack of symmetry and this bothered Maxwell. There was something *unaesthetic* about the equations as then known, and to improve the symmetry Maxwell proposed that one of the equations should have an additional term, which he named the displacement current. His argument was *fundamentally* intuitive; there was no experimental evidence for such a current. Thus modified, the Maxwell equations implied the existence of electromagnetic radiation encompassing gamma rays, x-rays, ultraviolet light, visible light, infrared frequencies and radio frequencies.

Many of the most practical applications of science have been made in this serendipitous and unpredictable way.

Einstein in his famous essay, *Physics and Reality*, wrote:

"Physics constitutes a logical system of thought which is in a state of evolution, and whose basis cannot be obtained through distillation by any inductive method from the experiences lived through, but which can only be attained by free invention. The justification (truth content) of the system rests in the proof of usefulness of the resulting theorems on the basis of sense experiences, where the relations of the latter to the former *can only be comprehended intuitively.*" (Italics mine)

Murphy's "line of sight" law, "I'll believe it when I see it," falls out of bed with the real optical image generated by the "illusion" we use in class.

In May, 1980, Dr. Diamond said to the AES Convention, "Here is a demonstration of an effect." A number of attitudes have been adopted.

1. It's up to Dr. Diamond to prove it to the skeptics.
2. It's up to the listener to disprove it.
3. It's up to the listener to defend it.
4. The listener will wait until increased experience and neutral tests confirm or deny either parts, or the whole of the hypothesis the demonstration put forth.

Raymond Thayer Birge, former Chairman of the Department of Physics at the University of California at Berkeley, in one of his last papers wrote:

"Now to me the study of science is, in a sense, a religion. For there can scarcely be anything more marvelous than the structure of nature, nor anything more satisfying than to *aid, even in the smallest way* (italics mine), in the gradual unfolding of the intricacies of our universe. From the beginning of the human race, man has speculated on the wonders of his environment, but there is and can be nothing in even his wildest speculation in any way comparable to the actual facts of nature." (Quoted in *Physics Today*, August, 1980 - Obituaries)

S. Chandrasekhar in his article, "Beauty and the Quest for Beauty in Science," (*Physics Today*, July, 1979) states:

"Perhaps it is in terms of.....overconfidence that one must try to understand the comparative sterility of some great minds. For as Claude Bernard has said, 'Those who have excessive faith in their ideas are not fitted to make discoveries.'"

The Scientist Must Be Humble

When the subject is the human sensitivity to a subliminal influence, the "scientific approach" requires a majority of sincere truth seekers to acquire an unaccustomed humbleness. There are the results of the startling, and ethically difficult to evaluate, experiments reported by the late Dr. Henry K. Beecher of the Harvard Medical School. "Patients suffering from angina pectoris were given *shan* arterial by-pass operations. They were merely cut open and sewn up. But the patients generally *expected* the operation to improve their condition, and, *in fact*, they did as well as patients who were given real by-pass operations."

A true scientific thinker, when presented with a new idea, hypothesis, or even wild assertion, first looks for that with which he can agree with in terms of his memory of what he at that moment still considers reliable data. He temporarily discards any errors detected as a negative state of mind inhibits creative insight. He usually will then turn to the acknowledged scientific literature on the subject and review in depth what others have written on the same or allied subjects. Finally, he will often review discredited sources on the chance that new data might cast a new light on formerly misunderstood hypothesis. Then, and only then, can he begin the experimental investigation of the theory put forth. It is of the utmost importance that before he experiments on his own that he learns to perform the original experiment to the satisfaction of the original experimenter (when available). Subsequent experiments are then usually alive with serendipity, creativity, and discovery.

(cont)

The Sampling Rate Too Low

This writer, while in the process of reviewing the acknowledged scientific literature, came across the following data:

"Our *subconscious* powers of auditory discrimination, however, are amazing. Experiments have shown (Klemm 1919, Hornbostel and Wertheimer 1920) that our cues for sound localization are provided by our perception of binaural *time* differences.....the time difference is only about 1/40th of a millisecond." This is primarily a *reflex motor process*.

(*The Natural Philosophy of Time*, 2nd Edition. G. J. Whitrow, Emeritus Professor of the History and Applications of Mathematics in the University of London and Senior Research Fellow of the Imperial College of Science and Technology - Clarendon Press - Oxford 1980.)

Dr. Diamond's "Deltoid Muscle" test is a test of the "short-circuiting" of the individual's *reflex motor process* by digital recordings. 1/40th of a millisecond is 25 microseconds (usec). Current digital sampling rates run from a low of 45,000 Hz to a high of 65,000 Hz or, in temporal terms, 22 usec to 15 usec. These intervals are right in the center of the temporal intervals *already demonstrated scientifically* as significant in terms of subliminal perception and subsequent human sensitivity.

A most legitimate question at this juncture must be, "Are the present sampling rates an order of magnitude too low in frequency?"

We'd suggest as an interim step the following label be placed on all digital recordings:

W A R N I N G

THIS DIGITAL RECORDING MAY BE
DELETERIOUS TO YOUR DELTOID MUSCLE

After writing the above remarks, we were sent copies of the following correspondence relating to the discussion of this issue in the AES Journal. The AES editor, Dr. Robert Fehr, elected to print Nelson Morgan's letter and refused to print Dr. Diamond's reply.

"A recent talk at the Los Angeles AES conference featured the assertion that digital encoding of music caused stress in listeners. The speaker (Dr. Diamond) performed a demonstration intended to support his claim. While he did provide an interesting show (in which volunteers had their arms pushed down more easily by the speaker during the digitally recorded passages), he failed to use even the most elementary precautions to insure the significance of the results. Specifically, the following deficiencies were noted:

"1) The test was not double, or even singleblind; that is, the experimenter was aware of which was which in his repertoire, and frequently stated out loud the character of each recording.

"2) The demo did not employ selections that were identical except for the factor under test (digitization); pair elements were only chosen to be similar.

"3) The stress criterion used was a highly subjective one, (performed by the experimenter), and one not shown to be correlated with any more conventional measures of stress such as GSR (Galvanic Skin Response) or EEG (Electroencephalograph) measurements.

"The speaker stated that he was aware of the informal nature of his presentation, and that it was only intended to spark interest in a heretofore unexplored area. Unfortunately, this does not excuse a total abandonment of scientific method; an 'informal' test, well publicized, can influence public opinion at least as easily as a stodgy old controlled test. This brings me to the main point of this letter. Due to the pub-

licity and interest this matter had already drawn, I felt it was necessary to do a controlled test. Bart Locanthi of Pioneer Development Labs provided me with a tape of 5 pairs of musical selections. Each pair consisted of one tune that was transferred directly from disc, and one that had been passed through a 16 bit A/D and D/A. Both had been anti-aliased at 18 kHz, so the only differences were due to digital encoding and decoding. The order within each pair was random, and was not revealed to me until I had completed all data collection. Subjects were chosen in pairs, so that one could do the arm pushing and the other be the subject. Additionally, basal skin resistance and GSR were recorded for objective stress measurement. Each 'pushing' subject was questioned after the session, and his comments recorded. While these people had not been specifically trained by Dr. Diamond, they were given his general 'pushing' instructions, and any noticeable change in arm compliance was noted.

"When all the data were recorded and I was told which was which, a standard non-parametric (no assumption of Gaussian distribution) statistical test was performed, namely a sign test. The results showed no correlation between digitization and stress by any of the three measures; typical scores were 8 to 7 or 6 to 7 (the scores being counts of number of instances in which there was more stress for the digital vs more stress for the analog). Additionally, there appeared to be no correlation between the 'pushing' stress measure and the skin resistance tests; it is open to question what such a test really measures.

"I think that there is a lesson for us in this: Scientific method is not a frill or a fetish, it

(continued)

"is a necessary minimum to achieve meaningful results.

"Thanks to Bart Locanthi and his group for their time in preparation of the test tape, to Alan Gevins and Bob Tannehill of the Langley Porter Neuropsychiatric Institute for their assistance with the measurement equipment and advice on the experiment, to Dr. Robert Morgan of

"San Diego State for help with the research design, and finally to Eric Allman of U.C. Berkeley for doing most of the real work.

Nelson Morgan
Electronics Research Laboratory
University of California at Berkeley

"Reply to letter of Mr. Nelson Morgan commenting on 'Human Stress Provoked by Digitalized Recordings' by John Diamond, M.D.

"I presented my demonstration of the stressful effects of digitalized recordings at the AES conference in Los Angeles for only one reason -- my deep love and respect for music. I have been practicing medicine and psychiatry for nearly twenty-five years and have used music as a major part of my practice in stress reduction for most of this time. I found that in my clinical setting the results with my patients in terms of stress reduction were completely different when digitalized recordings of musical material were used instead of the previously-used analog material by the same performers. I found that not only were the patients experiencing no benefit, but their stress was actually increased by the digital process.

"I was told by more than one member of the AES that the manufacturers 'took a bath' with quadrasonic sound and they were going to make very sure that no one 'rocked the boat' with digital because of the millions of dollars involved.

"I had no wish to go to the conference as some David attacking the digital Goliaths, but rather as a concerned lover of music and as a psychiatrist to demonstrate that something may bear investigation. I did not expect to be believed by many, in particular by the manufacturers of the digital equipment, but I thought that if just a few people involved in the industry would take some interest in the work and would cooperate in further research to overcome the problem, this could be a great benefit to the future of music.

"One of the great therapies that we have on this earth is music. Our ninety-odd years of recorded musical heritage is a treasure for all time. I wanted to make sure that this heritage would be preserved in a form that mankind could always use for its benefit. I wanted to demonstrate that we are recording priceless treasures, for example, the music of Yehudi Menuhin, and it is important that in the future we will be able to use them. What a tragedy if later they are judged as useless because of the stress factor which I found was being introduced by the digital recording process!

"I have been a lover of high fidelity for nearly thirty years, and nothing pleases me more than beautiful sound. I want the digital process to work because of its enhancement of the sound quality. The purpose of my presentation was to demonstrate that something was wrong with the present process. I feel this problem can be corrected, and I had offered to cooperate with any company interested in overcoming it, any company with a guiding sense of social responsibility.

"re: the specific points raised in Nelson Morgan's letter

"Prior to the Los Angeles meeting, both I and my chairman tried to obtain from the digital manufacturing companies samples that we could use for demonstration, but all refused. Thus I suspected that my reception would be as I had been warned. This was typical of the 'cooperation' I had encountered with the manufacturers of digital equipment.

"Morgan is quite correct when he states that my demonstration did not include double blinds or even single blinds. Of course it didn't. It was a twenty-minute demonstration. Double blind experiments had been conducted on over 200 subjects prior to my demonstration. A lecture demonstration is not the time to conduct new research, it is a time to present the results of that research. This I did.

"I would have preferred to use better selections of material but, as previously stated, the companies refused to provide them. Even a small manufacturer of digital recordings, from whom I have purchased many thousands of dollars worth of equipment over the years, became mysteriously 'unavailable' when I asked him to cooperate in providing me with digital test material. However, some of the material was identical -- in particular, the early Caruso and McCormack recordings in two formats, those that had been on analog transfer to LP and those that had been subjected to the Soundstream process.

"Now to the test itself.

"The demonstration consisted in the precise and accurate testing in a particular fashion of a specific muscle. I and many of my colleagues have demonstrated that when an analog recording is played the muscle will test strong, but when the digital recording is played, it will not.

(continued)

SYNERGETIC AUDIO CONCEPTS

Dr. Diamond, Continued

"This test, performed for other factors, has been used for over twenty years. It is employed by approximately 100,000 members of the healing professions around the world. And it has been performed now by possibly a million members of the lay public. There is nothing new about this test. It has been validated and standardized over years and years of clinical practice. What I demonstrated at the convention, as I have found on many hundreds of occasions, and as have my professional colleagues who have cooperated with me in this testing, is that every member of the audience who was tested was easily able to overcome the test pressure when an analog recording was played, but when a digital version was played they could not. As a practicing psychiatrist, I regard this as an indication of incapacitating stress.

"I pointed out at the meeting that this test was different to other tests and was much more accurate and much more valuable. I have previously found that Galvanic Skin Responses do not achieve the same result, nor do EEG measurements. I know that. That is the reason I presented the test that I did, because this specific test does show a difference. To criticize my work as Morgan does, because GSR and EEG results do not correlate, is beside the point. These are not the correct tests to use. The correct test to validate the findings is the one that I presented.

"Was this test really validated by Mr. Morgan? I first heard that Mr. Locanthi of Pioneer Development Labs was funding research to 'prove me wrong' so that I could 'be buried' (this was related to me by an AES member). So I contacted Mr. Locanthi, as I have all the digital companies, and offered to cooperate with him in this research. At this initial contact he informed me that Pioneer was funding research at Berkeley, but he declined to tell me who was doing the research. The next time I spoke with him, he contradicted himself and stated that Pioneer was not funding the research but that a lab (this time he refused even to admit that it was UC Berkeley) had approached him for the research. I felt this was very strange, particularly as I had taken notes of our first telephone conversation. I pointed out to him that as the problem seemed to revolve around the validity of my testing that it would be in the interest of science if the lab were to make contact with me to ensure they were testing correctly -- and to eliminate other, and often numerous, extraneous variables. I even volunteered to travel to the lab, at my own expense, to cooperate with them. All of this he dismissed.

"I find it incongruous, after having practiced medicine for many years and being dedicated to science and to healing, to have my work dismissed as being a 'fetish,' and to be labeled unscientific. True science does not start with taking measurements. True science does not necessarily have to be conducted in a laboratory with millions of dollars worth of equipment. It starts with an open and inquiring mind. If only Morgan had had the courtesy and the open-mindedness to contact me to work on it impartially, there might have been benefit for us all. Instead, it was, as one reader of the letter has observed, a 'hatchet job on behalf of the industry.'

"Perhaps the most telling aspect of my presentation was the interest that it generated and the fact that the hall was packed for the demonstration. I have been told on numerous occasions, both immediately following my presentation and since, that 'we can hear something wrong with digital but we don't know what it is. Our measuring devices have not picked it up, but your test has.' The interest was there, it seems, because most people told me they did not want it, but that it was being forced upon them by the manufacturing companies. At the meeting I did not hear science. When the Director of Research for perhaps one of the largest digital manufacturing companies jumped to his feet and repeatedly came up to the platform to stop my presentation, I did not hear the language of science directed against me. I heard the language of money.

"As I have often pointed out, my research is at a very early and primitive stage. It is funded by myself, as is all my research. I would be interested to know the source of the funds for the Electronics Research Laboratory of the University of California at Berkeley.

"What if my test results are right?

"Then the recording industry is doing a disservice to mankind. I maintain that the problem can be corrected and have been disappointed that no manufacturer has wanted to pursue it. Apparently, they would prefer to hide it than correct it. I am quite sure that when corrections are made in later versions of the equipment, then and only then will it be acknowledged that previously there had been a problem. I have seen this in the electronics industry, and of course in the drug industry, for many years.

"What a shame that Mr. Morgan did not contact me instead of consulting his authorities, who know little of the test I used. That would have been true scientific inquiry. To my way of thinking his research is completely invalid because he has not performed the test correctly. I would not conceive of using Mr. Morgan's test equipment without first consulting him and receiving instruction from him. Regardless of the precision of the scientific apparatus, the experiment is useless if the investigator has not been properly trained in the use of the measuring equipment. (Continued)

(continued)

"The banner of science is raised against my 'fetish.' And yet, in the long run, should not your own house be put in order before criticism is made of me? After all these years of scientific research we still do not really have a good loudspeaker. It seems that we still cannot even agree on tubes vs. transistors or on which class of amplifier. We cannot agree on microphone placement, or even on matching microphone types to specific instruments. And of course all the scientific measures are quite unable to approach the measurement of the artistic worth of the music and the performer. All of the scientific equipment seems somehow to have been at best of limited value. And this is why there has been, in the consumer's mind, so little respect paid to the 'aboveground' reviews of equipment, with all the measurements neatly displayed. Instead there is tremendous interest and respect for the underground magazines which have concentrated "on the subjective, on the listening effects. They have stated for years that the measurements are not what matters. There is something else. And that is the human response. And the human response somehow is more subtle and more valid when used correctly and in its appropriate place than all the millions of dollars worth of so-called scientific equipment. And this is what the test 'measures.' It is objective, it is replicable, and it will withstand any sort of double blind studies when performed correctly -- when the tester has been properly trained. It is a physiological response for which we do not yet have accurate measuring machines.

"Billions of dollars are involved in the digital process. Before we inflict unnecessary stress on the present generation of listeners and future generations, let us at least wonder that there may be a stress factor which may have been demonstrated at my presentation. Let us look, and let us work to overcome this. In so doing, we will in part repay our debt to music for all that it has done for us."

John Diamond, M.D.

Dr. Fehr, in this writer's experience, is guilty of a double standard of conduct as the following exchange of letters indicates:

THE GOLDEN RULE: THOSE WITH THE GOLD MAKE THE RULES

(Retyped by Syn-Aud-Con)

January 30, 1980

(Retyped by Syn-Aud-Con)

Journal Office
1980 February 18

Letter to the Editor
Journal of the Audio Engineering Society
60 E. 42nd St.
New York 10017

Mr. Don Davis
Synergetic Audio Concepts
P. O. Box 1134
Tustin, CA 92680

It is with surprise that I read the Cann and Lyons article, "Acoustical Impulse Response of Interior Spaces" in the December issue of the Journal.

Dear Don:

Thank you for your Letter-to-the-Editor on "Acoustical Impulse Response of Interior Spaces" by Cann and Lyons.

This is a superficial repeat of Dick Heyser's work with regard to energy vs time plots. (See "Determination of Loudspeaker Signal Arrival Times," Part I, Part II, and Part III, starting in October 1971, Vol 19, Number 9.)

We have sent copies to our reviewers for their consideration.

Not only is it a technique already exhaustively covered by Heyser, but Cann and Lyons employ a sub-optimal instrumentation methodology when compared to Heyser's patented method.

We have also sent a copy of your letter to the authors for their information and reply, should they wish to provide one. Any responses from them will also be considered by our reviewers before publication.

Specifically, the impulse (FFT) method is invalid for non linear signals, and Heyser's 20,000 to 1 energy advantage eliminates cannons (so does OSHA and common sense).

Sincerely,

It would be regrettable should this article encourage an uninformed investigator to choose an inefficient system.

Patricia M. Macdonald
Managing Editor, Journal
AUDIO ENGINEERING SOCIETY, INC.
60 East 42nd Street
New York, NY 10017

Sincerely,

Don Davis, President
SYNERGETIC AUDIO CONCEPTS

(continued)

(continued)

(Retyped by Syn-Aud-Con)

March 7, 1980

Letter to the Editor
 JOURNAL OF THE AUDIO
 ENGINEERING SOCIETY
 60 E. 42nd Street
 New York, New York 10017

It is not proposed that the echogram technique described in the article "Impulse Response of Interior Spaces" is an advancement in the state-of-the-art superseding Dick Heyser's valuable work. However, it does emphasize that echograms can easily and accurately be made, both in the model and full scale, with the simple gated time domain analyzer described.

The miniature yachting cannon depicted in Figure 7 is an appropriate source to use in very noisy environments to obtain sufficient signal-to-noise ratio. For quiet locations a bursting balloon is quite sufficient. A starter's pistol is useful when only mid-range frequencies are of interest. If the writer is serious, we must note that OSHA does not have jurisdiction over less than 1000 impulses per day of 130 dB at a worker's ear. Both the number and level are never even closely approached during the testing of any interior space.

Small impulsive sources such as those described above, have the advantage of being omnidirectional and broadband. A loudspeaker system with similar characteristics is unnecessarily cumbersome and expensive.

Mr. Davis correctly points out that impulsive signals are nonlinear. However, researchers have practically demonstrated that the results of the energy analysis technique described, are not compromised on this account. A bibliography of scale modeling containing more than 200 references, many of which address the accuracy of impulse testing, may be obtained from Grozier Technical Systems, 157 Salisbury Road, Brookline, MA 02146.

Sincerely,

Richard H. Lyon
 Professor, Dept. of Mech. Eng.
 MASSACHUSETTS INSTITUTE OF
 TECHNOLOGY
 Room 3-366
 Cambridge, Massachusetts 02139

Richard G. Cann, President
 GROZIER TECHNICAL SYSTEMS, INC.

(Retyped by Syn-Aud-Con)

March 28, 1980

Letter to the Editor
 Journal of the Audio Engineering Society
 60 East 42nd Street
 New York, New York 10017

Professor Lyon and Mr. Cann state in their reply of March 7, 1980, "If the writer is serious" as to my concern regarding their illustration of a 10 gauge yachting cannon as a suitable impulse source.

The peak level of a 12 gauge shotgun with a 28" barrel (measured at the shooter's left ear out of doors) is 174.5 dB for a duration of 2.8 msec. Now, a 10 gauge cannon with a barrel less than 12" fired in a reverberant space will, by the most conservative estimate possible, *appreciably exceed* the 12 gauge levels.

Calculating an equivalent level L_{EQ} we find:

$$L_{EQ} = 10 \text{ LOG} \left(\frac{\left(\frac{174.5 \text{ dB}}{10} \right)}{\frac{10}{3600 \text{ sec}} \times .0028 \text{ sec}} \right) = 113.4 \text{ dB for 1 Hr.}$$

Believe me, that exceeds OSHA regulations but, even more important, it violates common sense usage.

Every impulse testing session I have attended uses literally dozens of impulses at differing locations to achieve complete measurements. The cumulative effects are fascinating to contemplate.

Another hazard with regard to acoustic cannoneering is the rain of soot, dust, ceiling tiles, etc., the discharge of such devices causes in existing construction. A further hazard is the rupture of sound system microphone diaphragms, high frequency driver diaphragms, etc. I sincerely hope that this form of testing is not conducted in buildings where quality sound systems are installed.

In my youth the self-same cannon illustrated in the Cann-Lyon article under discussion was used to call yachts to the weekend races and was audible at a distance of several miles. The blank cartridges were deliberately designed to be *louder* than standard 10 gauge loads for hunting purposes. The concussion from these miniature marvels removed, with a blast, many a young yachting enthusiast's high frequency hearing as he bent over to fire it. Hearing protectors were unheard of and they all assumed it to be harmless. Fired indoors I would expect "fallout."

Cann and Lyon's suggestion of such a device as an impulse source should be accompanied by "Not responsible for hearing losses incurred if this device is followed."

Yes, gentlemen, I am serious!

Sincerely,

Don Davis, President
 SYNERGETIC AUDIO CONCEPTS

(continued)

Continued,,

(Retyped by Syn-Aud-Con)

Journal Office
1980 June 23Mr. Donald B. Davis
Synergetic Audio Concepts
P. O. Box 1115
San Juan Capistrano, CA 92693

and

Messrs. Richard B. Cann and Richard H. Lyon
Grozier Technical Systems, Inc.
157 Salisbury Road
Brookline, MA 02146

Gentlemen:

Enclosed (for Messrs. Cann's and Lyon's information), is the latest correspondence we have received in your exchange of comments on "Acoustical Impulse Response of Interior Spaces."

Taken in total, we feel that the exchange does not address the specific technical issues with sufficient clarity to be of benefit to our readers.

If the discussion is to be pursued, we recommend that it be done by private correspondence until the pertinent technical areas of disagreement can be clearly presented in one exchange of correspondence. We would then be pleased to consider it for publication.

If I can be of any assistance in this regard, please do not hesitate to contact me.

Sincerely,

Patricia M. Macdonald
Managing Editor, Journal
AUDIO ENGINEERING SOCIETY, INC.
60 East 42nd Street
New York, NY 10017

Enc: D.Davis' letter of 1980 March 28

(Retyped by Syn-Aud-Con)

July 3, 1980

Mr. Robert Fehr
Editor
Journal of the AES
60 E. 42nd Street
New York 10017

Dear Bob:

Here is the re-written letter you requested during our telephone conversation today.

If Cann and Lyons would write something to the effect that

We regret the oversight in failing to reference the pioneer work of Richard C. Heyser and appreciate Mr. Davis calling it to our attention.

or something similar, I believe the discussion can be ended.

You might be interested in the article, "Gunfire Noise Levels" by William Dresser in The American Rifleman, September 1975, pp 44-47. The article contains extensive tables of peak sound pressure levels and their durations for almost every type of firearm used by sportsmen.

"Acoustic Trauma of Sportsman-Hunter Due to Gun Firing" in the Laryngoscope, vol LXXII, No 11, November 1972, pages 1971-1989 by John S. Odess M.D. is a valuable source.

There is a report available from The Law Enforcement Assistance Administration stating specific hazard levels and specific attenuation requirements for police pistol ranges.

My figures for a 12 gauge shotgun came from Table I of Dresser's article. I also own a .458 magnum rifle that reaches the same acoustic level.

If Mr. Lyons has better data available I would be most pleased to hear of it. If he does not, he was out of order to criticize my data. Don't you agree.

Sincerely,

Don Davis, President
SYNERGETIC AUDIO CONCEPTS

(Retyped by Syn-Aud-Con)

July 3, 1980

Letter to the Editor
Journal of the AES
60 E. 42nd St.
New York 10017

Attn: Robert Fehr

The article, "Acoustical Impulse Response of Interior Spaces," by Cann and Lyons in the December issue of the Journal caused me both surprise and concern.

While the method described by Cann & Lyons has legitimate use as a teaching tool in modeling techniques, it is this writer's opinion that several misapplications of the technique are presented in this paper.

My surprise stems from the fact that the work in this paper is a superficial repeat of Dick Heyser's work with regard to energy vs time plots. (See "Determination of Loudspeaker Signal Arrival Times," Part I, II, and III, starting in October 1971, Vol 19, Number 9.)

Not only has the basic concept of energy vs time measurements already been exhaustively covered by Heyser, but Cann and Lyons suggest a sub-optimal instrumentation methodology as compared to Heyser's patented method.

Specifically, the Heyser technique, by insuring that total signal energy is always present in the center of the tracking bandwidth, obtains a 20,000 to 1 energy advantage over impulse sources attempting to maintain the same "time window." The processing of impulse signals through a loudspeaker, microphone and FFT analyzer is invalid whenever the loudspeaker happens to have non-linear response. The fast Fourier Transform is only valid for linear signals.

The illustration in Cann & Lyons' article of the use of a 10 gauge yachting cannon is again, to be charitable, a highly questionable practice.

This writer would regret it if investigators of full sized acoustic spaces were encouraged by Cann & Lyons' article to choose an inefficient system.



SYN-AUD-CON NEWSLETTER
FALL, 1980

(Continued)

SYNERGETIC AUDIO CONCEPTS

(Retyped by Syn-Aud-Con)

Editorial Office
1980 July 23

(Retyped by Syn-Aud-Con)

July 28, 1980

Mr. Donald B. Davis
Synergetic Audio Concepts
P. O. Box 1115
San Juan Capistrano, CA 92693

Dr. Robert O. Fehr
Editor
Journal of the AES
60 E. 42nd St.
New York, New York 10017

Dear Don:

Dear Dr. Fehr:

Your revised letter commenting on Cann and Lyon's article was just received. We plan to print it in the October Issue, together with the authors' reply.

The second paragraph of Cann & Lyon's original letter of March 7, 1980 is not acceptable to me. I would hope that they re-write their letter along the lines that I suggested in my last letter of July 3.

In accordance with our policy we are mailing your letter with your additional comments to Cann and Lyon to find out if they want to change their previous reply. I think that they pay due respect to Heyser's work in the first paragraph of their reply, and I shall encourage them to add an appropriate footnote, citing Heyser's original work.

In any case, I'd like to see what their reply is before you publish it.

Sincerely,

I appreciate your quick action after our telephone conversation.

Don Davis, President
SYNERGETIC AUDIO CONCEPTS

Sincerely,

Robert O. Fehr
Editor, Journal
AUDIO ENGINEERING SOCIETY
60 East 42nd Street
New York, NY 10017

(Retyped by Syn-Aud-Con)

Journal Office
1980 August 13

Mr. Donald B. Davis
Synergetic Audio Concepts
P. O. Box 1115
San Juan Capistrano, CA 92693

Dear Mr. Davis:

With reference to your letter of July 28, Mr. Lyon has been on vacation and we have not yet received a response from him.

We will be in touch with you again before anything is published.

Sincerely,

Robert O. Fehr
Editor, Journal
AUDIO ENGINEERING SOCIETY, INC.
60 East 42nd Street
New York, NY 10017

LETTER TO THE AES JOURNAL

Professor Lyons is considered "scientific" and worthy of protection; Dr. Diamond is judged "unscientific" and not worthy of even "equal time" when attacked.

Letter to the Editor
Journal of the AES
60 E. 42nd Street
New York, NY 10017

October 1, 1980

The Digital Standards Committee notes are illustrative of an unscientific approach to audio and a complete disregard for potential interferences with human physiological processes.

Dr. Toshi T. Doi of the Sony Digital Audio Division, Tokyo, Japan, is advocating sampling rates for disk systems as either 44.1 kHz or 50.4 kHz.

Quoting from the "Digital Audio Technical Committee Report," page 615 of the September 1980 JAES, Volume 28, No. 9:

"Questions were raised by Dr. Stockham and others about the possible problems caused by alternate sampling of channels, (in the EIAJ system for home VTR's) particularly if one were to use a single point stereo microphone for pickup.

"Most felt that the time delay of 12 usec between channels would not produce any audible effects, but *there was no evidence of any serious tests.*" (Italics mine) (continued)

Nelson Morgan's "Comments on 'Human Stress Provoked by Digitalized Recordings,'" page 613 of the same JAES, equates "arm pushing" with Dr. Diamond's deltoid test. Since the proper testing of the deltoid muscle is of any change in the reflex motor process, Mr. Morgan's group exhibited inexcusable laxity in not referring to and studying the literature of such testing. ("Muscles: Testing and Function," Henry O. Kendall et al - Baltimore: Williams & Wilkins, 2nd Edition 1971)

Mr. Morgan fails to state that his "Comments" was in fact financed by Mr. Locanthi's Japanese employer (Pioneer) and that the individuals generating the test tape are not without bias toward the outcome. Using anti-aliasing filters on the analog recording is inadmissible.

Therefore, the evidence clearly points out:

1. It is not an impartial attempt to evaluate Dr. Diamond's demonstration.
2. The tests conducted are not relevant to the claims Dr. Diamond made.

While the entire Dr. Diamond episode has witnessed the use of the words scientific and unscientific used like flashing samurai swords in defense of the digital Shogun there is no hard evidence that either side has any intention of suppressing emotions long enough to do a little preliminary research of the abundant existing literature.

"Our subconscious powers of auditory discrimination, however, are amazing. Experiments have shown (Klemm, 1919, Hornbostel and Wertheimer, 1920) that our cues for sound localization are provided by our perception of binaural time differences, differences of binaural intensity being far too feeble. The binaural time difference is greatest when the sound originates close to one ear, but even then is less than a millisecond. When the sound originates 3° to one side of the median plane of the head, the time difference is only about a fortieth of a millisecond. Nevertheless, it still provides an effective cue. The binaural time differences must, of course, be 'decoded' before we can refer them to location. This 'decoding' is *primarily a reflex motor process.*" (Italics mine)

From *The Natural Philosophy of Time* by G. J. Whitrow (2nd edition)

"Norbert Wiener (1958) pointed out that, because the alpha rhythm can be generated artificially by submitting the eye to a visual flicker of external impulses at the rate of about ten per second, it is reasonable to suppose that the natural rhythm is the response of the brain to a flicker caused by its own internal oscillations. He argued that careful analysis of the records reveals that around a central frequency of close to 10 Hz there is a rather empty range with a sharp peak of great intensity and small width in frequency in the centre, and he concluded that this narrow band of frequencies constitutes a 'clock' in the brain. In support of this conclusion he drew attention to the *analysis of reaction times* (italics mine), and he claimed that the various processes involved in perception impose on reaction times irreducible minima of about 0.1 seconds, the period of one cycle of the alpha rhythm."

And a further quote from the same source:

"Although we do not yet know for sure where the master clocks, if any, that control our submerged biological rhythms are located, it is possible that in the course of evolution inhibitory controls on these rhythms may have developed in the higher centres of our brains."

...."Nevertheless, our cognitive time sense, however much it may be controlled by social and psychological factors, is superimposed on the rhythms of the biological clocks that beat within us far below the level of consciousness."

All of the above quotations are from *The Natural Philosophy of Time* by G. J. Whitrow, Emeritus Professor of the History and Applications of Mathematics in the University of London and Senior Research Fellow of the Imperial College of Science and Technology, second edition, published by Clarendon Press - Oxford, 1980, pages 73, 128, and 166. This book contains the most exhaustive bibliography on these subjects it has been this writer's good fortune to encounter.

A fortieth of a millisecond is 25 usec. Dr. Stockham, Ms. Rodgers and Mahlon Burkhard all assure me that as short an interval as 5 usec is detectable at subliminal levels under circumstances such as the alternate sampling advocated by Dr. Doi. Dr. Diamond's own writings state that the test of the deltoid muscle is of its reflex motor response and that it is the subject's reaction time change that allows the arm to be pushed down without effort. It is not - repeat - not a test of strength.

When the time intervals of concern to Dr. Stockham in the Digital Standards meeting are equated with the evidence in the literature, Dr. Doi's replies become flippant.

A scientist should be capable of looking at Dr. Diamond's demonstration, of looking past Dr. Diamond's interpretation of that demonstration, to the possibility of an unexpected third cause and effect explanation.

(continued)

Dr. Diamond, continued

The literature clearly indicates that Dr. Diamond's deltoid demonstration may indeed be a measure of digital's present ability to "short circuit" reflex motor processes. Whether or not this is "stress" or anything else is a worthy project before any digital standard is prematurely arrived at -- to the ultimate woe of the audio industry.

Therefore, I suggest that the AES fund and sponsor a proper evaluation of this phenomenon using a panel of qualified personnel not beholden to digital interests in *any* manner. I'd further suggest two special monitors to serve in an advisory capacity to the chosen panel -- namely, Dr. Stockham for the digital engineering information he possesses and Dr. Diamond because he can "calibrate" whatever testing device is devised for testing reflex motor processes.

Art has usually preceded science, often by a wide margin. We have a unique opportunity in this case to demonstrate that audio engineers are capable of being simultaneously ethical and rigorous.

Sincerely,

SYNERGETIC AUDIO CONCEPTS

Don Davis, President

MEET DR. DIAMOND

On Sunday evening, November 2nd, Syn-Aud-Con will host Dr. John Diamond in their suite at the Waldorf Astoria Hotel. Syn-Aud-Con graduates wishing to meet Dr. Diamond, experience his method of deltoid muscle testing, and have the opportunity of discussing it with him, can do so by signing up at the Syn-Aud-Con booth on the exhibit floor. It will be first come - first served and those who sign up will be given a fixed time to be at the suite and allowed sufficient time to become acquainted with Dr. Diamond. Since we anticipate more applicants than can be accommodated in the time available, we'd suggest you let us know of your interest as soon as possible upon arrival at the show.

We are doing this because of the AES's unprecedented refusal to publish Dr. Diamond's reply to an attack on him in the AES Journal. This is a truly unique opportunity for Syn-Aud-Con graduates to experience what the arguments are all about.

EMILAR LOOKING FOR PEOPLE

It is exciting and pleasurable when Syn-Aud-Con is able to report on the exceptional success of one of our sponsors. EMILAR has experienced phenomenal growth during the past seven years and today utilizes its own plant, fully equipped with precision acoustic measurement equipment and the latest in computer-controlled machining equipment.

The real meaning of productivity in a society is exemplified by Emilar's inspired solution of early technical problems, followed by a fully dedicated program of solving production problems, as well.

Emilar is seeking similar growth people-wise, and we encourage Syn-Aud-Con graduates with talents aligned toward manufacturing and sales to check out the current opportunities at Emilar -- National Sales Manager and General Manager.



BOOKS AND ARTICLES OF INTEREST

DAVE ANDREWS of Andrews Audio in New York is involved in helping pioneer acceptance of PZM's, TEF, SBA and engineering design of sound systems. He recently installed a major, high quality sound system in the New York Hilton Hotel with notable success. db magazine published an article on this job written by Christine Kofoed of Community Light and Sound.

The photographs show lots of Shure, Crown and Community equipment used creatively -- One of the more interesting jobs covered by db in recent years.

As a result of the success of the Hilton job, Dave is now into a huge system installation at the Waldorf Astoria.

One of the greatest joys in life is the challenge of overcoming obstacles. In an excellent guest editorial in the September 25th Electronics by Bernard M. Gordon, he pointed out that:

"In the past, when our society has recognized danger, we have worked *together* to overcome the threat. Our present problems (productivity and quality control) have been decades in developing and will not be solved overnight. But, if we do not start now, it will take longer to cure."

One of Mr. Gordon's suggestions is particularly apt for Syn-Aud-Con graduates because *you* have met it head-on.

"Recognize that leaders in education must also have a commitment to providing well-grounded graduates *in tune with* the notion that education is a *continuing* process."

In an article entitled "Putting Excellence into Management" by Thomas J. Peters in Business Week, July 21st, 1980, the problems hindering *real* productivity in the United States are succinctly discussed and dissected. Our thirty years of experience found their examples all too familiar -- very bright young managers totally ignorant of the basics necessary to stay in business.

Eight attributes that Mr. Peters found shared by highly successful manufacturers today were:

1. A bias toward action -- "do it, fix it, try it"
2. Simple form and staff -- "small is beautiful" -- "divide even the largest efforts into small entrepreneurial units"
3. Continued contact with customers -- "customer driven companies" (if you don't love and respect the customer, you're in trouble)
4. Productivity improvement via people -- "giving people autonomy opens up the flood-gates to ideas" (motivation springs from a recognition of inherent worth)
5. Operational autonomy to encourage entrepreneurship -- "the store manager concept" -- "take management off their leash"
6. Stress on one key business value -- "single-minded focus on a value becomes a culture for the company" (just be sure you pick the right concentration)
7. Emphasis on doing what they know best -- "never acquire any business *you* don't know how to run"
8. Simultaneous loose - tight controls -- "a successful company controls a *few* variables tightly, but allows flexibility and looseness in others"

Seduction by MBA's is beautifully described as is the resultant miscarriages.

Finally, Peter Drucker has published his latest book, *Managing in Turbulent Times*, Harper and Row. Here are a couple of meaningful quotes:

"A rate of profit that does not equal *the cost of capital* is not 'profit' at all. It is loss, both for the firm and for the economy."

"Making a profit *is by definition impossible* in an inflationary period because *inflation is the systematic* destruction of wealth by government."

"Savings are not capital formation but delayed consumption."

and finally:

"The cost of capital is always - repeat - always the *minimum* cost of staying in business."

We recommend all of these writings as worthy of study, both by employees and employers, as a means of understanding the complex economic situation that has placed both of them in the same lifeboat.

SYNERGETIC AUDIO CONCEPTS
BOOKS OF INTEREST

Easily one of the most interesting and timely books to arrive on the scene (found for us by TOM McCARTHY of NorthStar in Minneapolis) is *STRUCTURES, or Why Things Don't Fall Down*.

We find it interesting because it is thorough, simple and accurate. It is timely because a number of public buildings here in S. California are falling down: inverted pyramids having a vogue here architecturally and a series of "let's screw it into the ground" structurally.

Who has more fun than the technically uninformed in a position to build monuments?

STRUCTURES...by J. E. Gordon, published by Plenum Press, 227 W. 17th St., New York 10011. It is available through most bookstores and the Science Book Club. About \$17.95

HELPFUL ACOUSTIC DATA

The July and August, 1980 issues of S)V (Sound and Vibration magazine) are of particular interest to a majority of Syn-Aud-Con graduates.

The July issue is devoted to "Materials for Noise and Vibration Control." The August issue contains "Systems for Noise and Vibration Control." Both issues include a "Buyer's Guide" to manufacturers and suppliers. Both issues form comprehensive mini manuals on:

- | | |
|---|------------------------------------|
| A. Sound absorptive materials and systems | D. Vibration isolation materials |
| B. Sound barrier materials and systems | E. Silencers |
| C. Vibration damping materials | F. Vibration/shock control systems |

The author for both issues is W. Ernest Purcell who clearly demonstrates his mastery of the subjects covered and steers a course through a mass of available material to the most useful and practical techniques and materials available today. The illustrations and excellent collection of equations and graphs place Mr. Purcell's reader in a position to effectively apply the fundamentals he so accurately describes.

Excellent illustrations and discussions of the "coincidence effect," "composite barriers," and "estimating transmission loss" have immediate meaning to control room designers and the necessity of employing dual design techniques for low and high frequencies is clearly delineated.

Sound transmission classes (STC) are carefully explained and illustrated. The section on silencers is valuable as is "Approximate Theories for Single and Double Panel Design" in the "Systems" issue.

Sound and Vibration is to be congratulated for their provision of a forum for Mr. Purcell's work. Syn-Aud-Con suggests these two issues be placed in a folder of their own and used regularly as both a text and a reference.

"Sound and Vibration is circulated without charge (in the United States and Canada) to individuals who are concerned with noise and vibration control, dynamic measurement instrumentation, hearing conservation, dynamic environmental testing and architectural acoustics...Application for a free subscription may be made by filling out the card bound in each issue or by requesting a subscription application card from the publisher."

Write SOUND AND VIBRATION, P. O. Box 9665, Bay Village, OH 44140

CLASSIFIED

EMPLOYMENT OPPORTUNITIES

Emilar is growing and needs people: National Sales Manager and General Manager.
Contact: Tom McMahon, 1365 McCann St., Anaheim, CA 92806, PH 714-632-8500, or Manny Mohageri

EMPLOYMENT OPPORTUNITY

Sound installation foreman with drawing skills. Prior foreman experience necessary with a minimum of 5 years installation experience in the field.
Contact Glenn Meeks, Sound Investments, 2051 E. 46th St., Indianapolis, IN 46205. Ph 317-257-1227

WANTED:

HP-45 Scientific or HP-80 Business calculators.
Contact Chris Hood, 5 Harrison St., Crafton, PA 15205. Ph 412-921-2911

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SYN-AUD-CON SPONSORS

Syn-Aud-Con receives tangible support from the audio industry, and ten 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.

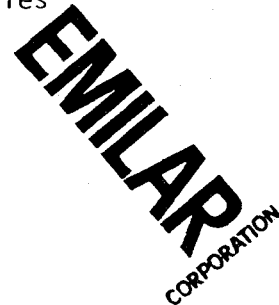
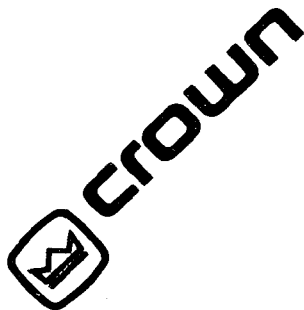
Personnel from these manufacturers receive Syn-Aud-Con training which provides still another link in the communications circuit between the ultimate user and the designer-manufacturer of audio equipment. They are "in-tune" with what a Syn-Aud-Con graduate needs.

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

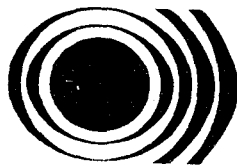
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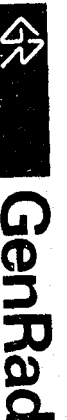
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