1985: RPG Hits the Trade Show Circuit

1985: First Ad and Business Card

As RPG began to fulfill orders for a growing number of studios, it started to advertise in the Journal of the Audio Engineering Society. And the first business cards were printed.

The RPG™ Acoustical Diffusor

TRC Studios

Acorn Sound Recorders

Otis Conner Productions

There has always existed a need in architectural acoustics for an attractive, modular surface treatment which would efficiently diffuse, i.e. uniformly distribute rather than absorb or attenuate, the acoustical energy in an enclosed space. RPG Diffusor Systems has recognized this need and pioneered the development of the RPG Acoustical Diffusor, which provides a highly diffusing surface that efficiently backscatters sound over a broad range of frequencies, with uniform wide-angle coverage. These desirable diffusive properties cannot be obtained to the same degree with conventional surface treatments, which employ geometrically irregular shapes, polycylindrical columns an/or alternating reflecting and absorbing panels. Many years of theoretical research and development, experimental testing and psychoacoustical evaluation have verified the effectiveness of the RPG Diffusor System. RPG Acoustical Diffusors consist of a series of wells of different depths, based on quadratic residue sequences, and are constructed from hand-rubbed lacquered hardwood and anodized aluminum for a truly handsome appearance.

The RPG Diffusor represents an acoustical design component which was formerly unavailable. Architectural acoustic designers now have at their disposal all of the required acoustical ingredients (absorption, reflection and diffusion), for exemplary and reproducible room design. Virtually any critical listening or performance environment can be enhanced by appropriate use of the RPG Acoustical Diffusor.

- **Auditoriums**
- **Churches**
- **Theaters**
- **Conference Rooms**
- **Concert Halls**
- **Rehearsal Spaces**
- **Orchestral/Choir Shells**
- **Audio/Video Recording Studios**
- **Radio/TV Announce Booths**
- **Mobile Studios**
- **Recording/Broadcast Control Rooms**
- **Disc Mastering Control Rooms**
- **Film Mix/Editing Control Rooms**
- **Exhibit Demo Rooms**
- **Acoustical Ceiling Systems**

Below we have listed a few of the growing number of users who have joined the RPG Diffusor System:

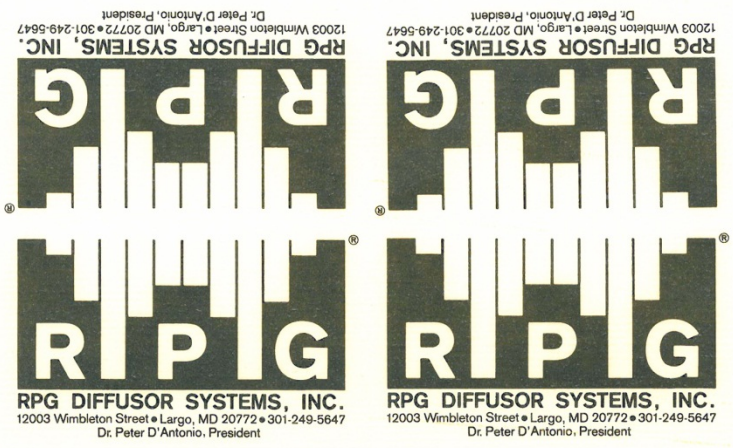
ACORN SOUND RECORDERS
Hendersonville, TN
ASTORIA MUSIC
New York, NY
CHICAGO RECORDING CO.
Chicago, IL
MASTERMIX
Nashville, TN
NEW AGE SIGHT AND SOUND
Atlanta, GA
OTIS CONNER PRODUCTIONS
Dallas, TX
RCA DIGITAL EDITING SUITE
New York, NY
SIGMA SOUND
New York, NY
JIMMY SWAGGART WORSHIP CENTER
Baton Rouge, LA
TELE-IMAGE
Las Colinas, TX
TRC STUDIOS
Indianapolis, IN
WFMT RADIO
Chicago, IL

All 2′ × 4′ modular models are now in stock.
For more information write or call:

RPG DIFFUSOR SYSTEMS, INC.
12003 Wimbleton Street
Largo, Maryland 20772
301-249-5647

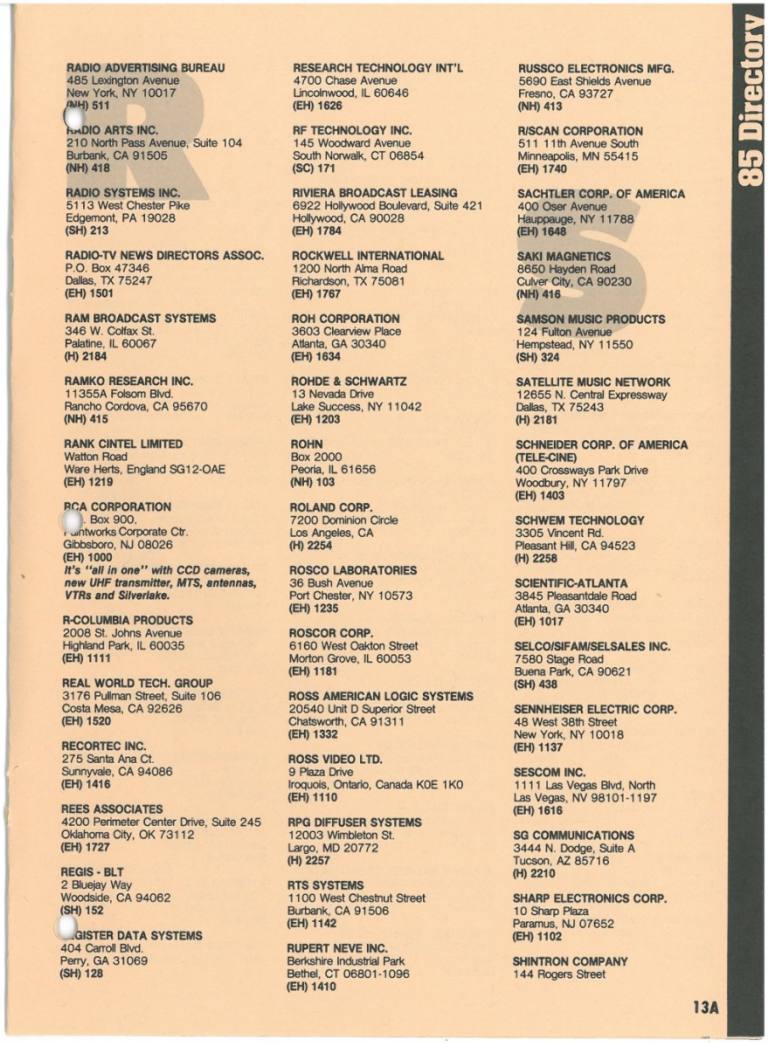
RPG™ is a registered trademark of RPG Diffusor Systems, Inc.

RPG DIFFUSOR SYSTEMS, INC.



1985: April First Exhibit at NAB

As RPG began to expand its market from recording studio to include broadcast studios, RPG exhibited at the 1985 Nation Association of Broadcasters Conference and Dr. D'Antonio lectured on a new broadcast studio acoustic design using a reflection free zone surrounding the mixing engineer and a diffuse rear.



RADIO ADVERTISING BUREAU
485 Lexington Avenue
New York, NY 10017
(NH) 511

RADIO ARTS INC.
210 North Pass Avenue, Suite 104
Burbank, CA 91505
(NH) 418

RADIO SYSTEMS INC.
5113 West Chester Pike
Edgemont, PA 19028
(SH) 213

RADIO-TV NEWS DIRECTORS ASSOC.
P.O. Box 47346
Dallas, TX 75247
(EH) 1501

RAM BROADCAST SYSTEMS
346 W. Colfax St.
Palatine, IL 60067
(H) 2184

RAMKO RESEARCH INC.
11355A Folsom Blvd.
Rancho Cordova, CA 95670
(NH) 415

RANK CINTEL LIMITED
Watton Road
Ware Herts, England SG12-OAE
(EH) 1219

RCA CORPORATION
P.O. Box 900.
Front works Corporate Ctr.
Gibbsboro, NJ 08026
(EH) 1000
It's "all in one" with CCD cameras, new UHF transmitter, MTS, antennas, VTRs and Silverlake.

R-COLUMBIA PRODUCTS
2008 St. Johns Avenue
Highland Park, IL 60035
(EH) 1111

REAL WORLD TECH. GROUP
3176 Pullman Street, Suite 106
Costa Mesa, CA 92626
(EH) 1520

RECORTEC INC.
275 Santa Ana Ct.
Sunnyvale, CA 94086
(EH) 1416

REES ASSOCIATES
4200 Perimeter Center Drive, Suite 245
Oklahoma City, OK 73112
(EH) 1727

REGIS - BLT
2 Bluejay Way
Woodside, CA 94062
(SH) 152

REGISTER DATA SYSTEMS
404 Carroll Blvd.
Perry, GA 31069
(SH) 128

RESEARCH TECHNOLOGY INT'L
4700 Chase Avenue
Lincolnwood, IL 60646
(EH) 1626

RF TECHNOLOGY INC.
145 Woodward Avenue
South Norwalk, CT 06854
(SC) 171

RIVIERA BROADCAST LEASING
6922 Hollywood Boulevard, Suite 421
Hollywood, CA 90028
(EH) 1784

ROCKWELL INTERNATIONAL
1200 North Alma Road
Richardson, TX 75081
(EH) 1767

ROH CORPORATION
3603 Clearview Place
Atlanta, GA 30340
(EH) 1634

ROHDE & SCHWARTZ
13 Nevada Drive
Lake Success, NY 11042
(EH) 1203

ROHN
Box 2000
Peoria, IL 61656
(NH) 103

ROLAND CORP.
7200 Dominion Circle
Los Angeles, CA
(H) 2254

ROSCO LABORATORIES
36 Bush Avenue
Port Chester, NY 10573
(EH) 1235

ROSCOR CORP.
6160 West Oakton Street
Morton Grove, IL 60053
(EH) 1181

ROSS AMERICAN LOGIC SYSTEMS
20540 Unit D Superior Street
Chatsworth, CA 91311
(EH) 1332

ROSS VIDEO LTD.
9 Plaza Drive
Iroquois, Ontario, Canada K0E 1K0
(EH) 1110

RPG DIFFUSER SYSTEMS
12003 Wimbleton St.
Largo, MD 20772
(H) 2257

RTS SYSTEMS
1100 West Chestnut Street
Burbank, CA 91506
(EH) 1142

RUPERT NEVE INC.
Berkshire Industrial Park
Bethel, CT 06801-1096
(EH) 1410

RUSSCO ELECTRONICS MFG.
5690 East Shields Avenue
Fresno, CA 93727
(NH) 413

R/SCAN CORPORATION
511 11th Avenue South
Minneapolis, MN 55415
(EH) 1740

SACHTLER CORP. OF AMERICA
400 Oser Avenue
Hauppauge, NY 11788
(EH) 1648

SAKI MAGNETICS
8650 Hayden Road
Culver City, CA 90230
(NH) 416

SAMSON MUSIC PRODUCTS
124 Fulton Avenue
Hempstead, NY 11550
(SH) 324

SATELLITE MUSIC NETWORK
12655 N. Central Expressway
Dallas, TX 75243
(H) 2181

SCHNEIDER CORP. OF AMERICA (TELE-CINE)
400 Crossways Park Drive
Woodbury, NY 11797
(EH) 1403

SCHWEM TECHNOLOGY
3305 Vincent Rd.
Pleasant Hill, CA 94523
(H) 2258

SCIENTIFIC-ATLANTA
3845 Pleasantdale Road
Atlanta, GA 30340
(EH) 1017

SELCO/SIFAM/SELSALES INC.
7580 Stage Road
Buena Park, CA 90621
(SH) 438

SENNHEISER ELECTRIC CORP.
48 West 38th Street
New York, NY 10018
(EH) 1137

SESCOM INC.
1111 Las Vegas Blvd, North
Las Vegas, NV 98101-1197
(EH) 1616

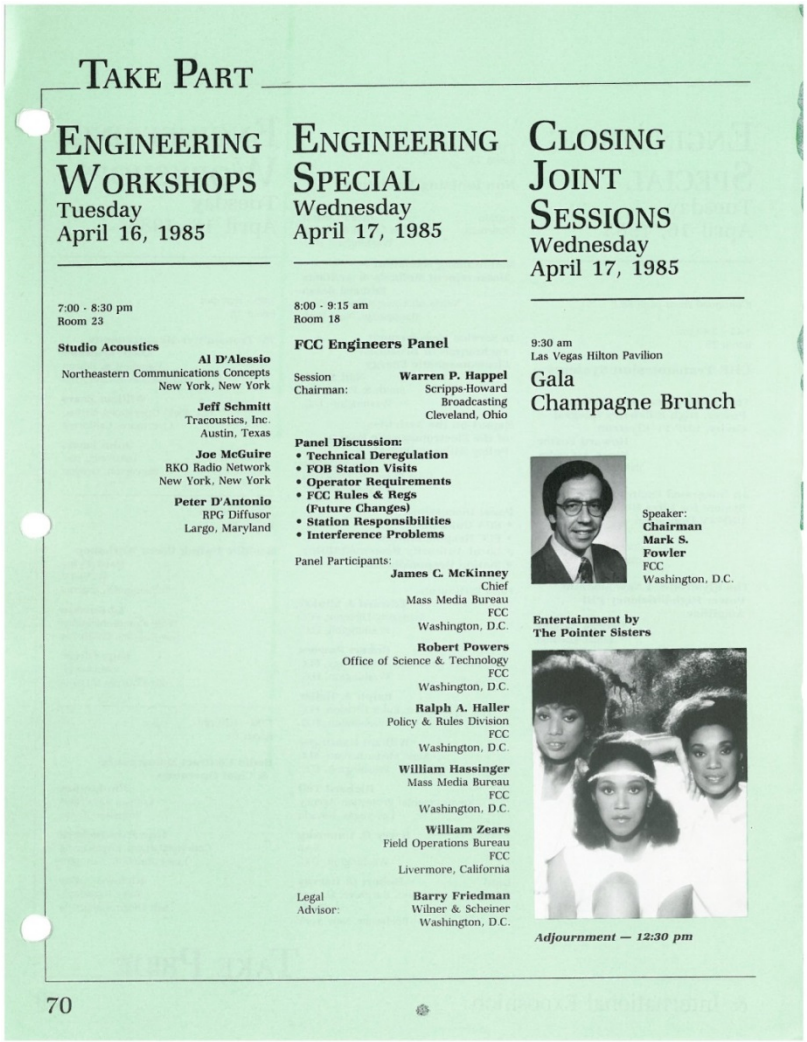
SG COMMUNICATIONS
3444 N. Dodge, Suite A
Tucson, AZ 85716
(H) 2210

SHARP ELECTRONICS CORP.
10 Sharp Plaza
Paramus, NJ 07652
(EH) 1102

SHINTRON COMPANY
144 Rogers Street

85 Directory

13A



TAKE PART

ENGINEERING WORKSHOPS
Tuesday
April 16, 1985

7:00 - 8:30 pm
Room 23

Studio Acoustics

Al D'Alessio
Northeastern Communications Concepts
New York, New York

Jeff Schmitt
Tracoustics, Inc.
Austin, Texas

Joe McGuire
RKO Radio Network
New York, New York

Peter D'Antonio
RPG Diffusor
Largo, Maryland

ENGINEERING SPECIAL
Wednesday
April 17, 1985

8:00 - 9:15 am
Room 18

FCC Engineers Panel

Session Chairman: **Warren P. Happel**
Scripps-Howard Broadcasting
Cleveland, Ohio

Panel Discussion:
- **Technical Deregulation**
- **FOB Station Visits**
- **Operator Requirements**
- **FCC Rules & Regs (Future Changes)**
- **Station Responsibilities**
- **Interference Problems**

Panel Participants:

James C. McKinney
Chief
Mass Media Bureau
FCC
Washington, D.C.

Robert Powers
Office of Science & Technology
FCC
Washington, D.C.

Ralph A. Haller
Policy & Rules Division
FCC
Washington, D.C.

William Hassinger
Mass Media Bureau
FCC
Washington, D.C.

William Zears
Field Operations Bureau
FCC
Livermore, California

Legal Advisor: **Barry Friedman**
Wilner & Scheiner
Washington, D.C.

CLOSING JOINT SESSIONS
Wednesday
April 17, 1985

9:30 am
Las Vegas Hilton Pavilion

Gala Champagne Brunch

Speaker:
Chairman Mark S. Fowler
FCC
Washington, D.C.

Entertainment by The Pointer Sisters

Adjournment — 12:30 pm

70

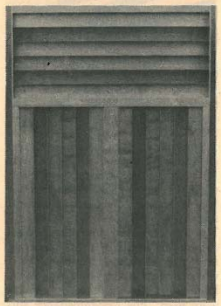
1985: May 78th AES Convention, Anaheim, CA

Following the NAB in April, RPG exhibited at the 78th AES Convention in Anaheim and presented a paper entitled "The Role of the Reflection Phase Grating Diffusor in Critical Listening and Performance Environments". A copy can be found at www.rpginc.com/News/Presentations. The contents were covered in the trades.

78th Audio Engineering Society Convention

PETER D'ANTONIO
RPG DIFFUSOR
SYSTEMS, INC.

Exhibitor



RPG Diffusor Systems Inc. at **Booth 810** was founded by Dr. Peter D'Antonio and Dr. John Konnert in 1983 to pioneer development of reflection phase grating acoustical diffusor systems in order to enhance the acoustics of critical listening and performing environments.

The company's current product line consists of the QRD-43/19 and QRD-19/7 systems and the QRD-7, which can either be wall mounted or used in a standard suspended grid ceiling. Clients listed by the company include NBC in Burbank, Oak Ridge Boy's Acorn Sound Recorders in Hendersonville, TN, Jim Swaggart Ministries of Baton Rouge, LA, WFMT of Chicago, IL, and Mastersound Astoria in New York.

EXHIBITION DATA

The AES 78th Convention is a full scale convention with the entire ground floor exhibit hall and connecting ballrooms containing 60,000 square feet of exhibition booths. In addition demonstration rooms in the Sierra and Bonita towers provide ample audio listening areas.

List of AES 78th Convention Exhibitors (as of February 22, 1985).

AB Systems Inc.
Accurate Sound Corporation
ACO Pacific Inc.
Adams-Smith
Advanced Music Systems
AEG—Telefunken Corp.
AEG—Telefunken Corp.
AGFA-GEVAERT Inc.
AKG Acoustics Inc. U.S.A.
Amek Consoles Inc.
Ampex Corporation
Anchor Audio Inc. (V.J. Electronics)
ANT Telecommunications/ SOLWAY Inc.
Aphex Systems Ltd.
Applied Research and Technology Inc.
Audico Inc.
Audio & Design Calrec Inc.
Audio/Digital Inc.
Audio Engineering Associates
Audio Intervisual Design Systems Facilitators
Audio Kinetics Inc.
Audio Precision Inc.
Audio-Technica U.S.
Audio Video Consultants
AXE
Kenneth A. Bacon Associates
Barcus-Berry Electronics Inc.
BASF Systems Corporation
BGW Systems Inc.
Biamp Systems Inc.
Broadcast Electronics Inc.
Bruel & Kjaer Instruments Inc.
California Switch & Signal
Cerwin Vega Inc.
Cetec Gauss
Cetec Ivie
Cetec Vega
Community Light & Sound Inc.
Compusonics Corp.
Connectronics Corporation
Crest Audio
Crown International Inc.
The David Hafler Co.
dbx Inc.
Digital Entertainment Corporation
Dolby Laboratories Inc.
Electro Sound Inc.
Electro-Voice Inc.
Emilar Corporation
Eventide Inc.
Everything Audio
Fostex Corporation of America
GML Inc.
Gotham Audio Corporation
Harrison Systems Inc.
Heino Ilsemann GmbH
Hill Audio Inc.
ICM Ltd.
Innovative Electronic Design Inc.
Inovonics Incorporated
Integrated Media Systems
International Music Corp.
JBL Incorporated/UREI
JRF Magnetic Sciences
JVC Company of America
King Instrument Corporation
Klark-Teknik Electronics Inc.
Lexicon Inc.
Magnefax International Inc.
Marshall Electronic
Marshall Electronics/ Mogami Product Div.
Meyer Sound Laboratories Inc.
Monster Cable Products Inc.
Nady Systems Inc.
Nagra Magnetic Recorders Inc.
Neotek Corporation
Neutrik Products
Network Music
New England Digital Corp.
Orban Associates Inc.
Otari Corporation
Philips Television Systems Inc.
P.P.S. Electronics Corporation
Pristine Systems Inc.
Professional Audio Services & Supply Co.
Publison Audio Professional
QSC Audio Products Inc.
Quantec Tonstudiotechnik GmbH
RCA Records
Recortec Inc.
Renkus Heinz Inc.
Rhone-Poulenc Systems/Pyral
RPG Diffusor Systems Inc.
Rupert Neve Incorporated
Saki Magnetics Inc.
Samson Music Products
Sanken Microphone/Pan Communications
Schoeps/Posthorn Recordings
Shure Brothers Incorporated
Sierra Audio Acoustics Ltd.
Solid State Logic, Inc.
Sony Corporation of America
Soundcraftsmen
Sound Ideas Sound Effects Library
Sound Technology Inc.
Sound Workshop Professional Audio Products Inc.
Sprague Magnetics Inc.
Studer Revox America Inc.
Studio Sound
Tandberg of America Inc.
Tannoy North America Inc.
TASCAM Professional Products
Tektronix Inc.
3M Co. Magnetic Audio/ Video Products Div.
TOA Electronics Inc.
Transco Products Corporation
TTL USA Inc.
Turbosound Inc.
URSA MAJOR Inc.
Valley People Inc.
Versadyne International Inc.
Westlake Audio Inc.
Whirlwind Music
Yamaha International Corporation

Additional information available
Society • 60 East 42nd Street, NY NY 10165 • 212 661 8528 Telex 620298
(West Coast data point 818 357 1289)

May 4, 1985

Architectural Acoustics Session

RPG Papers Refine Dead End

This year's convention will feature two technical papers presented by RPG Diffusor Systems Incorporated, of Largo, MD, this morning as part of the technical papers program on "Architectural Acoustics and Music." The session begins at 9 a.m.

Although RPG is a relatively new company, its staff, headed by Dr. Peter D'Antonio and Dr. John H. Konnert, has more than 30 years of diffraction physics and computer software development experience, coupled with more than 10 years of active involvement in recording studio design, engineering, and production. RPG has been conducting research in psycoacoustics and control room design utilizing reflection phase grating diffusors and the reflection free zone. The first paper, entitled "The Role of Reflection Phase Grating Diffusors in Critical Listening and Performing Arts Environments," is an overview of this research which details the theory behind it and how the diffusors can be used in the performing arts as well as the recording control room and studio. The second paper, "Control Room Design Utilizing a Reflection Free Zone and Reflection Phase Grating Diffusors," is a discussion of case studies involving the use of the diffusors in specific applications. Both papers are coauthored by D'Antonio and Konnert.

(continued on page 29)

The Daily

D'ANTONIO

(continued from page 8)

However, well-known architect Russel E. Berger II of Joiner-Pelton-Rose Inc., of Dallas, TX, also contributed to the second paper.

Presenting the papers will be D'Antonio, a studio owner himself; his interest in architectural acoustics and LEDE theory led to his design of the diffusors. His goal was to refine the LEDE control room by improving the dead end and creating a diffused sound field in the live end, without creating the deep comb filter effects found in many control rooms.

His method of improving the dead end involved more than the use of Sonex or fiberglass to absorb the sound. Employing the Tecron Time Energy Frequency (TEF) system analyzer in model simulation studies on diffractions from hard surfaces, he simulated the dead end by slaying its surfaces in such a way to create a reflection free zone around the mixing area.

This zone helped insure that the energy from the control room monitors only travels backward (reflection free) past the mixing position until it reaches the modular RPG Diffusors at the rear wall of the control room. When the sound contacts the diffusors it is scattered into a hemidisc (nearly 180 degrees of horizontal dispersion) and its energy is spread out over a period of time (two to six milliseconds).

This scattering of energy does not produce the deep comb filter effects that are usually caused by hard reflections. Rather, the scattering creates "desirable diffusive properties that are constant over the bandwidth of the diffusor" (over five musical octaves when using the RPG Diffusor QRD-43). These properties help eliminate coloration.

According to D'Antonio, "Conventional surface treatments employing geometrically irregular shapes, polycylindrical columns, and/or alternating reflecting and absorbing panels cannot obtain these diffusive properties." The final result is an accurate sound field at the console and throughout the room, a near ideal first reflection and diffusion without deep comb filter effects.

Marshall Electronic has introduced a new high-quality ambience device, the AES357, capable of stereo generation and room simulation among its 3,000 programs. It is on exhibit at **Booth 202.**

According to Stephen St. Croix, the AES357 has a 95 dB dynamic range and 20 kHz frequency response, and features include a remote control port and available software to control it from either an IBM PC, Apple Macintosh, or Apple IIC personal computer.

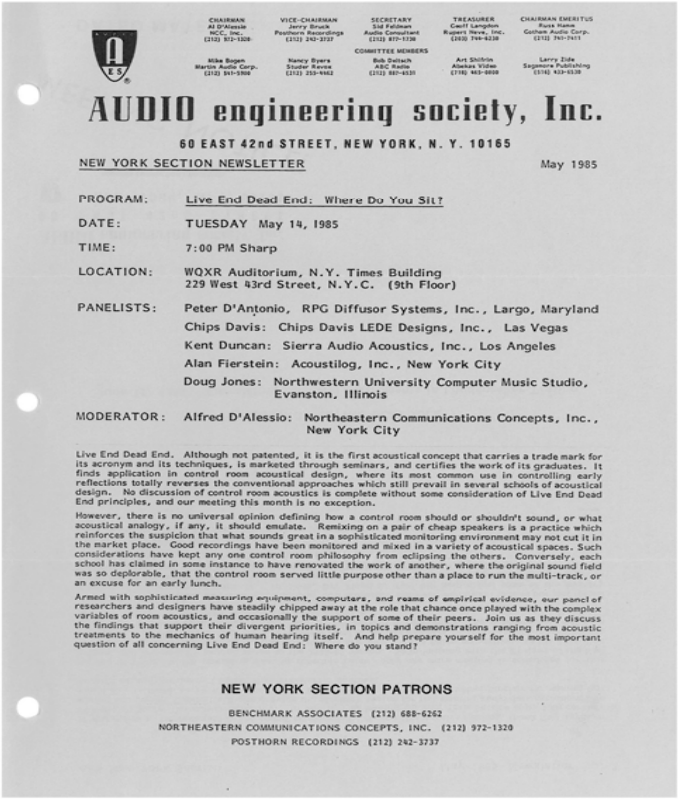
Among the unit's innovative features is a rear-projected front panel in which the words on the panel change depending on the function selected. The unit is active balanced in and out and has two inputs and four outputs. The company expects to begin shipping July 1.

1985: May AES NY Local Chapter

Photo/Michael J. Ricca

"Live End Dead End: Where Do You Sit?" was the subject of the May New York Section meeting. Answering this question are (left to right): Kent Duncan, Sierra Audio Acoustics, Inc.; Alan Fierstein, Acoustilog, Inc.; Chips Davis, Chips Davis LEDE Designs, Inc.; Doug Jones, Northwestern University Computer Music Studio, and Peter D'Antonio, RPG Diffusor Systems, Inc. Alfred D'Alessio (section chairman) Northeastern Communications Concepts, Inc., acts as moderator.

The Live-End-Dead-End control room design concept was gaining popularity in the recording industry and RPG was very involved in the scientific documentation of both the acoustical tools of absorption and diffusion used, as well as in-situ measurements. Al D'Alessio moderated a panel discussion of studio designers with a diverse background to try to present the prevailing approaches at the time. Included on the panel were Kent Duncan, Sierra Audio Acoustics, Alan Fierstein, Acoustilog, Chips Davis, Chips Davis LEDE Designs, Doug Jones, Northwestern University Computer Music Studio and Peter D'Antonio, RPG Diffusor Systems.



CHAIRMAN Al D'Alessio NCC, Inc. (212) 972-1320 | VICE-CHAIRMAN Jerry Bruck Posthorn Recordings (212) 242-3737 | SECRETARY Sid Feldman Audio Consultant (212) 877-1730 | TREASURER Geoff Langdon Rupert Neve, Inc. (203) 744-6230 | CHAIRMAN EMERITUS Russ Hamm Gotham Audio Corp. (212) 741-7411

COMMITTEE MEMBERS

Mike Bogen Martin Audio Corp. (212) 541-5900 | Nancy Byers Studer Revox (212) 255-4462 | Bob Dalisch ABC Radio (212) 887-6535 | Art Shifrin Abekas Video (718) 403-0900 | Larry Zide Sagamore Publishing (516) 433-5530

AUDIO engineering society, Inc.

60 EAST 42nd STREET, NEW YORK, N. Y. 10165

NEW YORK SECTION NEWSLETTER — May 1985

PROGRAM: Live End Dead End: Where Do You Sit?

DATE: TUESDAY May 14, 1985

TIME: 7:00 PM Sharp

LOCATION: WQXR Auditorium, N.Y. Times Building
229 West 43rd Street, N.Y.C. (9th Floor)

PANELISTS: Peter D'Antonio, RPG Diffusor Systems, Inc., Largo, Maryland
Chips Davis: Chips Davis LEDE Designs, Inc., Las Vegas
Kent Duncan: Sierra Audio Acoustics, Inc., Los Angeles
Alan Fierstein: Acoustilog, Inc., New York City
Doug Jones: Northwestern University Computer Music Studio, Evanston, Illinois

MODERATOR: Alfred D'Alessio: Northeastern Communications Concepts, Inc., New York City

Live End Dead End. Although not patented, it is the first acoustical concept that carries a trade mark for its acronym and its techniques, is marketed through seminars, and certifies the work of its graduates. It finds application in control room acoustical design, where its most common use in controlling early reflections totally reverses the conventional approaches which still prevail in several schools of acoustical design. No discussion of control room acoustics is complete without some consideration of Live End Dead End principles, and our meeting this month is no exception.

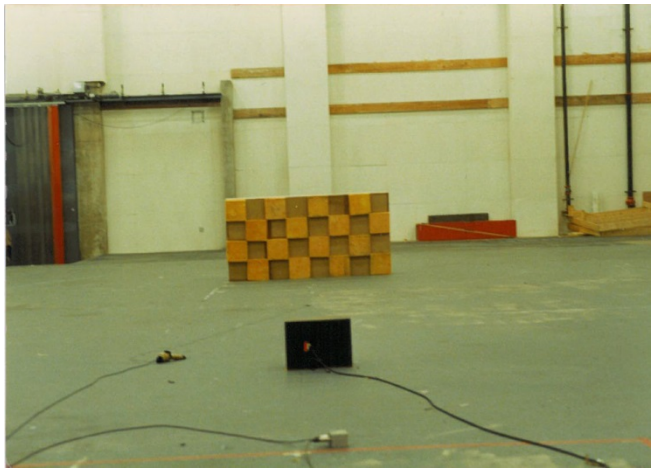
However, there is no universal opinion defining how a control room should or shouldn't sound, or what acoustical analogy, if any, it should emulate. Remixing on a pair of cheap speakers is a practice which reinforces the suspicion that what sounds great in a sophisticated monitoring environment may not cut it in the market place. Good recordings have been monitored and mixed in a variety of acoustical spaces. Such considerations have kept any one control room philosophy from eclipsing the others. Conversely, each school has claimed in some instance to have renovated the work of another, where the original sound field was so deplorable, that the control room served little purpose other than a place to run the multi-track, or an excuse for an early lunch.

Armed with sophisticated measuring equipment, computers, and reams of empirical evidence, our panel of researchers and designers have steadily chipped away at the role that chance once played with the complex variables of room acoustics, and occasionally the support of some of their peers. Join us as they discuss the findings that support their divergent priorities, in topics and demonstrations ranging from acoustic treatments to the mechanics of human hearing itself. And help prepare yourself for the most important question of all concerning Live End Dead End: Where do you stand?

NEW YORK SECTION PATRONS

BENCHMARK ASSOCIATES (212) 688-6262
NORTHEASTERN COMMUNICATIONS CONCEPTS, INC. (212) 972-1320
POSTHORN RECORDINGS (212) 242-3737

1985: July Seminal Measurements at Kaufman Astoria Studios



To document the performance of the new RPG Diffusors, attempts were made to measure the temporal and spatial response using the TEF Analyzer in full scale. This required a huge facility. Charles Bilello, a prominent studio designer working on the new Master Sound Astoria, arranged for RPG to have access to Stage H at the Kaufman Astoria Studios. At the time measuring the polar response was carried out by placing 37 microphones, spaced 5 degrees apart on a 5 m radius semicircle and a loudspeaker on a concentric 10 m radius semicircle. A PZM microphone was sequentially moved in 5 degree increments and the impulse response was recorded at each position. This was a very physical and laborious process, which today can be done in 15 minutes. This data was presented at the 79th AES in NY and represented the first comprehensive measurements of the temporal and spatial characteristics of the RPG Diffusor.

THE ACOUSTICAL PROPERTIES OF SOUND DIFFUSING SURFACES: THE TIME, FREQUENCY AND DIRECTIVITY ENERGY RESPONSE

2295 (B-6)

Peter D'Antonio
John H. Konnert
RPG Diffusor Systems, Inc.
Largo, Maryland

Presented at the 79th Convention 1985 October 12-16 New York

AUDIO AES

AES

This preprint has been reproduced from the author's advance manuscript, without editing, corrections or consideration by the Review Board. The AES takes no responsibility for the contents.

Additional preprints may be obtained by sending request and remittance to the Audio Engineering Society, 60 East 42nd Street, New York, New York 10165 USA.

AN AUDIO ENGINEERING SOCIETY PREPRINT

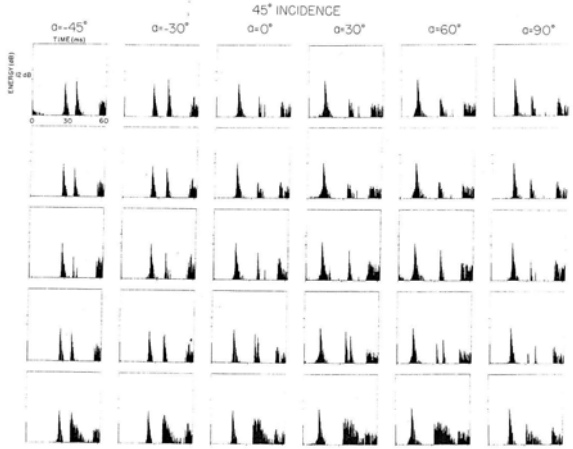


Fig. 13

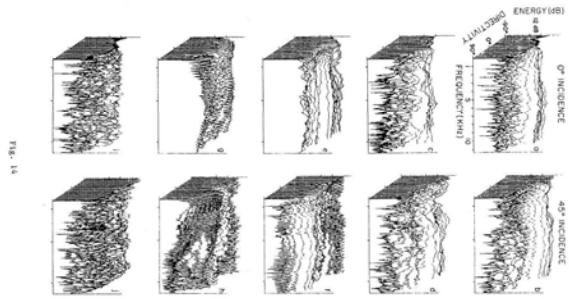
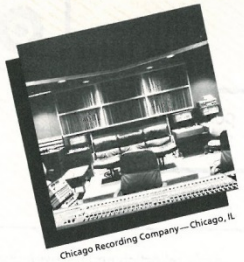


Fig. 14

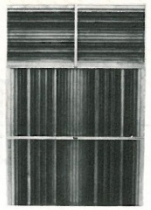
1985: August New Mix Magazine Ad and Article

As the number of studios using RPG Diffusors steadily increased RPG published a new ad in Mix Magazine, which also ran a feature article on TRC Studios that included RPG's QRD 4311 diffusors.

ANNOUNCING THE FIRST BROAD-BANDWIDTH WIDE-ANGLE ACOUSTICAL DIFFUSOR—THE RPG™



Chicago Recording Company—Chicago, IL



QRD® Cluster

TRC Studios—Indianapolis, IN

The RPG is a new modular diffusive surface treatment which uniformly distributes a broad bandwidth of acoustical energy in a room, without absorption. The RPG can easily, effectively and economically enhance the acoustics of any critical listening or performing environment.

The RPG consists of a series of wells of equal width, but different depths, separated by thin dividers. Well depths are based on quadratic-residue sequences. The spatial and temporal diffusion provided by the RPG minimizes frequency coloration by eliminating flutter echo, resonances, intense specular reflections and slap echos.

In addition, the RPG provides a unique dense reflection pattern which:

- Increases the apparent size of small rooms and the clarity and intelligibility of large rooms
- Allows accurate evaluation of signal processing and reverberation in post-production
- Increases the psychoacoustical spatial impression associated with early lateral sound
- Enhances the binaural perception of spatial textures and stereo images
- Provides ensemble reflections for performing musicians
- Affords a neutral ambiance

- ACOUSTICAL CEILINGS
- AUDIO-FOR-VIDEO
- AUDITORIUMS
- CHURCHES
- CONCERT HALLS
- CONFERENCE ROOMS
- DISC MASTERING
- EDITING SUITES
- EXHIBIT DEMO ROOMS
- FILM MIX
- MOBILE STUDIOS
- ORCHESTRAL/CHOIR SHELLS
- RADIO PRODUCTION
- RECORDING STUDIOS
- RECORDING CONTROL ROOMS
- REHEARSAL SPACES
- STEREO TV PRODUCTION
- THEATERS

The RPG is a new architectural design component which was formerly unavailable. We invite you to investigate how this innovative technology can improve the acoustics of your next project. Join the growing number of RPG diffusor users, a few of which are listed below.

Acorn Sound Recorders—Oak Ridge Boys
Hendersonville, TN

Mastermix
Nashville, TN

Mastersound Astoria
Astoria, NY

Medallion Film Labs
Toronto, Canada

NBC
Burbank, CA; Brooklyn, NY

NFL Films
Mt. Laurel, NJ

New Age Sight & Sound
Atlanta, GA

Otis Conner Productions
Dallas, TX

Polygram
New York, NY

RCA
New York, NY

Sigma Sound
New York, NY

Jimmy Swaggart Ministries
Baton Rouge, LA

Streeterville Studios
Chicago, IL

Tele-Image
Las Colinas, TX

WFMT Radio
Chicago, IL

All QRD® 2′ x 4′ modular models are now in stock

For more information write or call:
RPG DIFFUSOR SYSTEMS © 1985
12003 Wimbleton Street
Largo, Maryland 20772
301-249-5647

Canadian Representative: Gerr Electro-Acoustics, Ltd.

RPG DIFFUSOR SYSTEMS, INC.

Patent Pending

PHOTO: MCGUIRE STUDIO

Rear view of Studio A control room with D'Antonio quadratic residue diffusers.

volved in each of TRC's upgrades and expansions since 1973, Schatzlein naturally conferred with Milam regarding his plans. "Jerry's part of the 'family' here," says Schatzlein. "We just wouldn't consider a major move or equipment acquisition without involving him."

Mortuary Site Rejected

Initial plans were to relocate both 24-track rooms in a downtown building that had housed a mortuary. A local developer planned to restore the building and lease it to TRC. At Schatzlein's request, Milam asked Berger to check out the acoustic feasibility of the place.

"It was a beautiful old building," Berger says, "with stained glass windows and ornate cornice work." But the acoustic problems were formidable. The building fronted on a busy street, so additional windows of heavy laminated glass would have been needed to cover the stained glass. Isolation from low frequency noise would also have been a problem, says Berger, "because the structure is rather flimsy by studio standards." A plan to pour a resiliently-mounted concrete slab over the wooden floor at ground level was nixed by structural engineers since supports in the basement were inadequate.

"It would have cost $100,000 just to bring the building up to the level of a new shell, from the acoustic standpoint," says Schatzlein, so that site was abandoned. During a visit to Indianapolis, however, Berger happened to look at space adjacent to TRC's Studio B and told Schatzlein he thought that would be quite appropriate for the new Studio A. Studio B is located in a business/industrial park of concrete block buildings with 20-foot warehouse ceilings.

"Our clients like 'B', so the prospect of not having to move or change it much was appealing," says Schatzlein. The firm was able to get space adjoining Studio B for a total of 8,000 sq. ft. at ground level, on a nine-year lease. This allowed 6,000 sq. ft. for the two 24-track rooms, with the remaining space divided into two stories and occupied by the two smaller studios, corporate offices, and support facilities.

Selecting Design Concepts

With the site selected, Milam and Berger went to work on the plans for the new Studio A. "They really had to convince me on LEDE," says Schatzlein. "I've tended to believe the bad things I've heard about those rooms, and I just didn't want one." Berger insisted that properly-designed LEDE control rooms best achieve the objectives which define the optimum music mixing environment. According to Berger, those objectives are:

1) Control of short reflections into the mixing environment, so they do not interfere with the direct sound. This, he says, provides "even power distribution over a wide frequency bandwidth throughout the listening area."

2) Creation of "appropriate" ambience, to facilitate subjective judgments ("the room can't be anechoic"). This amount of "liveliness" allows proper judgments regarding microphone placement during recording and the addition of electronic reverberation during remix.

3) Insure that the room's ambience is diffuse as well as optimally delayed in time after the direct sound. This provides assurance that the ambient energy in the control room will not "overpower or degrade the program material."

4) Minimize hard "slap" reflections, so that the room is inert and "free from unnatural resonances and low frequency buildup."

"LEDE was originally perceived as a panacea for the correction of all control room ills," says Berger. "So it became a political issue, with almost everyone taking a firm stand either 'for' or 'against.' But practically everybody is building rooms now that incorporate at least some of the same concepts, whether they're calling them 'LEDE' or not." ("LEDE" and "Live End/Dead End" are trademarks of Synergetic-Audio-Concepts, San Juan Capistrano, CA).

The talk didn't convince Schatzlein. He flew to Dallas to evaluate Dallas Sound Labs, a studio designed by Joiner-Pelton-Rose using LEDE criteria, and came away impressed. "The 'sweet spot' was really big," he says. "The producer was getting the same flat response and stereo perspective as the engineer." But he remained concerned about the uncertainty of controlling back-wall reflections in this type of room.

Quadratic Diffusers Make the Difference

Milam and Berger convinced Schatzlein of their ability to take LEDE technology a step further in the TRC room by installing quadratic residue diffusers (QRDs), made by Peter D'Antonio's RPG Industries, in appropriate locations on the live rear wall. "I just wasn't sure about LEDE until quadratics," says Milam. "It sometimes seemed to be a hit-or-miss proposition, depending upon a hodge-podge of polycylindrical diffusers and angled panels on the back wall. With quadratics we're into a new wave of design. It's like coming out of the voodoo and into reality."

QRDs scatter an incident broad spectrum of *audio* frequency waves in a hemispherical pattern, just as the undersurface of the "Stealth" bomber will diffuse *radar* waves rather than sending reflections back to the source.

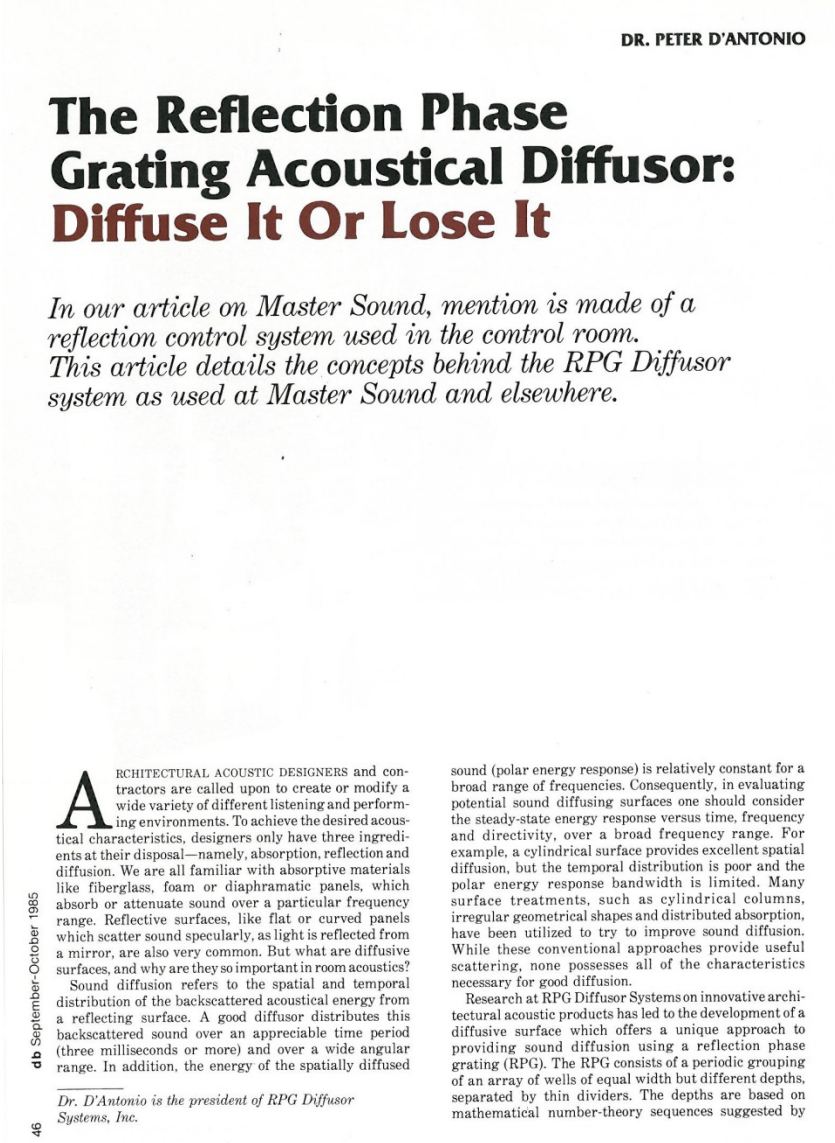
Milam says it's taken time to gain the confidence to employ QRDs to full benefit in LEDE rooms. The diffuser arrays are expensive (TRC has 14 at up to $900 each), so nobody wants to install more than are needed. "Studio design requires a balance of budget, client acceptance, and acoustical science," says Berger. "People have used these diffusers sparingly in the past to a good advantage, but the configuration at TRC seems optimal for the present state of the art."

Selecting a Builder

Having settled on design concepts, Schatzlein went in search of a builder. After evaluating a dozen contractors, TRC hired Stephco Construction of Indianapolis, headed by Chuck Ballard. "This is the fourth time we've built or completely rebuilt a multitrack room," Schatzlein says, "and we've used a different builder each time. I know what these guys try to do. The minute you glance away they start cutting corners on the acoustic specs, because they just can't believe things really need to be done to *those* kinds of tolerances. But Chuck is different." A musician himself, Ballard showed a real concern for acoustic considerations as well as aesthetics and musician comfort in the TRC rooms. He's now working as a consultant on several major studio construction projects around the country.

1985: September dB Magazine Article Master Sound Astoria

During RPG's measurements at Stage H on the temporal and spatial response of the RPG Diffusors, Master Sound Astoria was being built, as the first major production facility outside New York City in Astoria, NY. A comprehensive article was published in dB Magazine, along with an article by Dr. D'Antonio on the RPG Diffusor, which played a key role in the design by Charles Bilello.



DR. PETER D'ANTONIO

The Reflection Phase Grating Acoustical Diffusor: Diffuse It Or Lose It

In our article on Master Sound, mention is made of a reflection control system used in the control room. This article details the concepts behind the RPG Diffusor system as used at Master Sound and elsewhere.

ARCHITECTURAL ACOUSTIC DESIGNERS and contractors are called upon to create or modify a wide variety of different listening and performing environments. To achieve the desired acoustical characteristics, designers only have three ingredients at their disposal—namely, absorption, reflection and diffusion. We are all familiar with absorptive materials like fiberglass, foam or diaphramatic panels, which absorb or attenuate sound over a particular frequency range. Reflective surfaces, like flat or curved panels which scatter sound specularly, as light is reflected from a mirror, are also very common. But what are diffusive surfaces, and why are they so important in room acoustics?

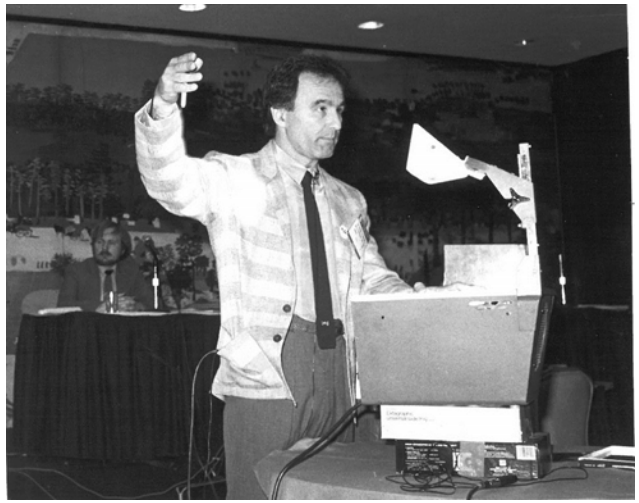
Sound diffusion refers to the spatial and temporal distribution of the backscattered acoustical energy from a reflecting surface. A good diffusor distributes this backscattered sound over an appreciable time period (three milliseconds or more) and over a wide angular range. In addition, the energy of the spatially diffused sound (polar energy response) is relatively constant for a broad range of frequencies. Consequently, in evaluating potential sound diffusing surfaces one should consider the steady-state energy response versus time, frequency and directivity, over a broad frequency range. For example, a cylindrical surface provides excellent spatial diffusion, but the temporal distribution is poor and the polar energy response bandwidth is limited. Many surface treatments, such as cylindrical columns, irregular geometrical shapes and distributed absorption, have been utilized to try to improve sound diffusion. While these conventional approaches provide useful scattering, none possesses all of the characteristics necessary for good diffusion.

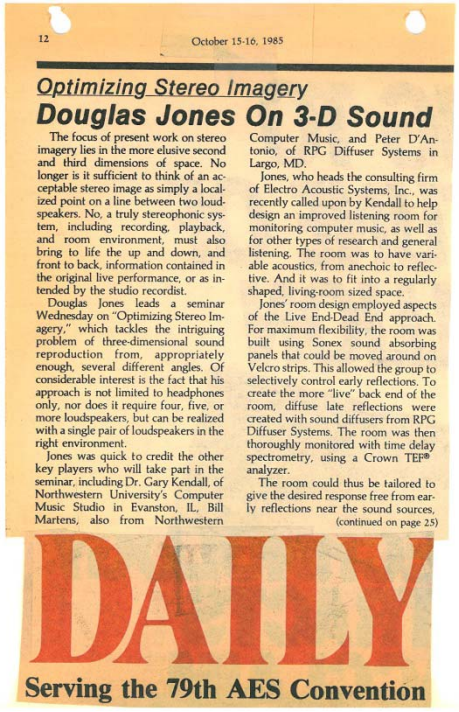
Research at RPG Diffusor Systems on innovative architectural acoustic products has led to the development of a diffusive surface which offers a unique approach to providing sound diffusion using a reflection phase grating (RPG). The RPG consists of a periodic grouping of an array of wells of equal width but different depths, separated by thin dividers. The depths are based on mathematical number-theory sequences suggested by

Dr. D'Antonio is the president of RPG Diffusor Systems, Inc.

1985: October 79th AES NY, RPG Nominated for a TEC Award

RPG was very busy at the 79th AES. Dr. D'Antonio presented his research on the first comprehensive measurements of the RPG Diffusor, RPG Exhibited it products and Dr. D'Antonio participated in a panel discussion on 3D Sound moderated by Doug Jones. Pictured in the panel are L to R Dr. D'Antonio, Dr. Bill Martens and Dr. Gary Kendall of Northwestern University.





12 October 15-16, 1985

Optimizing Stereo Imagery

Douglas Jones On 3-D Sound

The focus of present work on stereo imagery lies in the more elusive second and third dimensions of space. No longer is it sufficient to think of an acceptable stereo image as simply a localized point on a line between two loudspeakers. No, a truly stereophonic system, including recording, playback, and room environment, must also bring to life the up and down, and front to back, information contained in the original live performance, or as intended by the studio recordist.

Douglas Jones leads a seminar Wednesday on "Optimizing Stereo Imagery," which tackles the intriguing problem of three-dimensional sound reproduction from, appropriately enough, several different angles. Of considerable interest is the fact that his approach is not limited to headphones only, nor does it require four, five, or more loudspeakers, but can be realized with a single pair of loudspeakers in the right environment.

Jones was quick to credit the other key players who will take part in the seminar, including Dr. Gary Kendall, of Northwestern University's Computer Music Studio in Evanston, IL, Bill Martens, also from Northwestern Computer Music, and Peter D'Antonio, of RPG Diffuser Systems in Largo, MD.

Jones, who heads the consulting firm of Electro Acoustic Systems, Inc., was recently called upon by Kendall to help design an improved listening room for monitoring computer music, as well as for other types of research and general listening. The room was to have variable acoustics, from anechoic to reflective. And it was to fit into a regularly shaped, living-room sized space.

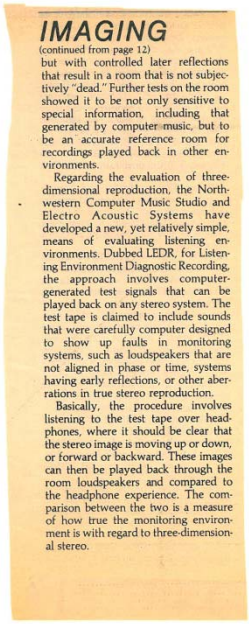
Jones' room design employed aspects of the Live End-Dead End approach. For maximum flexibility, the room was built using Sonex sound absorbing panels that could be moved around on Velcro strips. This allowed the group to selectively control early reflections. To create the more "live" back end of the room, diffuse late reflections were created with sound diffusers from RPG Diffuser Systems. The room was then thoroughly monitored with time delay spectrometry, using a Crown TEF® analyzer.

The room could thus be tailored to give the desired response free from early reflections near the sound sources.

(continued on page 25)

DAILY

Serving the 79th AES Convention



IMAGING

(continued from page 12)

but with controlled later reflections that result in a room that is not subjectively "dead." Further tests on the room showed it to be not only sensitive to special information, including that generated by computer music, but to be an accurate reference room for recordings played back in other environments.

Regarding the evaluation of three-dimensional reproduction, the Northwestern Computer Music Studio and Electro Acoustic Systems have developed a new, yet relatively simple, means of evaluating listening environments. Dubbed LEDR, for Listening Environment Diagnostic Recording, the approach involves computer-generated test signals that can be played back on any stereo system. The test tape is claimed to include sounds that were carefully computer designed to show up faults in monitoring systems, such as loudspeakers that are not aligned in phase or time, systems having early reflections, or other aberrations in true stereo reproduction.

Basically, the procedure involves listening to the test tape over headphones, where it should be clear that the stereo image is moving up or down, or forward or backward. These images can then be played back through the room loudspeakers and compared to the headphone experience. The comparison between the two is a measure of how true the monitoring environment is with regard to three-dimensional stereo.

1985: October Forbes Magazine Article

RPG Diffusor Systems was mentioned in a Forbes Magazine article describing the use of mathematical number theory by Prof. Manfred Schroeder.

Technology

Edited by Stephen Kindel

For centuries, number theory was mathematics' answer to omphaloskepsis. Great, but what's the point? Now, at last, a point.

Applied gozinta

By William Baldwin

TRADITIONALLY, nothing better portrayed the crystalline beauty of mathematical truth than number theory. Its practitioners pursued such seemingly trivial objects as perfect numbers, which equal the sum of their divisors (6=1+2+3). But to what end? From Euclid to Carl Friedrich Gauss (1777-1855), perhaps the greatest mathematician of them all, number theory remained a fascinating yet wholly unproductive pursuit. The "queen of mathematics" couldn't design a bridge or balance a budget. Applied number theory seemed about as useful a concept as applied poetry.

That is now changing. A book* by an AT&T Bell Laboratories scientist, Manfred Schroeder, details the extraordinary variety of modern tasks to which integers are relevant. He lists, among other things, encryption, antenna design, satellite picture transmission, precision measurements in physiology, concert hall acoustics, even the Stealth bomber.

Schroeder, 59, divides his time between the ivory tower and the ground floor of technology. He spends half the year in West Germany teaching physics and applications of number theory at the University of Göttingen, Gauss' home in the 19th century. The other half he spends at AT&T in Murray Hill, N.J., working on computer speech, the physiology of hearing and room acoustics.

How does number theory fit in with acoustics? Begin with this concept: Number theory is the science of gozinta. That is, 17 goes into 34 evenly, but no whole number bigger than 1 goes into 17 evenly. Thus, 17 is a prime number. Next on the gozinta list: remainders. When 49 is divided by 17, the answer is 2 with a remainder of 15. In this branch of mathematics, the 15 is much more important than the 2. We will see why in a minute.

One of the central problems of acoustics is unwanted reflections. Music reflected directly off a concert hall ceiling sounds flat because it reaches a listener's left and right ear simultaneously. For slightly different reasons, sound bouncing directly off the back wall of a recording studio makes it difficult for the recording engineer to hear what he is doing as he moves around the mixing console.

The solution: sound-diffusing panels that would scatter sound waves evenly off the walls or ceilings. But what shape of diffuser would best do the trick?

Sound waves bouncing around a room are like ripples bouncing off the sides of a swimming pool. When they are lined up, they can reinforce one another. When they aren't, they cancel out to some extent. The array of reinforcement and canceling determines how the sound is scattered.

Consider a sound wave 17 inches long, which happens to have a pitch in the soprano range. Its peak-and-trough pattern repeats every 17 inches. If the wave bounces off a soundboard in such a way as to travel an extra 49 inches, how much cancelation will there be? The same as with an extra distance of 15 inches. Why? Because any full 17-inch segment can be ignored. What counts is the remainder on division of 49 by 17. That remainder is 15.

Remainders, clearly, have something to do with designing the reflecting panel. But what? Here is where Schroeder's academic connection paid off. "Gauss' 200th birthday was celebrated in Göttingen in 1977 with talks by famous mathematicians," he recalls. "One mentioned the pioneering work Gauss had done on quadratic residues. When I heard that, I realized that was my solution."

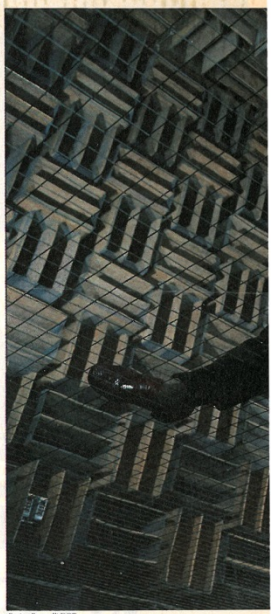
Finding quadratic residues means taking all the numbers less than a prime number (for example, less than 17) and multiplying each by itself. Divide 17 into each result and then look only at the remainder, or residue *(see table, opposite)*. This pattern of remainders tells how to build a reflecting panel. The soundboard is separated into narrow strips that jut out different distances, in proportion to that series of remainders.

Gauss worked out the difficult mathematics that Schroeder used to show the even scattering that results from quadratic residues. As it turns out, the pattern of distances works for a whole range of wavelengths. Baritones' voices are scattered along with sopranos'.

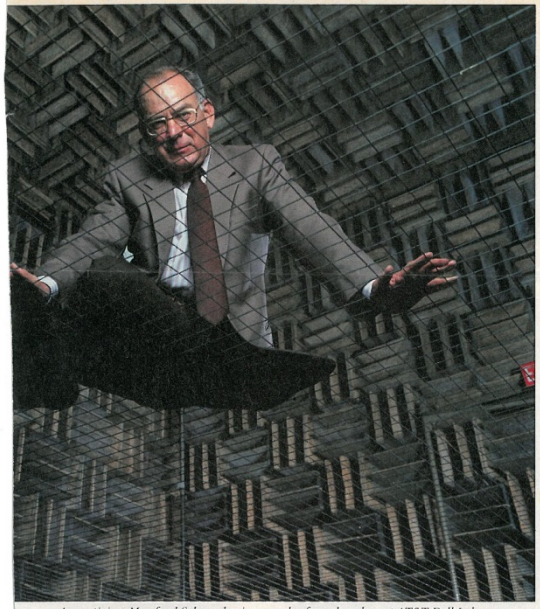
Schroeder's discovery is already in use. Several concert halls, including Wellington (New Zealand) Town Hall, have installed these reflectors. A three-year-old Largo, Md. company, RPG Diffusors Systems Inc., has a thriving business manufacturing reflectors with quadratic residue patterns. Says customer Ben Rizzi, co-owner of a New York recording studio: "With these Schroeder boxes the wall disappears."

And how is the telephone company making out in all this? It's doing fine with its 45 patents on Schroeder's work—from taking the screech out of public-address speakers to making music more stereophonic—but the Schroeder boxes are in the public domain. Equations can't be patented, and neither AT&T nor Schroeder is collecting royalties on quadratic residues. But then Gauss, who was pursuing only their mathematical perfection, never did either.

*Number Theory in Science and Communication, Springer-Verlag, 1984.



Enrico Ferorelli/DOT



Acoustician Manfred Schroeder in an echo-free chamber at AT&T Bell Labs
How to make walls and ceilings "disappear."

Music by the numbers

Multiply a number (top line) by itself (middle line), then divide by a prime number—here, 17. Keep only the remainder, or residue (bottom line). A 19th-century mathematician discovered the key formulas involving such quadratic residues. A 20th-century scientist put them to work in concert halls.

Number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Square of number	1	4	9	16	25	36	49	64	81	100	121	144	169	196	225	256
Remainder	1	4	9	16	8	2	15	13	13	15	2	8	16	9	4	1

Electronic building blocks

Three years ago Arthur Hahn was TRW's answer to the one-armed paperhanger. As facilities manager for the Los Angeles-based defense contractor, Hahn had administrative responsibility for the maintenance of more than 130 buildings totaling 8 million square feet and housing 30,000 TRW employees across the country. Amazingly, TRW had never provided Hahn a computer to do all that, and now his 200-person planning department was drowning in paper: stacks of leases, deeds, contracts and inventory lists. Finally, Hahn's department was given IBM PCs, and Hahn started trying to make sense of the mess in his department by transcribing everything onto floppy disks.

Sound bizarre for an aerospace giant on the frontiers of high tech? Indeed so, but in its buggy whip approach to

1985: October Nobel Prize

In 1985, Dr. D'Antonio was still employed at the Naval Research Laboratory as a diffraction physicist, while actively promoting and growing RPG Diffusor Systems. During a taxi ride to the airport following the 79th AES, Dr. D'Antonio heard the news on the radio that his supervisor Dr. Jerome Karle had received the Nobel Prize in Chemistry!

2 American Scientists Win Nobel in Chemistry

NOBEL, From A1

val Research Lab. "I do the physical applications, he works with the theoretical," she said. "It makes a good team. Science requires both types."

At an airport news conference, Karle was asked if he had anticipated winning. "There are very few serious scientists who don't fantasize about it one time or another," Karle said. "I thought it might be possible. The fact that it has actually happened is a little bit new."

The awards, whose recipients are determined by the Royal Swedish Academy of Sciences, include a medal bearing the likeness of Alfred Nobel, the Swedish inventor who established the prizes under the terms of his will in 1896 and endowed them with his earnings from the invention of dynamite.

Karle and Hauptman won for creating a method to determine the three-dimensional structure of all but the biggest molecules. Knowing the detailed molecular structure of a chemical can be crucial in determining how it works, or in trying to make the substance artificially.

Knowledge of molecular structure is important in chemistry and all the fields in which chemistry plays a role, from gene engineering to materials research to drug research.

"The Nobel Prize for chemistry is all about changing the field of chemistry. And this work changed the field," said Nobel laureate William Lipscomb of Harvard University. He said that throughout the field, the so-called "direct method" of Karle and Hauptman is used 80 to 90 percent of the time that molecule structures are determined.

A few decades ago, it could take months or even years to decipher the atomic structure of a substance. "It used to be a PhD thesis to run a structure or two," Lipscomb said. But now, with the direct method run on a computer, "You don't even have to be a crystallographer to get a 3D model of something. I have a service here that determines structure that is run by graduate students. It takes only a day or two now."

In chemistry, substances act the way they do because of their structure. For example, hemoglobin in the blood can carry oxygen because it can fold over and hold an oxygen molecule inside it. When it arrives at its destination in the body, another molecule by its shape triggers the unfolding of th release of the oxy

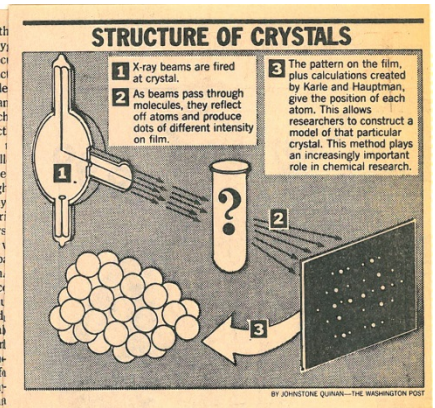
Because molec inate chemical ac it is crucial to de compare them, an tive sites" which their power to act

Determining with what is call lography has be challenge through In crystallography fired at a materi formed into crys reflect off atoms and produce a p photographic film.

The pattern c oms' positions m of light reflected balls in dance ha the facets of the r

The "direct m ematical system f sity of the X-ra with other measu struct the placem crystal. This give sional shape for t

Such a shape c example, where t a drug is and be new versions of i anticancer drug from plants, Willi that chemists orig out its structure the direct metho correct structu mined—and with



BY JOHNSTONE QUINAN—THE WASHINGTON POST

at which the electrons pile up at one edge does not vary smoothly with smooth changes in the magnetic field. Instead the rate changes in a stepwise fashion.

In other words, the metal's resistance to the sideways Hall current diminishes in discrete steps, or quanta, even as the magnetic field increases smoothly.

"This is probably not the easiest thing to understand but as far as physicists are concerned, it was clearly Nobel caliber work," said Arthur Gossard, a physicist who has made related discoveries at Bell Labs in Murray Hill, N.J.

Gossard said von Klitzing's discovery would permit the development of more precise standards for measuring electrical resistance, which is expected to be used in microelectronics.

Staff writer John F. Harris contributed to this article.

2 Americans Win Nobel Prize in Chemistry

Local Naval Researcher Cited for Work in Molecular Structures

By Philip J. Hilts
and Boyce Rensberger
Washington Post Staff Writers

A West German and two Americans, including a naval research scientist here, won Nobel Prizes in chemistry and physics yesterday. The chemistry award went to the Americans for inventing a method to determine the three-dimensional shape of molecules.

The physics prize, to a West German, was for his discovery of how electrons behave as they flow through a conductor in the form of electricity.

The chemistry prize went jointly to Herbert A. Hauptman, 68, a professor at the Medical Foundation of Buffalo, N.Y., and Jerome Karle, 67, a researcher at the U.S. Naval Research Laboratory here. The physics award was given to Klaus von Klitzing, 42, of the Max Planck Institute in Stuttgart.

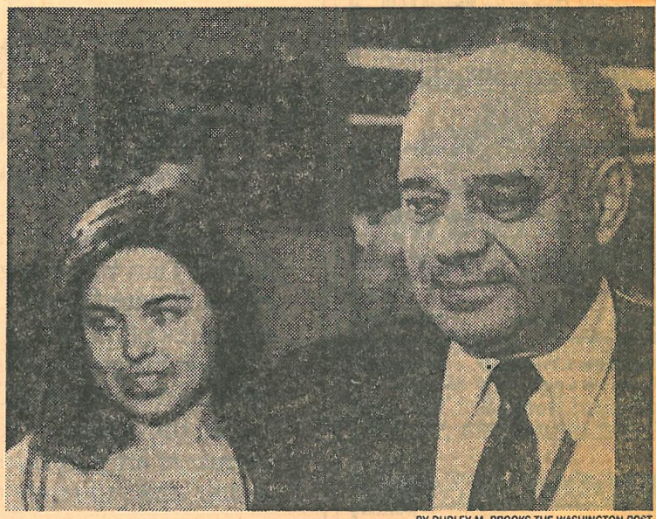
Karle, who lives in Falls Church, was aboard a flight from Munich to Dulles airport when he learned over the plane's public address system that he had won a share of the cash prize of 1.8 million Swedish kronor, or about $225,000.

"We are honored to have flying with us today America's newest Nobel Prize winner, and he doesn't even know it," said the Pan Am pilot. The passengers applauded and crew members opened a bottle of champagne for Karle.

Karle's wife Isabella, a scientist who has won numerous prizes for applying the method worked out by her husband and Hauptman, learned of the award when she arrived at work yesterday morning at the Na-

See NOBEL, A14, Col.1

■ *Navy lab nurtured career of Nobel winner Karle.* *Page A14*


BY DUDLEY M. BROOKS-THE WASHINGTON POST

New laureate Jerome Karle and daughter Madeline Tawney at Dulles airport.

1985: December Mix Tele-Image Article

At the end of a very busy year, Mix Magazine published a feature article on the use of RPG Diffusors at Tele-Image

The new audio control room at Tele-Image

PHOTO: CHAS McGRATH

MULTI-TRACKING IN THE EDIT SUITE

DALLAS' TELE-IMAGE PREPARES FOR STEREO TV

by Russell E. Berger II and Charles Chiles

Impressive growth in the Dallas area media market is no surprise considering the healthy economic environment. By investing $6.3 million in a new 32,500 square foot Dallas Communication Complex facility, the Tele-Image video facilities company has made a big bet on future market growth.

Traditionally, the careful mixing of synchronous audio to the edit master's two audio tracks is a vital and necessary part of the edit process. Quality productions often require time consuming attention to the details of audio during editing. When the finished product was to be monophonic and of modest fidelity,