

30th Annual NHCA Hearing Conservation Conference

Decibels in the Desert

February 24 – 26, 2005
Doubletree Hotel at Reid Park
Tucson, Arizona

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The logo for the National Hearing Conservation Association (NHCA). It features the letters "NHCA" in a bold, black, sans-serif font. The letter "H" is stylized with a white zigzag line passing through it, representing sound waves.

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Spectrum is a quarterly publication of the National Hearing Conservation Association, 7995 E. Prentice Avenue, Suite 100, Greenwood Village, CO 80111-2710. The information contained herein is designed to promote action and discussion among members. The information has been obtained from sources believed reliable, and the editors have exercised reasonable care to assure its accuracy. However, the NHCA does not guarantee that the contents of this publication are correct, and statements published do not necessarily reflect the opinion or official position of the NHCA.

Spectrum is available without charge to NHCA members in all categories. Anyone interested in publishing in Spectrum should contact Karen Wojdyla at the national office, or David Byrne or Kevin Michael, Co-Editors.



WELCOME TO DECIBELS IN THE DESERT

THE 30TH ANNUAL NHCA HEARING CONSERVATION CONFERENCE

The NHCA Program Committee has put together three full days of outstanding workshops, lectures, discussions and posters. The program has been designed to provide a broad spectrum of information, from practical tools and ideas for improving the day-to-day practice of hearing conservation to the latest research on noise exposure and hearing loss prevention.

Please set aside some time to visit the exhibit hall and discover the wide variety of products and services being offered by NHCA commercial members and other exhibitors. While you are in the exhibit hall, be sure to check out all the many unique and useful items that have been donated to the NHCA Silent Auction. Your generous bids help support NHCA and the NHCA Scholarship Foundation.

As always, there will be plenty of time for networking, socializing, and fun. On Wednesday, it's the NHCA Golf Tournament. Proceeds benefit the NHCA Scholarship Foundation. The opening reception, Thursday evening from 5 to 9 P.M. in the exhibit hall, is

a great opportunity to meet with exhibitors, members, students and guests. On Friday night, I hope you will join us for an evening of food, fun, and entertainment, including a live auction, at the Oasis at Wildhorse Ranch.

"Decibels in the Desert" promises to be one of the best conferences in our 30-year history. Much credit and thanks go to Theresa Schulz, NHCA Director of Education, and the NHCA Program Committee. Thanks also to Doug Ohlin and Jerry Jensema for organizing the golf tournament, and to Susan Megerson for assuring that the Student Conference Award program was a success.

Most of all, thank you for being here. Enjoy your time in Tucson.



Ted K. Madison, President

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NHCA AWARD

Outstanding Hearing Conservationist Award

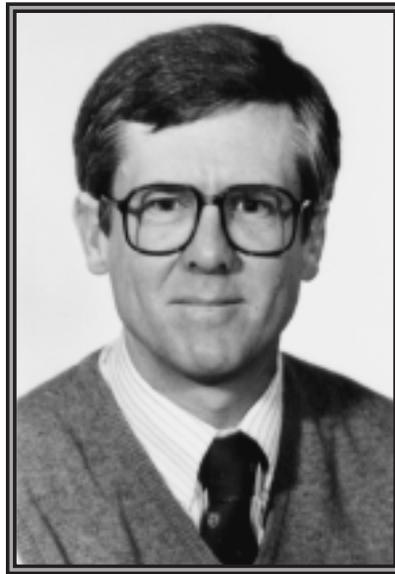
Established in 1990, the Award for Outstanding Contributions to the Field of Hearing Conservation is given to a person whose work is exemplary in our field. It is a pleasure to announce that this year's recipient is Dr. Robert Dobie for his contributions to hearing-loss prevention and to the evaluation of the effects of noise on hearing

Bob is a Clinical Professor in the Department of Otolaryngology – Head and Neck Surgery at the University of California Davis, Medical Center. When he entered medical school, Bob had thoughts of becoming a neurologist, neurosurgeon or psychiatrist. His medical school program at Stanford required significant research in the first two years of the program, but his attempts to find an opening in one of the laboratories in the areas that interested him were futile. However, at the suggestion of one of his professors, Bob contacted Dr. Blair Simmons in the ENT department, and his career in otolaryngology was inaugurated.

Bob completed his otolaryngology residency at Stanford in 1975, and then proceeded to a research fellowship in auditory physiology at the Kresge Hearing Research Laboratory in New Orleans. Later he completed a clinical fellowship in otoneuro-surgery in Zurich, Switzerland. His wide professional experiences include positions as:

- Professor and Chairman, Department of Otolaryngology-Head and Neck Surgery at the University of Texas Health Science Center, San Antonio, TX
- Director of Division of Extramural Research at the National Institute on Deafness and Other Communication Disorders, Bethesda, MD
- Director of the Virginia Merrill Bloedel Hearing Research Center at the University of Washington School of Medicine, Seattle, WA
- Corporate Consultant in Otology for Kaiser Aluminum and Chemical Corporation, Oakland, CA

In his 15 years at the University of Washington, Bob's skill at imparting information and mentoring students was repeatedly recognized by residents in the Department of Otolaryngology-Head and Neck Surgery. They presented him, on no



Dr. Robert Dobie

less than five occasions, with the Driftwood Award for the faculty member who contributed the most to resident training.

Just as Bob's venture into medical school did not follow his original career plans, his foray into the area of occupational hearing conservation and hearing loss prevention was also serendipitous. One of his medical school housemates was the son of Jim Hughes, the Medical Director for the Kaiser Aluminum and Chemical Corporation in the mid-1970s. Knowing that Bob was completing a residency in otolaryngology, Dr. Hughes explained that Kaiser was attempting to develop a hearing conservation program and that while he had been familiar with some of the materials written by Drs. Aram Glorig and Joseph Sataloff, he felt that Kaiser needed additional help and thought Bob was the man for the job. Bob indicated that while he did not know much about hearing conservation at that time, he was willing to learn. He became a consultant to Kaiser Aluminum in 1976, a position he held until

1986 when Kaiser outsourced their occupational medicine department.

As Bob became more knowledgeable about hearing conservation, so too did his appreciation for the field. It became apparent to him that his efforts could make a difference to a large number of people, especially when he recognized the potential preventive aspects of hearing conservation to help others avoid the untoward health effects of unprotected exposure to hazardous noise.

The contributions realized from Bob's focus on hearing conservation/hearing-loss prevention, are legion. His efforts and insight have impacted critical and controversial hearing-conservation related topics such as calculation of hearing handicap and the determination of impairment, apportionment of hearing loss, workers' compensation, the effects of impulse noise, definitions of threshold shift and the evaluation of hearing-conservation program adequacy, the detection of hearing loss in individual cases and the importance of the noise notch, the evaluation and treatment of tinnitus with particular attention to its relationship to depression, and even the auditory risks associated with the discharge of automotive airbags. Bob also has provided substantial and varied contributions in other areas of otolaryngology, largely unrelated to hearing conservation: facial nerve function, temporal coding in the cochlea, head and neck carcinomas, Meniere's disease and its relationship to the progression of hearing loss, cochlear implants, and the detection of malingering. But it is not just the breadth of the areas he has investigated, it is the quality, depth and sophistication of his analyses that are so important to those of us who have studied and relied upon his publications.

As one might imagine from the range of topics Bob has addressed, not only within our field but also in the broader context of

otolaryngology, he is a prolific writer. Bob has authored (or co-authored) numerous books, monographs, chapters in textbooks, over 100 papers, and frequent editorials and letters to editors. Eight of his books, 29 of his chapters and at least 20 of his papers are pertinent to hearing conservation and hearing loss prevention. Practitioners in our field are probably most familiar with his highly regarded and often-quoted text, *Medical-Legal Evaluation of Hearing Loss*, which is now in its second edition. But of equal import are the monographs that have been produced under his tutelage by the National Academy of Science (*Hearing loss: Determining Eligibility for Social Security Benefits*) and the American Academy of Otolaryngology – Head and Neck Surgery (*Evaluation of People Reporting Occupational Hearing Loss*).

Throughout the years, Bob has shared his knowledge and expertise with numerous organizations, including the Council for Accreditation in Occupational Hearing Conservation (CAOHC), the Committee on Hearing, Bioacoustics, and Biomechanics (CHABA), the American Academy of

Otolaryngology – Head and Neck Surgery (AAOHN), the American College of Occupational and Environmental Medicine (ACOEM), the American National Standards Institute (ANSI), and of course the National Hearing Conservation Association (NHCA).

As a member of the CAOHC Council for 10 years, Bob served as its Secretary/Treasurer and developed a pattern of investment strategy and reporting that is still utilized today. He collaborated and starred in the CAOHC video, *Anatomy, Physiology and Diseases of the Ear*; which is utilized as part of the curriculum for training Occupational Hearing Conservationists.

Bob has been a voting member of the ANSI S3 Committee on Bioacoustics, served on ANSI's Working Group S12/WG34 (Methodology for a Hearing Conservation Program), was a member of the CHABA Executive Committee from 1987-1990, and served on CHABA's Working Group on Hazardous Exposure to Intermittent and Steady State Noise from 1998 to 1993. The high esteem in which he is held by his peers is reflected by

the fact that he has served as President of the Association for Research in Otolaryngology and has held the chairmanship of numerous professional/scientific committees and work groups.

For a professional of such tremendous stature and contributions to our field, what we are struck with is his quiet and thoughtful approach, and willingness to consider alternative points of view. But perhaps even more compelling is that in a world of exploding information and seeming boundless publications and reports of unknown pedigree, Bob is a contributor to whom we can turn, with complete confidence that his evaluation has been conducted with insight and attention to detail, and that his conclusions are well founded and reliable. Bob is truly the ultimate "go to" person when what one seeks is a definitive examination of the problem at hand. And as his many students and associates can attest, he is someone who freely and humbly shares his knowledge and friendship.

Elliott H. Berger

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COMMITTEE & ALLIED MEETINGS

WEDNESDAY, FEBRUARY 23

| <i>Time:</i> | <i>Group:</i> | <i>Room:</i> |
|-----------------------|-------------------------|--------------|
| 8:00 A.M. – NOON | Executive Council | Ironwood |
| 6:00 P.M. – 7:15 P.M. | Program Committee | Ironwood |
| 7:30 P.M. – 8:30 P.M. | Member Services Council | Ironwood |

THURSDAY, FEBRUARY 24

| | | |
|-----------------------|------------------------|---------|
| 4:00 P.M. – 5:00 P.M. | Scholarship Foundation | Redwood |
|-----------------------|------------------------|---------|

FRIDAY, FEBRUARY 25

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|-----------------------|--------------------|----------|
| 4:30 P.M. – 5:30 P.M. | OSHA Alliance Team | Basswood |
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SATURDAY, FEBRUARY 26

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|-----------------------|-------------------|---------------|
| 7:30 A.M. | HCE | Boojum/Bonsai |
| 6:00 P.M. – 8:00 P.M. | Executive Council | Ironwood |

SUNDAY, FEBRUARY 27

| | | |
|------------------|--|---------|
| 8:30 A.M. – NOON | ANSI S12/WG11 Hearing Protector Attenuation and Performance | Redwood |
|------------------|--|---------|

EXHIBIT SCHEDULE — SALONS E–H

THURSDAY, FEBRUARY 24

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| Exhibit Set-up and Registration 11:00 A.M.-4:00 P.M. |
| Exhibit Open |
| Opening Reception in Exhibit Hall 5:00 P.M.-9:00 P.M. |

FRIDAY, FEBRUARY 25

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| Continental Breakfast/ Exhibits Open 7:30 A.M.-8:30 A.M. |
| Break/Exhibits Open 10:00 A.M.-10:45 A.M. |
| Luncheon with Exhibitor Introductions 12:00 NOON-1:30 P.M. |
| Break/Exhibits Open 2:25 P.M.-3:10 P.M. |

SATURDAY, FEBRUARY 26

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|--|
| Exhibits Open 7:30 A.M.-8:00 A.M. |
| Break/Exhibits Open 10:00 A.M.-11:00 A.M. |
| Exhibit Dismantling 12:00 NOON-4:00 P.M. |

LIVE AND SILENT AUCTION

Participate in NHCA's Live and Silent Auctions and bid on items to help support our organization! If you are interested in donating an item for one of the auctions, please bring that item(s), or a certificate, to the conference registration desk. The live auction will be held on Friday evening at The Oasis at Wildhorse Ranch. The Silent Auction will run through Saturday morning.

2005 STUDENT CONFERENCE AWARDS

NHCA is pleased to announce the recipients of this year's Student Conference Award. This award is available to students who are actively pursuing a degree in a discipline related to hearing conservation and who are enrolled at least half time in an accredited educational institution. Applications were submitted by students from a variety of academic programs across the country. Recipients receive free conference registration and partial reimbursement for travel expenses. Special thanks go to our 2005 sponsors for making this program possible: 3M Occupational Health & Environmental Safety Division, Aearo Company, the American Industrial Hygiene Association, Bacou-Dalloz Hearing Safety Group (Bilson/Howard Leight), James Lankford, Quest Technologies, Inc., Sonomax and Westone Laboratories.

Please welcome this year's award winners to the conference:

Elizabeth Beal, Central Michigan University
Third Year AuD program

Dana Libman, University of South Florida
Third Year AuD program

Rachel Sanders, University of Northern Colorado
Second Year AuD program



Join us for the
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Hearing Conservation
Conference

February 16–18, 2006

Hyatt Regency Tampa
Tampa, Florida

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❖ **American Academy of Audiology**

The American Academy of Audiology represents over 9,700 audiologists and is dedicated to providing quality hearing care services through professional development, education, research, and increased public awareness of hearing and balance disorders. To learn more about the audiology profession and how audiologists are helping the 28 million Americans who suffer from hearing loss, please visit the Academy’s web site at www.audiology.org.

❖ **American Industrial Hygiene Association**

Founded in 1939, the American Industrial Hygiene Association (AIHA) is the premier association of occupational and environmental health and safety professionals. AIHA’s 12,000 members play a crucial role on the front line of worker health and safety every day. Members represent a cross-section of industry, private business, labor, government and academia.

❖ **American Speech-Language-Hearing Association**

ASHA is the professional, scientific, and credentialing organization representing over 115,000 audiologists, speech-language pathologists, and hearing and speech scientists who provide hearing conservation, diagnostic, rehabilitative, and consultative services and conduct research for children and adults who are at risk for or have hearing, balance, speech, language, and/or swallowing disorders. Approximately 45 percent of ASHA’s audiologists provide hearing conservation services for industry. For more than a decade, ASHA coordinated the efforts of the Coalition to Protect Workers’ Hearing, which address federal regulatory initiatives from OSHA,

NIOSH, MSHA, and agency reform efforts by Congress. ASHA has a Special Interest Division on Hearing Conservation.

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❖ **Centers for Disease Control and Prevention; National Institute for Occupational Safety and Health**

The National Institute for Occupational Safety and Health (NIOSH) is the federal agency responsible for conducting research, disseminating information, and issuing recommendations regarding prevention of work-related disease injury. NIOSH is part of the Centers for Disease Control and Prevention (CDC) and also investigates potentially hazardous working conditions when requested by employers or employees. Headquartered in Washington, D.C., NIOSH has offices in Atlanta, Georgia, and research divisions in Cincinnati, Ohio; Morgantown, West Virginia; Bruceton, Pennsylvania; and Spokane, Washington.

❖ **Council for Accreditation in Occupational Hearing Conservation (CAOHC)**

CAOHC is dedicated to the establishment and maintenance of training standards for those who safeguard hearing in the workplace. CAOHC has been a leader in providing standards for occupational hearing conservation programs since its inception in 1973. CAOHC certification offers the certified occupational hearing conservationist (COHC) credibility and serves as verification that the conservationist has been trained to the highest standards. CAOHC certification is recommended by the Occupa-

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tional Safety and Health Administration (OSHA) and is mandatory for the Mine Safety & Health Administration (MSHA). In 2003 the 4th Edition *Hearing Conservation Manual*, by Alice Suter, Ph.D., was introduced. All hearing conservation team members will find this manual vital in the front-line defense against hearing loss in workers. More information about CAOHC is available on the worldwide web at: www.caohc.org

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❖ OSHA-NHCA Alliance

The Occupational Safety and Health Administration (OSHA) and National Hearing Conservation Association (NHCA) Alliance, which was signed June 2, 2003, focuses on helping to prevent noise-induced hearing loss (NIHL) from exposure to industrial noise and other environmental factors for all workers. OSHA and NHCA will use their expertise to help advance a culture of good hearing health by developing and implementing Hearing Conservation Programs (HCPs) and Hearing Loss Prevention Programs (HLPPs) while sharing best practices and technical knowledge.

Continued on page 12

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This online program is fast, economical, and no additional software is required. Program updates are automatic on the Internet service and customized to meet client's needs. Excellent technical support provided. For overview visit: www.resultgroup.com or call ResultGroup, Inc., 865-680-6331, email: info@resultgroup.com.

❖❖ Sonomax

Sonomax Hearing Healthcare Inc. (www.sonomax.com) has developed, manufactures, and markets a groundbreaking in-the-ear platform technology and SonoPass™ fitting software that allows its proprietary earpiece to be permanently customized to the exact shape of an ear, on the spot, in minutes. This is a major advancement for all auditory applications because it delivers effective interface with the ear that is easily fit and dramatically enhances the performance and comfort of all in ear communications products. Commercial applications are numerous and include: hearing protection, noise cancellation & Digital sound processing (DSP), voice critical communication units for military and first responders, hearing aids, cellular telephone headsets, MP3 players, and other wireless transmission technologies. Given the Worldwide convergence of increased awareness and intolerance to the danger of loud noise and hearing loss's unacceptable prevalence as the workplace's most common occupational illness, advancements in hearing aid circuitry and baby boom demographics, and the communications explosion of the 21st century, Sonomax is relevant to markets that number in hundreds of millions of people.

Tremetrics

Tremetrics provides a complete line of microprocessor and digital audiometers, mobile testing systems, hearing test booths and comprehensive hearing/health data management software. The new HT Wizard Easy-Touch audiometer provides innovative features never before offered in a stand-alone audiometer. Tremetrics is your source for total hearing testing solutions, service and calibration.

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sorry

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We hear you

WINNERS OF NHCA "Hearing Safety" CONTEST 2003



Petr Mironets



Kelsey Landeis



Nate Anderson



Lynn Nguyen

The winners of NHCA's "Hearing Safety" contest in 2003 were third graders at Panther Lake Elementary in Kent Washington. Their teacher was Mrs. Lynn Thompson.

CONFERENCE PROGRAM

THURSDAY, FEBRUARY 24

| | | |
|--|---|----------------|
| 7:30 A.M. – 5:30 P.M. | Registration and Information Desk Open | Ballroom Foyer |
| 7:30 A.M. – 8:30 A.M. | Continental Breakfast | Ballroom Foyer |
| 8:30 A.M. – 11:30 A.M. | Morning Workshops | |
| <p>Workshops (Select one of the following workshops. You must pre-register for each session—available on a first-come, first-served basis until full)</p> | | |
| A.M. or P.M. | <p>1. Noise Exposure Assessment: Sampling Strategy and Data Acquisition <i>Lee D. Hager, Sonomax Hearing Healthcare, Inc., Portland, MI</i></p> | Bonsai |
| A.M. or P.M. | <p>2. Controversies of Medical/Legal Evaluations <i>Robert A. Dobie, M.D., UCDCM, Sacramento, CA</i></p> | Boojum |
| A.M. or P.M. | <p>3. Auditory Warning Signal and Display Design <i>John G. Casali, Ph.D., CPE, CIE, Virginia Tech, Blacksburg, VA</i> <i>Jeff A. Lancaster, Ph.D., Virginia Tech, Blacksburg, VA</i></p> | Ironwood |
| A.M. only | <p>4. Otoacoustic Emissions 101 <i>Martin S. Robinette, Ph.D., Mayo Clinic College of Medicine, Mayo Clinic, Scottsdale, AZ</i></p> | Salon B |
| P.M. only | <p>5. Happy Ears—Acoustical Literacy and Acoustical Advocacy <i>Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R/Aearo Company, Indianapolis, IN</i> <i>Les Blomberg, Executive Director, Noise Pollution Clearinghouse, Montpelier, VT</i></p> | Salon B |
| 8:30 A.M. – 4:00 P.M. | <p>All-Day Seminar—Hearing Loss Prevention: The Basics</p> <ul style="list-style-type: none"> • Effective Hearing Protection <i>Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R/Aearo Company, Indianapolis, IN</i> • The Audiogram—How to Use It <i>Mary M. McDaniel, M.S., CCC-A, Pacific Hearing Conservation, Inc., Seattle, WA</i> • Hearing Loss Recordability Issues <i>Susan C. Megerson, M.A., CCC-A, University of Kansas, Shawnee Mission, KS</i> • Noise Measurement <i>Rick L. Neitzel, M.S., CIH, University of Washington, Seattle, WA</i> • Hot Topics Q&A <i>COL Nancy L. Vause, Ph.D., USA Medical Research & Materials Command, Frederick, MD</i> • Education & Motivation <i>Laurie Wells, M.S., FAAA, Associates in Acoustics, Inc., Loveland, CO</i> | Cottonwood |
| 9:45 A.M. – 10:15 A.M. | Workshop & Seminar Break with Refreshments | Ballroom Foyer |
| 11:30 A.M. – 1:00 P.M. | Lunch (on your own) | |
| 1:00 P.M. – 4:00 P.M. | Afternoon Workshops—see workshops listed above | |

| | | |
|-----------------------|---|-------------------|
| 2:15 P.M. – 2:45 P.M. | Workshop & Seminar Break with Refreshments | Ballroom Foyer |
| 4:00 P.M. – 5:00 P.M. | Networking Time and Committee Meetings | |
| 4:30 P.M. – 6:30 P.M. | Public Workshop: Hearing Loss Prevention for Children: Outreach in Schools <i>Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R/Aearo Company, Indianapolis, IN</i> <i>Charley Fankhauser, Ph.D., MEDI, Benecia, CA</i> <i>Gregory A. Flamme, Assistant Professor, Western Michigan University, Kalamazoo, MI</i> <i>Susan Griest, MPH, OHSU, Portland, OR</i> <i>Linda Howarth, B.A., OHSU, Portland, OR</i> <i>William Hal Martin, Ph.D., OHSU, Portland, OR</i> <i>Shelby Myers-Verhage, Research Assistant, University of Iowa, Iowa City, IA</i> | Salon B |
| 5:00 P.M. – 9:00 P.M. | Opening Reception in the Exhibit Hall | Salons E, F, G, H |

FRIDAY, FEBRUARY 25

| | | |
|-------------------------|--|-------------------|
| 7:30 A.M. – 5:30 P.M. | Registration and Information Desk Open | Ballroom Foyer |
| 7:30 A.M. – 8:30 A.M. | Continental Breakfast in the Exhibit Hall | Salons E, F, G, H |
| 8:30 A.M. – 8:40 A.M. | Opening Remarks <i>NHCA President Ted K. Madison, M.A., CCC-A,</i> <i>3M Occupational Health & Environmental Safety Div., St. Paul, MN</i> <i>NHCA Director of Education Theresa Y. Schulz, Ph.D.,</i> <i>Sonamax Hearing Healthcare, Inc., Fall Branch, TN</i> | Salons A, B, C, D |
| | Poster Introductions <i>Gregory A. Flamme, Assistant Professor, Western Michigan University, Kalamazoo, MI</i> | Salons A, B, C, D |
| 8:40 A.M. – 9:40 A.M. | Keynote Presentation: OAEs and Noise-Induced Hearing Loss <i>Martin S. Robinette, Ph.D., Mayo Clinic College of Medicine, Mayo Clinic, Scottsdale, AZ</i> | Salons A, B, C, D |
| 9:40 A.M. – 10:00 A.M. | Level-Dependent Hearing Protection and the Distortion Otoacoustic Emission after Small Arms Fire <i>LTC Lorraine A. Babeu, Ph.D., CCC-A, U.S. Army Research Laboratory, APG, MD</i> | Salons A, B, C, D |
| 10:00 A.M. – 10:45 A.M. | Break—Exhibits, Silent Auction, Posters | Salons E, F, G, H |
| 10:45 A.M. – 11:05 A.M. | The Crisis in Occupational Hearing Conservation in America <i>George R. Cook, Au.D., CCC-A, AAA-F, Workplace Group, Greensboro, NC</i> | Salons A, B, C, D |
| 11:05 A.M. – 11:25 A.M. | Gasaway Lecture <i>James Banach, V.P. Operations and CIO, Quest Technologies, Inc., Oconomowoc, WI</i> | Salons A, B, C, D |
| 11:25 A.M. – 11:55 A.M. | NHCA Business Meeting | Salons A, B, C, D |
| 12:00 NOON – 1:30 P.M. | Luncheon—Acoustics of Laughter <i>Jo-Anne Bachorowski, Associate Professor, Vanderbilt University, Nashville, TN</i> | Boojum/Bonsai |

CONCURRENT SESSIONS

| | | |
|-----------------------|---|----------|
| 1:40 P.M. – 2:25 P.M. | Media Theater <i>Sandra MacLean Ueberuaga, Alaska Occupational Audiology & Health Services, Inc., Anchorage, Alaska</i> <i>Dave Stern, Operations Manager, Washington Audiology Services Inc., Seattle, WA</i> | Ironwood |
|-----------------------|---|----------|

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|------------------------|---|-------------------|
| 1:40 P.M. – 2:25 P.M. | Issues for the Hard of Hearing and ADA Accommodations in Industry <i>George R. Cook, Au.D., CCC-A, AAA-F, Workplace Group, Greensboro, NC</i> | Palo Verde |
| 1:40 P.M. – 2:25 P.M. | Public Hearing Loss Prevention 1. <i>Dangerous Decibels: A Model for Public Hearing Health Education</i> 2. <i>NIHL and Tinnitus Prevention: Automated NIHL Screening in a Museum Setting</i> <i>William Hal Martin, Ph.D., OHSU, Portland, OR</i> 3. <i>Can a Museum Exhibit Effectively Communicate the Hearing Conservation Message?</i> 4. <i>Dangerous Decibels Program in 4th and 7th Grade Classrooms: Are They Getting the Message?</i> <i>Susan Griest, MPH, OHSU, Portland, OR</i> | Salon D |
| 1:40 P.M. – 2:25 P.M. | Preventing Hearing Loss in Rural Youth: The I-HeLP Project <i>Gregory A. Flamme, Assistant Professor, Western Michigan University, Kalamazoo, MI</i> <i>Shelby Myers-Verhage, Research Assistant, University of Iowa, Iowa City, IA</i> | Salons A, B, C |
| 2:25 P.M. – 3:10 P.M. | Break—Exhibits, Silent Auction, Posters | Salons E, F, G, H |
| 3:10 P.M. – 3:30 P.M. | Age & Gender Distribution of Recordable & Non-Recordable Noise-Induced Persistent Threshold Shifts <i>Timothy L. Rink, Ph.D., HTI, Inc., Worthington, OH</i> | Salons A, B, C, D |
| 3:30 P.M. – 4:30 P.M. | Forum: Baseline Revision: Ears vs People <i>John Elmore, AuD., MBA, Precision Hearing Conservation, Helotes, TX</i> <i>Laurie Wells, M.S., FAAA, Associates in Acoustics, Inc., Loveland, CO</i> | Salons A, B, C, D |
| 4:30 P.M. – 6:30 P.M. | Networking Time, Committee Meetings, PSO Meeting | |
| 6:30 P.M. – 10:30 P.M. | Special Event: The Oasis at Wildhorse Ranch Enjoy an evening of food, fun, entertainment and Live Auction at the historical 1890s twenty-acre ranch nestled in the lush foothills of the Tucson Mountains. Buses will begin boarding at approximately 6:15 P.M. in front of hotel for a 6:30 P.M. departure—Please be prompt. Return to the hotel is scheduled for 10:30 P.M. | |

SATURDAY, FEBRUARY 26

| | | |
|------------------------|--|-------------------|
| 7:30 A.M. – 8:00 A.M. | Exhibit Hall Open | Salons E, F, G, H |
| 7:30 A.M. – 5:30 P.M. | Registration and Information Desk Open | Ballroom Foyer |
| 8:00 A.M. – 8:50 A.M. | Chat Sessions—Breakfast <i>Coordinated by Sandra MacLean Ueberuaga, Alaska Occupational Audiology & Health Services, Inc., Anchorage, Alaska</i> | Boojum/Bonsai |
| 9:00 A.M. – 9:20 A.M. | Techniques for Measuring Hearing Protector Attenuation— and the correct answer is...? <i>Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R/Aearo Company, Indianapolis, IN</i> | Salons A, B, C, D |
| 9:20 A.M. – 9:40 A.M. | An Integrated MIRE Field Measurement Technique for Predicting Real-Ear Attenuation of a Custom-Molded Earplug Instrumentation and Validation <i>Jeff A. Lancaster, Ph.D., Virginia Tech, Blacksburg, VA</i> <i>John G. Casali, Ph.D., CPE, CIE, Virginia Tech, Blacksburg, VA</i> | Salons A, B, C, D |
| 9:40 A.M. – 10:00 A.M. | A New Approach to the Objective Assessment of HPD Performance in the Field <i>Jeremie Voix, P.Eng., M.A. Sc., Sonomax Hearing Healthcare Inc., Montreal, Canada</i> | Salons A, B, C, D |

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|-------------------------|--|-------------------|
| 10:00 A.M. – 11:00 A.M. | Break—Exhibits, Silent Auction, Attended Posters | Salons E, F, G, H |
| 11:00 A.M. – 11:20 A.M. | Hearing Protection in the Construction Trades: Who Uses It, How Often and How Well Does It Work? <i>Rick L. Neitzel, M.S., CIH, University of Washington, Seattle, WA</i> | Salons A, B, C, D |
| 11:20 A.M. – 11:50 A.M. | Prospective Noise-Induced Changes to Hearing Among Construction Industry Apprentices <i>Noah S. Seixas, Ph.D., CIH, University of Washington, Seattle, WA</i> | Salons A, B, C, D |
| 11:50 A.M. – 12:10 P.M. | OSHA Construction Standards and Alliance Update <i>Deborah Gabry, Audiologist, Health Scientist, OSHA Department of Labor, Chevy Chase, MD</i> <i>Carol M. Stephenson, Ph.D., CDC/NIOSH, Cincinnati, OH</i> | Salons A, B, C, D |
| 12:10 P.M. – 1:30 P.M. | Awards Luncheon <ul style="list-style-type: none"> • Michael Beall Threadgill Award • Outstanding Hearing Conservationist Award • Media Award • 2004 Outstanding Lecture Award • 2004 Outstanding Poster Award • 2004 Golden Lobe Awards | Boojum/Bonsai |
| 1:40 P.M. – 2:00 P.M. | Noise Exposure of Musicians Playing in Orchestra Pit <i>Alberto Behar, P. Eng., CIH, INCE Bd. Cert., Noise Control, Scarborough, Ontario, Canada</i> | Salons A, B, C, D |
| 2:00 P.M. – 2:20 P.M. | Hearing Examination of Adults (20 to 60 years old) in the National Health and Nutrition Examination Survey (NHANES), 1999-2004 <i>Howard J. Hoffman, Director, Epidemiology and Biostatistics Program, NIDCD/NIH, Bethesda, MD</i> <i>Christa L. Themann, MA, CCC-A, NIOSH, Cincinnati, OH</i> | Salons A, B, C, D |
| 2:20 P.M. – 2:40 P.M. | Break | |
| 2:40 P.M. – 3:10 P.M. | Early Indicators of Noise-Induced Hearing Loss: Issues for Consideration <i>John R. Franks, Ph.D., NIOSH, Cincinnati, OH</i> <i>CDR William J. Murphy, Ph.D., NIOSH, Cincinnati, OH</i> <i>Mark R. Stephenson, Ph.D., CDC/NIOSH, Cincinnati, OH</i> | Salons A, B, C, D |
| 3:10 P.M. – 3:40 P.M. | OSHA Should Not Change Its STS Definition (yet) <i>Robert A. Dobie, M.D., UCDCMC, Sacramento, CA</i> | Salons A, B, C, D |
| 3:40 P.M. – 4:50 P.M. | Forum: Hot Topics S3.1 Background Noise Levels; FRA, EPA, Value of 500 Hz; and Other Hot Issues <i>Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R/Aearo Company, Indianapolis, IN</i> <i>Theresa Y. Schulz, Ph.D., Sonomax Hearing Healthcare, Inc., Fall Branch, TN</i> | Salons A, B, C, D |
| 4:50 P.M. – 5:00 P.M. | Closing Remarks <i>NHCA President Ted K. Madison, M.A., CCC-A,</i> <i>3M Occupational Health & Environmental Safety Div., St. Paul, MN</i> <i>NHCA Director of Education Theresa Y. Schulz, Ph.D.,</i> <i>Sonomax Hearing Healthcare, Inc., Fall Branch, TN</i> | Salons A, B, C, D |

CONFERENCE ABSTRACTS

THURSDAY, FEBRUARY 24

Noise Exposure Assessment: Sampling Strategy and Data Acquisition

Lee D. Hager, Sonomax Hearing Healthcare, Inc., Portland, Michigan

The noise survey provides key information to drive the rest of our hearing conservation efforts. It should tell us who to include in the HCP, how to interpret their audiogram, how and where to focus noise control efforts, which hearing protector is appropriate, and more. Gathering the right data in a systematic fashion can provide the basis for an effective hearing conservation program.

This workshop will provide attendees the tools and information they need to effectively collect and manage noise exposure data, including appropriate selection of instrumentation, sampling protocol, and report format. New technology in instrumentation and approach will be discussed in the context of effective hearing conservation program management.

Controversies of Medical/Legal Evaluations

Robert A. Dobie, M.D., USDMC, Sacramento, California

We will debate three controversial medical-legal propositions:

1. "Does recreational music cause hearing loss?" (pro: Brian Fligor; con: Bob Dobie),
2. "Is the scientifically appropriate exchange rate 3 dB?" (pro: Dennis Driscoll; con: Bill Clark), and
3. "Are speech tests superior to pure tones for assessing hearing impairment?" (pro: Sig Soli; con: Bob Dobie).

Auditory Warning Signal and Display Design

John G. Casali, Ph.D., CPE, CIE, Grado Professor, and Jeffrey A. Lancaster, Ph.D., Virginia Tech, Blacksburg, Virginia

Adhering to a human-centered design philosophy, this three-hour workshop will provide practical guidance concerning the selection, design, implementation, and performance of nonverbal auditory alarms and warnings for use in noisy environments. Signal design parameters (frequency spectrum, intensity, temporal pattern, etc.) will be covered in a framework of human engineering guidelines, ISO and other standards, and relevant research from the literature. Brief coverage will be given to hearing protector effects, attentional factors, and unconventional auditory warnings, such as auditory icons. The workshop will be taught at a beginner to novice level, and only a basic, introductory knowledge of human factors engineering and/or acoustics is required. Participants will learn to compute masked thresholds, required spectral levels of auditory signals, and receive guidance in the design of basic auditory displays. Participants will solve at least one example design problem and hear a variety of different auditory warning signals. Illustrative examples of signal audibility calculations and research on signal detection conducted at Virginia Tech will be presented.

Otoacoustic Emissions 101

Martin S. Robinette, Ph.D., Mayo Clinic College of Medicine, Mayo Clinic, Scottsdale, Arizona

Emphasis will be on clinical experience from testing thousands of adults and children with OAEs. The workshop content will in-

clude (1) the discovery of, and subsequent physiological correlates of OAEs, (2) normative data including test-retest variability and interpretation, (3) clinical applications including patients with pure cochlear hearing loss (NIHL and ototoxicity), sudden and fluctuating hearing loss, conductive loss and children with PE tubes, pseudohypacusis, acoustic neuroma, auditory neuropathy and central auditory pathway disorders.

Happy Ears – Acoustical Literacy and Acoustical Advocacy

Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R-/Aearo Company, Indianapolis, Indiana

Sound is fun (music, friends, pets, nature, ...), sound is touch (in fact it is touching at a distance), sound is communication (duh!), sound is life (yes, scientists are exploring use of sound to search for life in the solar system) and we live in a world where sound can be overwhelming, annoying, and hazardous to our hearing and to our health. In this two-part seminar we will explore acoustical literacy and the joys of hearing, so that our audience becomes passionate about audition and the importance of protecting the organ that makes that possible. We will then examine community noise from the viewpoint of the acoustical commons and civility. The goal will be to empower the attendee to become an acoustical advocate who works with organizations, communities, industry, and regulatory agencies to make the world quieter, better sounding, and more conducive to our emotional and spiritual health. The seminar includes listening opportunities. Resources will be provided including handouts, web sites, and CDs.

All Day Seminar – Hearing Loss Prevention: The Basics

This workshop will feature experts in the field of hearing loss prevention discussing the essential elements of an effective hearing loss prevention program. The seminar is designed to provide information that is useful to the audiometric technician as well as the professional supervisor. Whether you're new to the field or have been practicing hearing conservation for years, this workshop is guaranteed to offer something of interest. The interaction that is encouraged with audience participation, between rookies and veterans, makes this exchange all the more valuable.

Effective Hearing Protection

Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R-/Aearo Company, Indianapolis, Indiana

As hearing conservationists we can measure, assess, document, and counsel, but when it comes to effective intervention, our primary tool, sometimes our only tool, is a hearing protector. Therefore it behooves us to become knowledgeable about the specification of hearing protection devices and their use in hearing conservation programs. This presentation will focus on hearing protector function, how they are tested and rated (with particular reference to the NRR), the performance gains available from the use of dual hearing protectors, the effects of hearing protectors on speech communications, and useful tips on fitting today's popular products. The attendee will also learn about current developments such as flat and moderate attenuation hearing protectors, and earmuffs with active noise reduction (ANR) circuitry.

The Audiogram – How to Use It

Mary M. McDaniel, M.S., CCC-A, Pacific Hearing Conservation, Inc., Seattle, Washington

The audiometric test is essentially the report card for the hearing loss prevention program. No worker's hearing has ever been preserved or protected because he or she took a hearing test. How we use that hearing test, how we convey the information, how we track the data becomes critical to the program. This session will go beyond just looking for standard threshold shift. It will provide the technician with information about obtaining a valid result, and will offer the professional supervisor insight into follow-up strategies.

Hearing Loss Recordability Issues

Susan Megerson, M.A., CCC-A, University of Kansas, Shawnee Mission, Kansas

Identification of work-related hearing loss has long been one of the most complicated and controversial areas of government-mandated injury/illness recordkeeping. Effective in 2000, MSHA provided a new definition of "reportable" hearing loss in its revised noise standard, Part 62. OSHA also defined new criteria for recording occupational hearing loss with its recent revision to 29 CFR 1904 (effective in 2003, with a separate Form 300 column in effect January 1, 2004). This workshop presentation will focus on the basic requirements of MSHA and OSHA recordkeeping regulations, as well as implications for professional review of audiograms and determination of work-relatedness. Although com-

pliance with recordkeeping rules is important to the ultimate goal of tracking incidence of work-related hearing loss, emphasis will also be placed on best practices for an effective hearing loss prevention program.

Noise Measurement

Rick L. Neitzel, M.S., CIH, University of Washington, Seattle, Washington

In his segment of this seminar, Rick will provide an overview of the measurement of noise, including an introduction to that dear friend/archenemy of hearing loss prevention (the decibel), the equipment we use to measure noise (sound level meters, dosimeters, octave band analyzers, oh my!), and how all this relates to protecting people's hearing.

Employee Education: Learning to Protect the Priceless

Laurie Wells, MS, FAAA, Associates in Acoustics, Inc., Loveland, Colorado

Since noise-induced hearing loss is an invisible and insidious invader, motivating the at-risk employee is challenging. Therefore, it is critical for each employee to discover that hearing is precious and worth protecting. Ideas and demonstrations will be presented to enhance employee training classes and encourage active employee participation in the HCP. By knowing the physical and psychological effects of noise-induced hearing loss as well as appreciating the intricate, complex sensory organ of hearing employees will be more apt to carry the responsibility of good hear-



ing health care. The requirements of OSHA/MSHA education will be discussed, as well as key elements for successful training program delivery. Hopefully, you too will be inspired to become a “hair cell ambassador.”

FRIDAY, FEBRUARY 25

OAEs and Noise-Induced Hearing Loss

Martin S. Robinette, Ph.D., Mayo Clinic College of Medicine, Mayo Clinic, Scottsdale, Arizona

Evoked otoacoustic emissions (EOAEs) are an objective, albeit indirect measure of outer hair cell (OHC) motility. EOAEs are useful in estimating normal cochlear function and normal hearing, audiometrically. Animal studies and some human case studies suggest EOAEs are more sensitive to OHC damage from noise exposure or ototoxicity than the pure-tone audiogram. From such findings it is appealing to suggest EOAEs as an objective measure to both predict and monitor noise-induced hearing loss (NIHL) and thereby improve prevention. However, attempts to estimate pure-tone hearing thresholds from EOAE measures continue to be problematic primarily due to large between individual EOAE variability. Several sources of EOAE variability, both measurement and physiological, will be discussed as well as singular and longitudinal studies of EOAEs and noise-induced hearing loss. While new insights are forming EOAEs, at present, are not recommended for predicting or monitoring NIHL in individuals separate from pure-tone audiometry.

Observation of the DPOAE after Exposure to Small Arms Fire

LTC Lorraine Babeu, Ph.D., U.S. Army Research Laboratory, APG, Maryland

Noise hazards on the battlefield are capable of creating temporary or permanent hearing loss. Whether the hearing loss is temporary or permanent, the change in hearing sensitivity is usually large enough to impact on the combat readiness of the soldier. In order to protect themselves against the debilitating effects of exposure to noise, soldiers have used hearing protection in the form of earplugs or noise muffs. These types of hearing protective devices provide protection for the auditory system but are not conducive to verbal communication. The dismounted soldier wants and needs hearing protection that is adaptive to the environment and allows communication while providing hearing protection at a moment's notice, such as the type of protection that would be needed during a firefight. Level-dependent hearing protection (LDHP) has the potential to provide the soldier with both the needed protection and the ability to communicate. In its passive state the LDHP is designed to provide little to no attenuation in low ambient noise levels. However, when impulse noise is present the attenuation characteristic of the LDHP provides protection and when the impulse noise dissipates the LDHP returns to its passive state. In order to achieve level dependent attenuation, designers have used orifices, valves, diaphragms or electronic circuitry. Within the last ten years there has been great interest by the U.S. Army in level dependent earmuffs and earplugs. One level dependent earplug developed at the French-German Institute and used by the French Army has also been adopted by the American Army. The American version of this earplug, the Combat Arms Earplug, has two sides: the yellow side is the level-dependent side

and the olive drab side is non level dependent. Given that level dependent hearing protection provides varying attenuation at difference frequencies the purpose of this experiment was to determine if the amplitude of the DPOAE would change in soldiers wearing the level dependent hearing protection after firing small arms weapons. Nine Infantry soldiers over the course of nine days wore the Combat Arms Earplug (level dependent and non level dependent side) and the Peltor ComTac earmuff while firing the M4 and M16 Rifle. On each day soldiers had pre-and post-distortion product otoacoustic emission (DPOAE) measurements recorded. There were no significant ($p < .05$) main effects for type of hearing protection and before and after firing DPOAE amplitude. The question of whether the frequency response which provides less attenuation in the lower frequencies affects the amplitude values of the DPOAE during small arms weapons fire according to these results were not statistically significant

The Crisis in Occupational Hearing Conservation in America

George R. Cook, Au.D., CCC-A, AAA-F, Workplace Group Greensboro, North Carolina

Recent changes in OSHA regulations and OSHA enforcement policies have resulted in a significant decrease in hearing conservation activities in America. Hundreds of thousands of employees who were in a hearing conservation program in the past are being excluded today. Companies are fearful of increased incidence rates and look for every avenue to reduce possible Standard Threshold Shift recordables. Occupational hearing conservation programs in America were healthier three years ago. The situation that exists is few companies are willing to conduct wellness hearing testing, and testing those at-risk or with intermittent exposure because of the threat of increasing their OSHA illness incidence rate. Occupationally related hearing loss will occur within these select groups increasing company liabilities through decreased worker productivity and worker's compensation costs. The challenge is to encourage companies to expand their hearing testing activities and be proactive in dealing with any work-related hearing changes. There should also be consideration for lowering the Action Level to 80 dBA TWA.

Acoustics of Laughter

Jo-Anne Bachorowski, Ph.D., Vanderbilt University, Nashville, Tennessee

Laughter is a species-typical vocalization that is far more likely to be produced in social circumstances than when alone. The rich and variable acoustic features of laughter will be described, as will empirical findings showing that the occurrence of particular kinds of laugh acoustics are more likely to occur in some social circumstances than in others. The results of perception studies further indicate that some types of laughs are more likely than others to elicit positive emotions in others. Theoretically, laughter is proposed to “work” by tweaking the emotion-related response systems of listeners with one functional outcome being to support the occurrence of cooperative behavior.

Dangerous Decibels™: A Model for NIHL and Tinnitus Prevention

William Hal Martin, Ph.D., OHSU, Portland, Oregon

Dangerous Decibels™ is a private and federally funded public health campaign with the goal of reducing the incidence of noise-

induced hearing loss and related tinnitus. The program incorporates museum exhibitry, educational outreach and ongoing research to achieve this goal. Through these vehicles the program currently reaches as many as 800,000 people per year. Dangerous Decibels™ serves as one model that may provide resources and be adapted to many venues of hearing loss prevention.

NIHL and Tinnitus Prevention: Automated NIHL Screening in a Museum Setting

William Hal Martin, Ph.D., OHSU, Portland, Oregon

The purpose of this study was to evaluate a method of studying NIHL in the public using unsupervised, automated data acquisition. The Dangerous Decibels™ museum exhibition includes an interactive computer game that collects and stores demographic and risk-for-NIHL information from visitors as well as performs an automated hearing screening at 4kHz. Validation of the accuracy of the acquired information is being performed in 400 subjects. Results of the validation study will be presented.

Can a Museum Exhibit Effectively Communicate the Hearing Conservation Message?

Susan E. Griest, MPH, OHSU, Portland, Oregon

The Dangerous Decibels™ exhibit opened at the Oregon Museum of Science and Industry in June of 2002. The exhibit has 12 components designed to address three educational messages: sources of dangerous decibels, consequences of dangerous decibels and ways to protect oneself from dangerous decibels. A summative evaluation was conducted to determine the effectiveness of

the exhibit to increase knowledge, change attitudes and intended behavior regarding hearing loss prevention. 300 adults participated in the study. Baseline and post-exhibit questionnaires were administered. Results will be presented.

Dangerous Decibels™ Program in 4th and 7th Grade Classrooms: Are They Getting the Message?

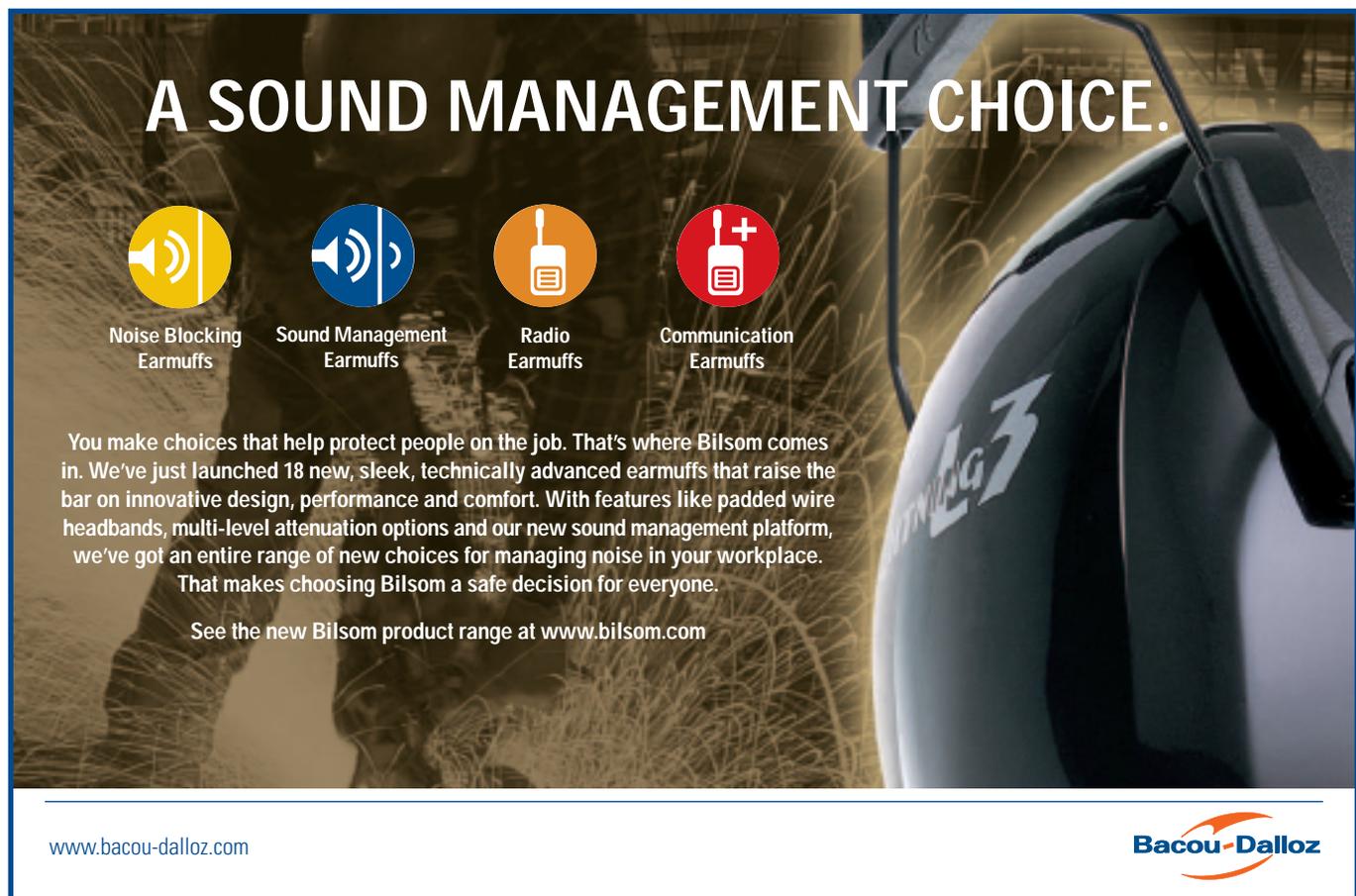
Susan Griest, MPH, OHSU, Portland, Oregon

The Dangerous Decibels™ classroom program was delivered to over 500 fourth and seventh grade students. An evaluation of the program's ability to increase knowledge, change attitudes and intended behavior was conducted using baseline, post-presentation and three-month follow-up questionnaires. Results from the study group (classrooms that received the program) were compared to a comparison group (classrooms that did not receive the program). Significant improvements and challenge areas were noted. Suggestions for program effectiveness will be presented.

Age and Gender Distribution of Recordable and Non-Recordable Noise-Induced Persistent Threshold Shifts

Timothy L. Rink, Ph.D., HTI, Inc., Worthington, Ohio

On July 1, 2002, OSHA announced a significant change in policy as it pertains to recording occupational hearing loss cases on the 300 Log. A review of 143,843 audiometric records gathered from manufacturing, government and service sector employees in 2003 revealed that 10,260 employees (7.13% of the test population) recorded an annual STS. Significantly, 71.65% of the STS's met the new criteria for recordability. This translates to



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5.11% of the total test population and is considerably greater than the NIOSH estimate of 3.09%. More remarkably, 77.17% of all noise-induced persistent threshold shifts as confirmed by retest met the new guidelines for inclusion on the 300 Log. Further examination of the incidence of noise-induced persistent threshold shifts by gender and age revealed provocative patterns that are the focus of this presentation.

Measuring Hearing Protector Attenuation, and the Correct Answer Is ...?

Elliott H. Berger, M.S., INCE, Bd. Cert, E-A-R/Aearo Company, Indianapolis, Indiana

There are numerous well-documented measurement methods available to evaluate hearing protector attenuation; however, many of them can and have been misused, and the erroneous results have led to misleading conclusions. This paper will examine the gold standard in hearing protector attenuation measurements, namely real-ear attenuation at threshold (REAT), and compare it to the most popular alternatives such as microphone in real-ear (MIRE) that includes the use of probe microphones, imbedded microphones, and miniature microphones, and acoustical test fixtures, also called blockheads. Examples of the latter include the ANSI specified blockhead, KEMAR, and others. Illustrative data will be provided to guide the user in the proper application of such techniques and tools, and the errors to avoid.

An Integrated MIRE Field Measurement Technique for Predicting Real-Ear Attenuation of a Custom-Molded Earplug: Instrumentation and Validation

Jeff A. Lancaster, Ph.D., and John G. Casali, Ph.D., CPE, CIE, Virginia Polytechnic Institute and State University, Blacksburg, Virginia

Jeffrey Goldberg and Orval Baskerville Custom Protect Ear, Surrey, British Columbia, Canada

A study was conducted to determine the correspondence of spectral attenuation for a custom-molded earplug using three measurement techniques. Custom Protect Ear's custom-mold earplug was tested using the real-ear-attenuation-at-threshold (REAT, ANSI S3.19-1974) technique for comparison with: 1) Flashtest™ microphone-in-real-ear (MIRE) noise reduction technique using a third party software-driven spectrum analyzer, and 2) Flashtest™ MIRE noise reduction technique using an ANSI-standardized real-time spectrum analyzer (Larson-Davis 3200). Results indicated significant differences between the attenuation means of the three measurement techniques; however, they support the development of correction weights using a predictive regression equation that can be applied at each test frequency to provide an indication of the attenuation likely to be achieved when using the standardized REAT procedure. Actual or potential applications of this research include the further development of a portable MIRE procedure that can be applied in field settings with an eye toward the ultimate improvement of hearing conservation programs.

A New Approach to the Objective Assessment of HPD Performance in the Field

Jeremie Voix, PEng., M.A. Sc., Sonamax Hearing Healthcare Inc., Montreal, Canada

This presentation introduces a new method to assess the real field performance of HPDs over time. The study looked at the evolution of Subject-Fit performance values, over time, on a sample of users with the same HPDs, to monitor effectiveness and performance improvement or deterioration. The ability to retest, at will, allows not only confirmation of continued performance but can be used as an active training tool.

Hearing Protection in the Construction Trades: Who Uses It, How Often and How Well Does it Work?

Rick L. Neitzel, M.S., CIH, University of Washington, Seattle, Washington

Hearing conservation programs in the construction industry are rare, and, where present, often rely on workers' use of hearing protection devices (HPDs) to reduce exposures below 85 dBA. This reliance on HPDs for protection from high noise is problematic, as the degree of protection provided by an HPD depends on not only the HPD's attenuation level, but also the amount of exposure time during which the HPD is used. Noise exposure and HPD use data drawn from construction apprentices employed in nine construction trades were analyzed to assess HPD effectiveness. A combination of one-minute dosimetry noise levels and simultaneous self-reported HPD use was evaluated, as were occupational HPD use data collected by questionnaire as part of a longitudinal study of noise exposure and hearing loss in construction workers. Direct measurements of earplug attenuation were also made on workers using the FitCheck attenuation measurement system. The mean full-shift noise levels across more than

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700 workshifts exceeded 85 dBA for all but one trade, and nearly one-third of all monitored minutes were above 85 dBA. Workers used HPDs less than one-quarter of the time they were needed (i.e., when exposure levels exceeded 85 dBA.) Workers who reported “always” using HPDs in high noise on questionnaires actually wore them only one-third of the time they were needed. Direct attenuation measurements showed that, on average, workers achieved more than 50% of the labeled Noise Reduction Rating of their earplug, but that the variability in achieved attenuation was large. Lastly, when the measured earplug attenuation levels and use time data were combined, the effective protection afforded by HPDs was less than 3 dB on average, though the difference between mean attenuation levels for the different trades was large. Overall, HPD use reduced overexposure situations for only 20% of the measured full-shift exposures. These results demonstrate the need for better hearing conservation efforts in the construction industry.

Prospective Noise-Induced Changes to Hearing Among Construction Industry Apprentices

Noah S. Seixas, Ph.D., CIH, University of Washington, Seattle, Washington

Early development of noise-induced hearing loss (NIHL) among noise-exposed workers has been poorly characterized by existing methods. In order to characterize the development of noise-induced damage to hearing, we prospectively monitored hearing and noise exposure among a cohort of newly enrolled

construction industry apprentices and a comparison group of graduate students, using standard pure-tone audiometry and distortion product otoacoustic emissions (DPOAEs). Three hundred twenty-eight subjects (632 ears) were monitored annually an average of 3.4 (± 0.8) times. In parallel to these measures, noise exposure and hearing protection device (HPD) use were extensively monitored during construction work tasks. Trade-specific mean exposure L_{eq} levels, with and without accounting for the variable use of hearing protection in each trade, were calculated and used to group subjects by trade-specific exposure level. Mixed effects models were used to estimate the change in hearing outcomes over time for each exposure group, while adjusting for age, gender, previous noise exposure and baseline audiometry, and accounting for subject and ear. Small but significant exposure-related changes in DPOAEs, on the order of -0.5 dB per year at 90 dB exposure, were observed, especially at 4 kHz, with less clear but similar patterns observed at 3 kHz. Pure tone audiometric thresholds displayed only slight trends toward increased threshold levels with increasing exposure groups. The effect of using alternative approaches to noise exposure metrics are explored. The results indicate that construction apprentices in their first three years of work, with average noise exposures under 90 dBA, have measurable losses of hearing function. Despite numerous challenges in using DPOAEs for hearing surveillance in an industrial setting, they appear somewhat more sensitive to these early changes than are evident with standard pure tone audiometry.

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OSHA Alliance Update

Deborah Gabry, OSHA Department of Labor, Chevy Chase, Maryland

Deborah will be speaking on the OSHA alliance program in general and specifically on the NHCA/OSHA alliance. She will present a brief history of the Alliance, its purpose, program milestones, benefits of participating, goals and requirements, its intended impact and examples of products produced and activities undertaken by the NHCA/OSHA alliance. She will also discuss potential future activities and how to navigate OSHA's website.

Noise Exposure of Musicians Playing in Orchestra Pit

Alberto Behar, Eng. CIH, INCE, Bd. Cert., Noise Control, Scarborough, Ontario, Canada

Sound exposures of Canadian Opera Company orchestra players were measured during 18 sessions that included rehearsals, dress rehearsals and actual performances of two operas. Testing was done in the orchestra pit normally used for the performances. Eighty musicians' exposures were measured using five noise dosimeters in each session for the entire duration (three hours) of each event. The measured estimate was L_{eq} , from which the $L_{ex, year}$ was calculated using the number of hours per year played for the Canadian Opera Company. Following the ISO 1999 Standard, results indicate that, playing for the Company, there is no risk of hearing loss for the players.

Hearing Examination of Adults (20 to 69 years old) in the National Health and Nutrition Examination Survey (NHANES), 1999–2004

Howard J. Hoffman, Epidemiology and Biostatistics, National Institute on Deafness and Other Communication Disorders (NIDCD), NIH, Bethesda, Maryland, and Christa L. Themann, MA, CCC-A, NIOSH, Cincinnati, Ohio

Hearing loss severe enough to interfere with the understanding of normal speech is experienced by several million people in the U.S. Previous estimates, derived mainly from health interview surveys, suggest that at least 10 percent (20 million) of adults have sufficient trouble hearing to impact their quality of life. Hearing loss may be caused by several environmental factors (principally noise exposure) and, as well, many genetic factors may cause or contribute to hearing loss in combination with environmental factors. The NCHS has conducted a unique series of health and nutrition examination surveys since the early 1960s. The health exams are conducted in mobile centers (four trailers linked together) that are transported to randomly selected communities to ensure a standardized environment for obtaining high-quality data. From 1999 to 2004, NHANES included pure-tone, air-conduction hearing threshold measurements in each ear at .5, 1, 2, 3, 4, 6, and 8 kHz from a nationally representative sample of civilian, non-institutionalized adults, 20 to 69 years old. These data provide the first national estimates of adult hearing loss based on thresholds in nearly 30 years. The methodology for the NHANES hearing examination will be explained and preliminary findings presented. The importance of these data for tracking Healthy People 2010 objectives will be discussed. Implications for directing efforts in hearing loss prevention and monitoring progress in prevention will also be addressed.

Early Indicators of Noise-Induced Hearing Loss: Issues for Consideration

William J. Murphy, Mark R. Stephenson and John R. Franks, National Institute for Occupational Safety and Health, Hearing Loss Prevention Team, Cincinnati, Ohio

The precursor of noise-induced hearing loss (NIHL) often is manifested by a marked shift in the hearing at audiometric frequencies 2 to 6 kHz with a recovery at frequencies above the shift. The noise-induced notch index has been proposed as the difference between the pure-tone averages of 2, 3 and 4 kHz and the pure tone average at 1 and 8 kHz [Rabinowitz and Dobie, *Spectrum*, 20:8-11, 2003]. The notch index and two variants of the calculation were tested against a set of 3320 audiograms collected from subjects that participated in the National Health and Nutrition Examination Survey (NHANES IV) during the years 1999 and 2000. A strict notch definition yielded 397 audiograms that contained a notch. Three variations of the notch index were tested using the subset of audiograms. The average difference in pure-tone averages using 2, 3 and 4 kHz had a mean notch index of 0.5 + 6.1 dB. The average difference in pure-tone averages using 2, 3, 4 and 6 kHz had a mean notch index of 4.1 + 2.9 dB. The average area difference using 2, 3, 4 and 6 kHz had a mean notch index of 7.4 + 6.3 dB. The results of the analysis demonstrate that the notch index is more effective when 6 kHz is included in determining whether a subject has a noise-induced notch.

OSHA Should Not Change Its STS Definition (yet)

Robert A. Dobie, M.D., UCDFMC, Sacramento, California

NIOSH has recommended that the current OSHA definition of a standard threshold shift (STS) be changed. Among the advantages claimed for the new definition was that it "gives a high percentage of true positive tags" compared to the OSHA definition. This assertion was based on the "confirmation" method of validation, which has been shown in simulation experiments to have two systematic biases which could have accounted for the apparently superior performance of NIOSH's STS definition. STS validation research published to date does not establish the superiority of either "any-frequency" definitions (such as NIOSH's) or "pure tone average" definitions (such as OSHA's). Future validation research should compare STS rates in noise-exposed workers to STS rates in non-exposed workers, or should consider and control the biases of validation methods (such as the one NIOSH relied on) which do not require a control group.

POSTER ABSTRACTS

1. Characterization of Agricultural Noise Exposure at a Swine Confinement Facility in Iowa

Chandran Achutan and Randy L. Tubbs, National Institute for Occupational Safety and Health, Cincinnati, Ohio

This poster presents noise exposures encountered at a swine confinement facility in Iowa. Three of the seven full-shift personal dosimetry samples exceeded the NIOSH REL. Data were also analyzed as a function of specific tasks. Task-based analysis of the data showed that the highest exposures were during power washing of pens, snout snaring, and heat checking. This poster discusses controls currently in place and recommendations on further reduction of noise at this facility.

2. Noise Exposure Levels for Workers in the Fishing Industry

Elizabeth E. Beal, Central Michigan University, Mt. Pleasant, Michigan

Individual dosimetry was used to determine noise exposure levels for workers onboard 16 different lobster fishing vessels. Results revealed over 46% of the lobster fishing industry jobs exhibited 8-hour TWAs over 90 dBA, 46% of the jobs had TWAs between 85-89 dBA, while less than 7.7% of the jobs had 8-hour TWAs below 85 dBA. Eight-hour TWAs for the loudest job was over 95 dBA. Eight-hour time-weighted averages (TWAs) and daily noise doses obtained using the currently mandated Occupational Health and Safety Administration (OSHA) measurement criteria were also compared to those obtained using the American Conference of Government Industrial Hygienists (ACGIH) recommended criteria. The ACGIH method yielded significantly higher 8-hour TWAs and daily doses than the OSHA method. The effect of variables such as type of diesel engine, type of exhaust, location of engine, muffler use, and type of boat material were also examined. Implications of this study will be discussed.

3. Industrial Model of Audiometric Testing for High School Students

Deanna K. Meinke, M.A., FAAA, University of Northern Colorado, Greeley, Colorado; Sarah Meade, M.A., CCC-A, Weld County School District 6, Greeley, Colorado; Cheryl DeConde Johnson, Ed.D., consultant, Colorado Department of Education; Jerry Jensema, BSE, Health Conservation, Inc., Rockford, Illinois

This poster will describe the outcomes from a cooperative effort between the Colorado Department of Education, Greeley School District #6, Health Conservation, Inc., University of Northern Colorado, and Associates in Acoustics, Inc., with regard to the use of an industrial audiometric testing program implemented at a high school. Approximately 640 students in the 9th and 12th grades received computerized audiometric threshold testing on a mobile van within a one-week school day schedule. Threshold testing proved time efficient, averaging 2.6 minutes per student. Audiometric outcomes are contrasted with school screening criteria and also describe the detection of newly identified hearing loss in the student population consistent with hazardous noise exposure.

4. A System for Assessing the Fit of Hearing Protectors in the Field

Sig Soli¹, Andy Vermiglio¹, and Vern Larson²

We developed an automated, self-administered system for assessing attenuation achieved in the field with earplugs. The system employs a loudness balance test protocol that requires little or no intervention from a professional. Our objective is to significantly reduce the variability of attenuation associated with fitting in order to minimize the risk of over- and under-protection. This presentation describes the results of a comparison of REAT attenuation data with attenuation derived from the loudness balance procedure.

1 House Ear Institute, Los Angeles, California

2 Howard Leight Ind., San Diego, California

5. Noise Exposures in Aircraft Passenger Cabins during Flight Operations

Randy L. Tubbs, Ph.D., National Institute for Occupational Safety and Health, Cincinnati, Ohio

NIOSH received a request for a noise evaluation from flight attendants working for a commuter airline. The aircraft tested included four turboprop planes and two regional jets. A series of 15-second samples were collected and stored with a real-time analyzer during takeoff, landing, and at cruise altitude. Noise data showed the individual commuter flights were not loud enough to increase the risk of noise-induced hearing loss for flight attendants. However, if the aircraft's noise-vibration suppression system was not operating during flight, then there could possibly be noise overexposures. The spectral data revealed the possibility of interference in communications between passengers and the flight crew. The NIOSH investigator proposed the use of "musician-type" ear plugs by flight attendants if FAA approval can be obtained.

6. Audiometer Calibration: Measurement Instrumentation Issues Relating to Bandwidth

John Lloyd, Student; Jeff A. Lancaster, Ph.D., Research Assistant Professor; John G. Casali, Ph.D., CPE, CIE, Grado Professor, Auditory Systems Laboratory, Dept. of Industrial & Systems Engineering, Virginia Tech, Blacksburg, Virginia

OSHA-required calibration of audiometers is often accomplished through field or user calibration, and includes measurement of the dB(linear) level of a pure tone at 500, 1000, 2000, 3000, 4000, and 6000 Hz. Measurement instrumentation vendors sell many different kinds of equipment for this purpose, e.g., 9A couplers, sound level meters (SLM), and octave-band (OB) or 1/3-octave band analyzers. However, some of the 'calibration kits' offered by vendors include SLMs that are limited to octave bands. To investigate the capabilities and/or limitations of various filter bandwidths toward audiometer "field" calibration, a Beltone (model 114) audiometer was set to the manufacturer's specified dBHL of 70 for calibration purposes, and its output was measured using several filter bandwidths: 1 OB, 1/3 OB, 1/12 OB,

and 1/24 OB. It was determined that calibration using only an octave band filter missed 3000 Hz and 6000 Hz, and that measured deviations between the coarsest resolution (1 OB) and the highest resolution tested (1/24 OB) were 5.8 dB and 1.3 dB at 2000 Hz and 4000 Hz, respectively. A conclusion from this analysis is that when calibrating audiometers using analyzer bandwidths which do not have band centers at the pure tone frequencies to be calibrated, it is essential that correction factors be applied. Some instrumentation manufacturers provide these correction factors and they must not be ignored in practice.

7. Immersive Simulation of Hearing Loss

Patrick M. Zurek and Joseph G. Desloge, Sensimetrics Corporation, Somerville, Massachusetts

Presented by Lorraine Delhorne

Simulation of hearing loss is useful for demonstrating the communication challenges facing hearing-impaired people. However, current 'simulations,' most of which are only recordings, do not actually elevate thresholds; i.e., they do not simulate hearing loss, per se. At this poster we will describe the development of a hearing loss (and prosthesis) simulator that is immersive—the user's detection thresholds for ambient sounds are shifted by a prescribed degree. This threshold shift is achieved through a combination of passive attenuation (from muff-type hearing protectors), additive masking noise (introduced by within-muff earphones) and automatic gain control applied to the signals picked up by microphones near each ear. Listeners' subjective reactions to even moderate degrees of simulated hearing loss suggest that the system may be an effective motivational tool in hearing conservation programs. The simulator will be demonstrated at the poster. [Work supported by NIDCD].

8. Apprentice Carpenter Hearing Levels from 1995 to 2003

Pamela S. Graydon, B.S.; Mark R. Stephenson, Ph.D.; and Christa L. Themann, M.A., NIOSH, Cincinnati, Ohio

As part of an ongoing study, the National Institute for Occupational Safety and Health (NIOSH) measured apprentice carpenter hearing levels in 1995 and again in 2002-2003. These two samples will be compared to see if apprentice carpenter hearing levels have changed during this interval. Results will also be evaluated against data from the National Health and Nutrition Examination Survey 1999+ (NHANES) to see how apprentice carpenters' hearing compares to that of an age and gender-matched sample from the general population.

9. Options in Defining Background Noise During Audiometric Testing

Elliott H. Berger, M.S., INCE, Bd. Cert., E-A-R/Aearo Company, Indianapolis, Indiana

Background noise in audiometric testing continues to be an issue of concern in the regulatory and audiological communities. A well-refined and scientifically tested ANSI standard (S3.1-1999) exists that clearly defines acceptable ambient sound pressure levels and the associated errors in threshold measurement that they create. Yet some in the hearing conservation community would like the permissible levels changed, arguing that the exist-

ing specifications are predicated on misassumptions. The facts are, however, that the S3.1 standard is based on objective measurements and includes options to adjust its tabled values, depending upon the amount of masking that the experimenter is willing to tolerate. This paper briefly reviews the data and theory behind the standard, clarifies the proper interpretation of the tables in the standard and the options that it provides, compares its specifications to the values proposed by the National Hearing Conservation Association (NHCA) and the American Speech-Language Hearing Association (ASHA) (NHCA, 1994), and summarizes actual room noise measurements reported in the literature.

10. Prevalence and Risk Factors of Hearing Loss in Farming and Construction

Majorie McCullagh, Ph.D., RN, and Madeleine Kerr, Ph.D., University of Minnesota School of Nursing, Minneapolis, Minnesota

To describe prevalence of hearing loss and related risk factors among workers in farming and construction. Methods: Hearing thresholds and demographic data were obtained from NHANES III (1988-94). Results: Hearing thresholds (500-8000 Hz) and risk factors for hearing loss are compared for these groups of workers. Conclusions: Implications for prevention programs is discussed.

11. Revisiting the Quartic Model for Early Identification of Noise-Induced Hearing Loss

William J. Murphy, Ph.D., and John R. Franks, Ph.D., NIOSH, Cincinnati, Ohio

In a 1976 article by Cooper and Owen (Audiologic profile of noise-induced hearing loss, Arch. Otolaryngol. 102:148-150), they advanced a quartic model to perform a least-squares fit to an audiogram for the purpose of identifying a noise-induced notch indicative of early onset of noise-induced hearing loss. This model has been revisited for the purpose of better quantification of a set of rules that will best identify the presence or absence of a noise-notch. A subset of 1660 subjects' right and left audiograms collected for the National Health and Nutrition Examination Survey (NHANES IV) were fit with a quartic model. As well, several hearing scientists and audiologists within NIOSH examined and classified the audiograms as having a notch or not. Preliminary results suggest that the choice of notch criteria dramatically affects the identification accuracy when correlated with clinical judgments. This paper will present how these rules were developed and how the quartic model may be interpreted and applied in a hearing conservation program.

CONFERENCE PRESENTERS

LTC Lorraine A. Babeu, Ph.D., CCC-A



LTC Lorraine Babeu, Ph.D., is a research audiologist for the U.S. Army Research Laboratory located at Aberdeen Proving Ground, MD. She is the team leader of the Hearing Protection Research Team. She has been in the military for fifteen years. During this time she has served as Program Manager for Hearing Conservation at various military installations.

Jo-Anne Bachorowski, Ph.D.



Dr. Jo-Anne Bachorowski received her doctoral degree in clinical psychology from the University of Wisconsin – Madison. She is currently at Vanderbilt University where she is an Associate Professor of Psychology, Director of the doctoral program in clinical science, and Associate Editor of *Cognition and Emotion*. Her research is broadly concerned with nonlinguistic aspects of vocal signals.

James Banach



James Banach is the Vice President of Operations and CIO Quest Technologies, Inc., Past President of NHCA, past chair of the AIHA Noise Committee, AIHA representative to CAOHC, ANSI S3 and alternate ANSI S12. He has presented for CAOHC certification and director courses, PDC's for AIHA and NHCA's "Excellence in Hearing Conservation" program. His publications include articles on noise measurement, hearing conservation, and noise exposure outside the workplace, input documents to OSHA and MSHA. James has degrees from UWM and Keller Graduate School of Management.

Elizabeth E. Beal, Au.D. Candidate



Elizabeth E. Beal is a third year Au.D. student from Central Michigan University in Mt. Pleasant, Michigan. Originally from Beals Island, Maine, she graduated from the University of Maine at Orono with her bachelor's in Communication Sciences and Disorders in 2000.

Alberto Behar, P.Eng., C.I.H., INCE Bd. Cert.



Alberto Behar is a Professional Engineer and Certified Industrial Hygienist. He is the President of Noise Control and Management consulting company dealing with occupational and environmental noise as well as with hearing conservation and protectors, fields he has been active in for almost 40 years. He is also Research Associate with the Sensory Communication Group, University of Toronto. He is the author of over 50 referenced papers and of two books on noise control.

Elliott H. Berger, M.S.



Elliott Berger is the senior scientist for auditory research at E-A-R/Aearo Company. For over 25 years he has studied hearing protection, hearing conservation, and related topics, and has presented his research in over 60 articles and textbook chapters. He chairs ANSI working group S12/WG11 on hearing protector attenuation and performance, is a fellow of the Acoustical Society of America, past-president of the National Hearing Conservation Association, fellow of the American Industrial Hygiene Association and past-chair of its Noise Committee, a board member of the Council for Accreditation in Occupational Hearing Conservation, and the 1993 recipient of the National Hearing Conservation Association's Outstanding Hearing Conservationist Award.

John G. Casali, Ph.D., CPE, CIE, CHFEP



Dr. John Casali is the John Grado Professor of Industrial and Systems Engineering at Virginia Tech. After receiving his Ph.D. in Human Factors Engineering at Virginia Tech, he developed the Auditory Systems Laboratory, an acoustics research facility that specializes in hearing protection, auditory displays, and communications devices. He is a Fellow of the Human Factors and Ergonomics Society and the Institute of Industrial Engineers, and former Vice-President of NHCA. He has received NHCA's Outstanding Lecture and Media awards. His research at Virginia Tech has been sponsored by various government agencies and corporations to a total of over \$5 million. Dr. Casali holds three patents and has authored over 150 publications. He enjoys consulting with companies and community groups on warning signal issues, hearing protection, community noise, and patent litigation, at least between periods of fishing and working on his British sports cars.

William W. Clark, Ph.D.



William W. Clark is the Director of the Program in Audiology and Communication Sciences at Washington University School of Medicine. Dr. Clark's research interests include the effects of noise on hearing and the ear, and he has published more than 80 papers on the subject. His studies include the effects of leisure noise on hearing, hearing loss in noise exposed transportation workers, origin of spontaneous and distortion product otoacoustic emissions, and protection against noise trauma are well known to auditory scientists.

George R. Cook, Jr., Au.D., CCC-A, F-AAA



George Cook has over 35 years of experience in the occupational health setting. As a founder, major principal, and Vice President of Hearing Conservation for Oto-Data, Inc. and Vice President of U.S. HealthWorks, he created initial service format and facilitated departmental growth to major players in the service market. He also served as Senior Oc-

cupational Audiologist consultant visiting plants to establish or evaluate hearing conservation programs. He now is a business principal with Workplace Group providing occupational hearing conservation services to businesses and employers. He is a certified CAOHC Course Director (#54). Over the course of his career, George has developed criteria, program logic and report format for audiogram interpretation, pioneered the use of PC software used in plant medical departments. He has written numerous articles about hearing conservation and hearing tests. He has been a NHCA annual conference presenter on many occasions over the years. George is a member of the National Hearing Conservation Association, the American Speech-Language-Hearing Association and the American Academy of Audiology. He is a licensed audiologist in North Carolina, Virginia and New York state.

Robert A. Dobie, M.D.



After medical school and ENT residency, a research fellowship, and faculty positions at the University of Washington and Texas, Bob Dobie became Director of the Division of Extramural Research at NIDCD. He is the author of *Medical-Legal Evaluation of Hearing Loss* (2nd Edition). He has served as a member of the Council for Accreditation in Occupational Hearing Conservation, as chairman of the noise subcommittee of the AAO-HNS, and as president of the Association for Research in Otolaryngology.

Dennis P. Driscoll, PE



Dennis Driscoll is President and Principal Consultant of Associates in Acoustics, Inc. He has both a Bachelor of Science and Master of Science degrees from North Carolina State University. Besides directing the business administration of the company, his primary responsibilities include conducting engineering noise control surveys, data analysis, research, and design of recommendations for noise control. In addition, he conducts environmental and community noise surveys to determine regulatory compliance and mitigation, when warranted. Mr. Driscoll is lead author of Chapters 9 and 15, "Noise Control Engineering," and "Community Noise," respectively, which are published in *The Noise Manual*, 5th Edition, by the American Industrial Hygiene Association. He also served as one of the textbook editors. Toward professional certification, he is a registered Professional Engineer and a Board Certified Noise Control Engineer. He is a Past President of the National Hearing Conservation Association (NHCA), a Fellow Member of the American Industrial Hygiene Association (AIHA), past Chair of the AIHA Noise Committee, and recently completed a five-year term as a Council Member of the Council for Accreditation in Occupational Hearing Conservation.

Gregory A. Flamme



Greg Flamme is an Assistant Professor in the Department of Speech Pathology and Audiology at Western Michigan University. He earned his Ph.D. in Audiology at the University of Memphis and did postdoctoral work in Epidemiology and Biostatistics at the University of Iowa. His research interests are in hearing loss as a public health problem, hearing loss prevention, and treatment.

John R. Franks, Ph.D.



Dr. John Franks of the National Institute for Occupational Safety and Health has been involved in the development of standards and regulations related to occupational hearing loss prevention for more than 30 years. He has served on committees of the American Speech-Language Hearing Association, the American Society for Testing and Materials, the American National Standards Institute and the National Hearing Conservation Association. He has published or presented more than 70 articles and presentations and holds two patents. His interest in impulsive noise dates back to 1969 when he forgot to insert his earplugs before firing an M-1 rifle in Army basic training.

Deborah Gabry

Ms. Deborah Gabry is currently a Senior Health Scientist with OSHA. She received a Master's Degree in Audiology from Columbia University, then practiced clinically at Sibley Hospital in Washington, D.C., until she moved to the Department of Labor to head the Office of Workers Compensation Program where she created the hearing loss unit. She joined Dr. Alice Suter at OSHA's Office of Health Standards to work as a team in developing the Hearing Conservation Amendment. After the standard was issued in 1983, Deborah made presentations on the standard across the country. She moved on to the Directorate of Science Technology and Medicine where she works on developing technical guidance documents, and safety and health outreach projects, including videos for the shipyard industry. Ms. Gabry is the sole audiologist at OSHA and is involved in issues on hearing conservation. She was an invited instructor at the OSHA Office of Training and Education, and presented on hearing conservation to the U.S. Job Corps. Deborah was instrumental in forging the NHCA/OSHA Alliance. Ms. Gabry works with NIOSH, FDA, EPA and other government agencies in her daily work. She maintains her certification from the American Speech-Language-Hearing Association, and is also CAOHC certified.

Pamela S. Graydon



Pam Graydon is an Electronics Engineer who has been working for the National Institute for Occupational Safety and Health (NIOSH) since 1990. She joined the Hearing Loss Prevention Team in Cincinnati, Ohio, during 1999. She has earned two Bachelor degrees, the first in 1993 and the second more recently in 2003 from Northern Kentucky University in Electronics Engineering Technology. She is currently CAOHC certified and enjoys learning more about hearing conservation every day.

Susan Griest, M.P.H.



Susan Griest, M.P.H., is a Staff Scientist for the Oregon Hearing Research Center at Oregon Health and Science University. She also is a collaborator with the Veterans Affairs Medical Center, National Center for Rehabilitative Auditory Research in Portland, Oregon. She received her Master's in Public Health from the University of Washington (1989). For the past 22 years, Ms. Griest has been a researcher

and educator in the area of tinnitus and noise-induced hearing loss. She has been a Co-Investigator for the Dangerous Decibels™ project over the past four years. Since 1996, Ms. Griest has been a member of the National Hearing Conservation Association (NHCA) Task Force: Hearing Conservation Education for Children & Adolescents. For the past two years she has served as the associate member delegate for the NHCA Executive Council.

Lee D. Hager



Lee Hager is Hearing Loss Prevention Consultant for Sonomax, a leading provider of new technology in hearing loss prevention. He has been active in hearing loss prevention since 1986, serving as Past-President of NHCA and past Chair of the AIHA Noise Committee. He presents to professional associations and groups on hearing loss prevention issues and contributes to health and safety publications. He is a member of the NIOSH National Occupational Research Agenda (NORA) Hearing Loss Prevention Team.

Jerry G. Jensema, BSE



Jerry Jensema is a principal officer of HCI (Health Conservation, Inc.) and has been the Chief Operating Officer (COO) since 1987. Jerry holds a BSE in Occupational Health and Safety from the University of Wisconsin and has worked in the area of Health and Safety for over thirty years. Prior to joining HCI, his experience included safety management positions in the food and manufacturing industries and the Executive Vice Presidency of Occupational Health Service of Milwaukee, Wisconsin. HCI is a privately held corporation offering a wider range of mobile employee health testing capabilities on a nationwide basis.

Cheryl DeConde Johnson, Ed.D., FAAA



Cheryl DeConde Johnson is a senior consultant with the Colorado Department of Education where she is responsible for the areas of Deaf and Hard of Hearing Disabilities and Audiology services. She provides technical assistance and leadership for deaf education and educational audiology services statewide. She is a co-author of the *Educational Audiology Handbook*, as well as numerous other articles and chapters. In recognition of her commitment and contributions to educational audiology, Dr. Johnson was honored as the 1993 Rolland J. Van Hattum award recipient from the Foundation of the American Speech-Language-Hearing Association, the 2000 Professional Achievement award recipient presented by the American Academy of Audiology, and the 2001 Frederick Berg Award from the Educational Audiology Association.

Madeleine Kerr, Ph.D., RN



Madeleine Kerr is an Associate Professor at the University of Minnesota School of Nursing. She conducts intervention research in construction worker hearing loss prevention. She is principal investigator of the NIDCD-funded study "Latino-based Multimedia to Prevent NIHL" involving Latino construction workers in the design and evaluation

of bilingual computer-based education to promote use of hearing protection. She represents the American Association of Occupational Health Nurses on the Council for Accreditation in Occupational Hearing Conservation.

Jeff A. Lancaster, Ph.D.



Dr. Lancaster is Research Assistant Professor of Industrial and Systems Engineering at Virginia Tech, and Laboratory Manager of the Auditory Systems Laboratory, an acoustics research facility. He holds the M.S. and Ph.D. in Human Factors Engineering/Ergonomics, is a member of the Human Factors and Ergonomics Society (HFES) as well as the HFES Aerospace Systems technical group. He has conducted numerous experimental investigations into hearing protection devices and augmented devices for both basic and applied research.

William Hal Martin, Ph.D.



Dr. Martin is a Professor of Otolaryngology / Head and Neck Surgery and Professor of Public Health & Preventive Medicine at the Oregon Health & Science University in Portland. He is the multi-program director of the Oregon Hearing Research Center Tinnitus Clinic, the tinnitus research program and of intraoperative neurophysiological monitoring. He is also co-director of the Dangerous Decibels™ hearing loss and tinnitus prevention program including a permanent exhibit at the Oregon Museum of Science and Industry (OMSI), a Northwest regional educational program for elementary and middle school students, and a research program studying factors related to noise-induced hearing loss in children. Dr. Martin is the Research Scientist in Residence at OMSI. He is a Fellow of the American Society for Neurophysiological Monitoring and of the American Academy of Audiology. Dr. Martin's career in hearing began at the University of California, Irvine, where he worked closely with Dr. Arnold Starr, studying the development of the auditory system in premature infants. He received his doctorate in Speech and Hearing Sciences with an emphasis in computational physics and auditory neurophysiology from the University of California, San Francisco, under Drs. Don Jewett and Michael Merzenich and had a Post-doctoral Fellowship in neurophysiology at the Technion in Haifa, Israel, under Dr. Hillel Pratt. Prior to coming to OHSU, he was the Director of Audiology & Neuro-monitoring and the Director of the Garfield Auditory Research Laboratory at Temple University in Philadelphia for 12 years. He has contributed to over 250 publications and presentations in hearing and neuroscience.

Marjorie McCullagh, Ph.D.



Marjorie McCullagh holds a Ph.D. in nursing from the University of Michigan, Ann Arbor. Dr. McCullagh is a certified clinical specialist in occupational health nursing and currently serves as an associate professor of nursing at North Dakota State University. Her research focuses on prevention of noise-induced hearing loss among farmers.

Mary M. McDaniel, MS, CCC-A



Mary McDaniel is the owner of Pacific Hearing Conservation, a consulting firm, in Seattle, WA, and is an adjunct audiologist for Center for Hearing Health, in San Ramon, CA. She has worked exclusively in occupational audiology for the past 20 years. Mary is a past president of the National Hearing Conservation Association and last year's recipient of the Michael Beall Threadgill Award. She is very active as a certified course director for the Council for Accreditation in Occupational Hearing Conservation (CAOHC) and currently serves on CAOHC's Executive Council. Mary is a member of the American Speech-Language-Hearing Association and past Chair of ASHA's Special Interest Division in Hearing Conservation and Occupational Audiology. She is also a member of the American Academy of Audiology and the Acoustical Society of America.

Sarah Meade, M.A., CCC-A



Sarah Meade is currently employed as an Educational Audiologist for Greeley-Evans School District 6, and also serves as a mentor to Educational Audiologists entering the field. Prior to working for Greeley-Evans District 6, she worked as an Educational Audiologist throughout many rural communities in the central mountains of Colorado. Her previous experience includes service as a Regional Audiology Coordinator for the Colorado Department of Public Health and Environment (CDPHE), and a parent facilitator for the Colorado Home Intervention Program (CHIP) for Deaf and Hard of Hearing children.

Susan C. Megerson, M.A., CCC-A



Susan Megerson received her B.A. from Emory University and M.A. in Audiology from the University of Kansas. She is an ASHA-certified audiologist, CAOHC-certified course director, and long-time provider of hearing conservation services to industry. She is a past Chair of the Council for Accreditation in Occupational Hearing Conservation and has been an active member of the American Industrial Hygiene Association's noise committee. Susan joined NHCA in 1986 and has served on committees, the executive council, and as the association's President. She is the 1998 recipient of NHCA's Threadgill Award for Outstanding Service. She is currently a consultant and instructor at the University of Kansas.

Deanna K. Meinke, M.A., FAAA



Deanna Meinke is an Assistant Professor of Audiology at the University of Northern Colorado. She has both undergraduate and graduate student teaching responsibilities for Audiology and Speech-Language-Hearing science courses where she enjoys sharing her passion for hearing loss prevention. Her research interests include distortion product otoacoustic emissions and the prevention of noise-induced hearing loss across the lifespan. She currently chairs the National Hearing Conservation Association Task Force on Hearing Conservation Education for Children and Adolescents and coordinates hearing loss prevention outreach for the Marion Downs Hearing Center.

CDR William J. Murphy, Ph.D.



Commander William Murphy is co-leader of the NIOSH Hearing Loss Prevention Team in the Division of Applied Research and Technology in Cincinnati, OH. His primary interests are fundamental acoustics, hearing loss, hearing protection devices (HPDs) and noise control engineering. Recently, he has researched the impulse response of both nonlinear and linear hearing protectors and has developed software to measure the attenuation of HPDs and pioneered the analysis of laboratory and field attenuation measurements of HPDs.

Shelby Myers-Verhage



Shelby Myers-Verhage is a research assistant working on the Iowa Hearing Loss Prevention Project. She earned her Master of Arts in Teaching (M.A.T.) at the University of Iowa. Her primary background is in the classroom, working with middle school and college students. She has worked on state boards developing educational benchmarks, standards, and assessments of educational progress. She has presented at educational conferences at the state and regional levels.

Richard L. Neitzel, MS, CIH



Rick Neitzel holds an MS in Environmental Health from the University of Washington, a BS in Safety from the University of Southern California, and is a Certified Industrial Hygienist. He is a Research Scientist in the UW Department of Environmental and Occupational Health Sciences, serves as Director of Communications for the National Hearing Conservation Association, and sits on the Noise Committee of the American Industrial Hygiene Association. His research interests include assessment of noise exposure and hearing loss in construction, evaluation of vibration exposure and health effects, and development of noise controls and effective hearing conservation programs.

Timothy L. Rink, Ph.D.



Tim Rink holds an undergraduate degree from Capital University and masters and doctoral degrees in audiology from The Ohio State University. He is the founder and chief executive of HTI, Inc., a corporation that has provided on-site medical surveillance, reporting and record keeping services to clients throughout North America since 1976. In addition to serving as the PSO Delegate on the NHCA Executive Council, Tim has served on various Ad Hoc Committees.

Martin S. Robinette, Ph.D.



Dr. Martin Robinette is a Professor of Audiology at the Mayo Clinic College of Medicine, Department of Otolaryngology, Mayo Clinic Scottsdale. He received his Ph.D. (Audiology) at Wayne State University, 1970; Section Head, Audiology, Mayo Clinic Rochester, 1986-94; and Associate Dean College of Health, University of Utah, 1984-86. He is an ASHA Fellow and recipient of Honors of the Association; ASHA 67 publications including three textbooks and over 240 conven-

tion papers and invited presentations. Martin is Chair of 43 Graduate Student Committees, 38 Master's and 5 Ph.D.

Noah Seixas, Ph.D., CIH



Noah Seixas is a Professor in the University of Washington's Industrial Hygiene and Safety Program within the Department of Environmental and Occupational Health Sciences, and is also the Rohm and Haas Professor of Environmental Health. He is a Certified Industrial Hygienist, and holds a Ph.D. in Industrial Safety from the University of Michigan – Ann Arbor and an M.S. in Industrial Hygiene and Safety from Harvard. His research interests include exposure assessments in the context of retrospective, cross-sectional and prospective epidemiology studies across a variety of industries, and exploration of statistical aspects of exposure and dose estimation.

Mark R. Stephenson, Ph.D.



Mark Stephenson is currently serving as a Senior Research Audiologist at the Centers for Disease Control and Prevention's (CDC) National Institute for Occupational Safety and Health (NIOSH). He is the director of a NIOSH research project that is developing hearing loss prevention programs for the construction industry. In 1986, Mark received a Ph.D. in audiology & hearing science from the Ohio State University. Mark joined NIOSH in 1993 after having completed a 20-year career in the USAF. Mark spent most of his Air Force career at the Aerospace Medical Research Laboratory where he investigated the effects of hazardous noise, hearing protector performance, and voice communications in noise. At the time of his retirement from the Air Force, Mark was serving as an Associate Chief of the USAF Biomedical Sciences Corps, through which he functioned as the director of the USAF audiology and speech pathology programs. Mark is active in numerous professional organizations. He has played a significant role in the development of many acoustical standards through his membership in various committees and working groups of the Acoustical Society of America. He has served as President of the Air Force Audiology Association, and as Vice President of the National Hearing Conservation Association. He is currently the Chair of the American Academy of Audiology (AAA) Task Force on Hearing Conservation. Mark also serves AAA as a representative to the Council for Accreditation in Occupational Hearing Conservation. Mark holds adjunct faculty appointments to the graduate schools of the Ohio State University, Miami University, and Michigan State University. In their spare time, Mark and his wife Carol enjoy scuba diving as well as showing and training Bernese Mountain Dogs.

Christa L. Themann, MA, CCC-A



Christi is a Research Audiologist at the National Institute for Occupational Safety and Health in Cincinnati, Ohio. She received her master's degree in audiology from the University of Cincinnati in 1989, and is certified by the American Speech-Language-Hearing Association. Her research experience includes epidemiologic studies of noise and hearing loss, including the NIOSH Farm Family Health and Hazard Survey, as well as research on test methods for hearing

protector attenuation and hearing conservation strategies for workers with impaired hearing. Currently, Christi is managing the audiometric component of the National Health and Nutrition Examination Survey.

Randy L. Tubbs, Ph.D.



Dr. Randy Tubbs is a psychoacoustician with NIOSH, having served in this position for the last 19 years of his 27-year career as an officer in the U.S. Public Health Service, reaching the rank of Captain. He is responsible for addressing all of the occupational noise and vibration exposure requests in support of NIOSH's Health Hazard Evaluation program. He received his A.B. in Experimental Psychology from the University of Michigan – Flint, and the M.A. and Ph.D. degrees in Experimental Psychology from Miami University, Oxford, Ohio. Dr. Tubbs is active in research on the effects of noise on hearing, on hearing conservation programs, and on occupational vibration exposures.

Jeremie Voix, P.Eng., M.A.Sc.



Jeremie Voix is an Acoustics Engineer with field experience in industrial noise reduction projects. He holds a Bachelor of Fundamental Physics from University of Lille (France) and a Master of Applied Sciences in Acoustics from Sherbrooke University (Canada). Jeremie is Director of Research and Chief Scientist of Sonomax Hearing Healthcare Inc (Montreal, Canada). He also is currently finishing his Ph.D. at the University of Quebec (Montreal, Canada).

Laurie Wells, MS, FAAA



Laurie Wells is a board certified audiologist and the Manager of Audiology for Associates in Acoustics, Inc. She has served NHCA in the past on the Nominations, Steering, Publications, and Editorial committees and in elected offices as Secretary and Vice-President, and President-Elect. As a hearing loss prevention consultant, Laurie provides professional audiology review and audiometric database management, advises on hearing conservation issues including hearing protection, workers' compensation, employee education, record-keeping, noise measurement, and hearing loss management in the workplace. Laurie is a CAOHC course director and has directed multiple courses in the U.S. and Europe.

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