It's Crystal Clear We're Here to Hear!

2020 NHCA Annual Conference The Sandestin Hotel • Destin, Florida

> > 111

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Spectrum is available without charge to NHCA members in all categories. Anyone interested in publishing in Spectrum should contact Kim Gill at the NHCA office.

The mission of the National Hearing Conservation Association is to prevent hearing loss due to noise and other environmental factors in all sectors of society.



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2021 NHCA Conference





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A PRESIDENT'S WELCOME



Welcome to Destin, Florida and the 44th Annual NHCA Conference "It's Crystal Clear, We're Here to Hear!" I hope you find this year's conference exciting and informative. I also hope you find your stay at the Sandestin Golf and Beach Resort warm, welcoming and relaxing.

Some fun facts about our host city:

-The Emerald Coast is a stretch of coastal area along the Gulf of Mexico that runs for roughly 100 miles on the Florida Panhandle. Approximately 4.5 million people visit the area each year with over 80 percent of all the vacationers visiting Destin. However, according to 2015 data, Destin's population is just under 14,000.

-Destin takes its name from Leonard Destin, a fishing captain who made his home in the area around 1845. Originally hailing from New London, CT, Leonard brought some New England charm and architecture to the Emerald Coast when he constructed a traditional colonial home at the Moreno Point Military Reservation.

-Destin's pure white sand may look like sugar, but it is actually made from ground quartz crystal from the Appalachian Mountains. Residue from the mountains is carried to the Gulf of Mexico by way of the Apalachicola River. By some estimates, the quartz crystal first started making its way down to Destin 20,000 years ago.

-Today, Destin is located on a peninsula that separates the Gulf of Mexico from Choctawhatchee Bay. Many years ago, however, this peninsula was once an island. Over time, changes in sea level caused the island to connect with the mainland.

-Destin is also known as "The World's Luckiest Fishing Village". That's because Destin is home to the largest fleet of charter fishing vessels in one port in all of North America. Visitors come from all over the country to charter their own fishing trips and to sample Destin's superb seafood.

I addition to enjoying your resort accommodations, it is my hope that you are able to explore Destin and enjoy this unique and beautiful location!

A huge thank you to our conference planning committee led by Program Chair, Tanisha Hammill and her Program Chair-Elect, Dee Hightower. The entire program team spent many hours planning a high quality conference. Committee members include: Rachel Bouserhal, Susan Cooper, Kathy Gates, Heather Malyuk, Elliott Berger, Caleb Kronen, Corey Portnuff, Michele Alexander, Vishakha Rawool and the Presidential Trio. The entire staff of Civica including Kim Gill, Executive Director for NHCA and staff members Dani Korth and Chandler Bruns have worked tirelessly behind the scenes to make our conference the best it can be. One last thank you – but certainly not least – to my Presidential Trio teammates: Vickie Tuten (outgoing Past-President) who has been a mentor and friend for years; I have appreciated your guidance and support; and Theresa Schulz (incoming President) who provided valuable input to conference planning and EC meetings as a voice of wisdom and clarity. When you see these staff members and volunteers throughout the conference venue, please take a moment and thank them for their dedicated service to NHCA.

Your organization has had a busy year! NHCA presented a learning module at the American Academy of Audiology's Annual Conference, many of our members participated in the World Hearing Day Wikipedia Edit-a-thon, important updates were made to the NHCA Policy and Procedure Manual, four Spectrum editions were published, a letter of support for the Hearing Protection Act of 2019 was approved, NHCA provided ASHA and other sister organizations support for the Audiology & Speech-Language Pathology Interstate Compact legislation, the Robert Dobie Library was established on our website, and more recently NHCA became a partner in the International Year of Sound 2020 and conducted an NHCA stand-alone webinar.

Finally, the 10th anniversary edition of the International Journal of Audiology was edited by the very first guest editors, Drs. Thais Morata and Deanna Meinke. They have worked extremely hard to put together a preeminent issue. I am certain there are many more accomplishments by the Executive Council, our many Task Forces and NHCA members. Your NHCA leadership team endeavors to work within our organization and with our partners to promote the prevention of hearing loss due to noise and other environmental factors.

Finally, I would like to thank our Exhibitors and Sponsors! Without their support and dedication to NHCA, this conference would not be able to take place. Please make sure you thank them for their support as you visit with them during the conference.

Once again, welcome to Destin! I hope the sun shines bright, the learning and laughter is in abundance and that friendships bloom.

PROGRAM CHAIR'S WELCOME

I could not be more proud to have the honor to welcome you to the 2020 National Hearing Conservation Association's Annual Conference in beautiful Destin, Florida! I was thrilled two years ago to be asked to take the helm of such a big responsibility in the footsteps of my predecessor, Dr. Ed Lobarinas. I knew it would mean three things, getting the opportunity to 1) serve the NHCA community, a community that has taught me so much over the years and provided opportunities to present my work, network with giants in the field, and grow professionally; 2) to work with my mentors, truly awe-inspiring people, on the Executive Council as well as the dedicated and knowledgeable people who volunteered alongside me on the Program Task Force this last year; and 3) to choose a sunny, Florida location to host our conference in the dead of winter!

While summer calls for papers can be tough to garner enough submissions of merit (who wants to write abstracts on holiday?), I am happy to say that we received an amazing response this year, with over 70 submissions to evaluate. The result, I hope you'll agree, is a stellar line-up of presentations from novice and seasoned professionals alike. We will be showcasing both "traditional" NHCA papers such national and industry approaches to hearing conservation programs being presented in our Friday morning plenary sessions, and our breakout track exploring Novel Measurement Strategies on Saturday morning; as well as more tangential topics with high relevance to the hearing conservation mission, such as our



Keynote talk from Dr. Jennifer Deal, exploring aging and dementia's relationship to hearing loss. My vision for this year's program was to provide a comprehensive line-up of perspectives in order to follow long-term endeavors to their current state of the science, but also to add new tools to your toolbox, allowing you to better reach your patients with meaningful messages and understand new ways to identify and prevent hearing loss.

As we enter a new decade, it is important to look to the future of our craft – how can we leverage Artificial Intelligence technologies to prevent or mitigate hearing loss? Our colleague from MIT Lincoln Laboratory, Dr. Gregory Ciccarelli will delve into this exciting new frontier. We also looked to a 21st century leader in communications platforms – the podcast – to book our luncheon speaker, podcast star of Twenty Thousand Herz, Dallas Taylor (check out a sneak peek about his lecture here: https://vimeo.com/386847075).

And as tensions rise globally, it seems certain that military conflicts will continue to require our best efforts in novel hearing protection strategies, a theme discussed from many perspectives this year from speakers like Dr. Douglas Brungart from Walter Reed National Military Medical Center and use of pharmaceutical interventions presented by the UK's Dr. Jameel Muzzafar. Moreover, Dr. Melissa Papesh will close-out our program with an important presentation exploring "Auditory Deficits Associated with Exposure to High-Intensity Blast Waves: Evidence from Military Veterans."

The trials and tribulations our military face is the true north of my own professional compass, and I am honored to announce our 2020 Gasaway Awardee and lecturer, US Army Lieutenant Colonel Jillyen Curry-Mathis. Over my 15-year career within the US Military environment, I have only ever heard Dr. Currty-Mathis's name mentioned with regards to her can-do attitude, her willingness to go above and beyond to better serve her fellow Service members, her outside-the-box thinking to solve problems and elevate military hearing conservation operations, and her effectiveness to get things done. Her lecture will share her unique stories and experiences in her Army audiology career and is not to be missed!

We worked hard to squeeze every last CEU out of the program this year (15.5 credit hours!), to make it a valuable contribution to our audiologists who rely on this conference to fulfill their requirements. I've also worked in a lot of fun activities to network and truly get to know your colleagues while you are here, so don't miss out on the Friday Night Event being held at Margaritaville or the scavenger hunt/bar crawl to follow through the exciting HarborWalk Village area. Saturday morning, we'll kick off with a Vendor Appreciation Breakfast where you can get to know our valued vendors exhibiting and generously sponsoring the conference, so don't skip the most important meal of Saturday!

I know many of you have traveled far, through long flights to get here and we are grateful for your time and investment in your continuing education and/or the dissemination of your work's findings. We aimed to find a destination that offered affordable rooms at a destination worth traveling to for its beauty and amenities. While we'll be bussing you around this year, keep in mind that we may return here in two years if this location is well-reviewed by you all, so note that current construction on a conference venue immediately adjacent to the lodging area and village will be complete by then (2022), eliminating the need for bussing. Please share your thoughts with us at the end of the week if you want to ensure we come back to Sandestin with that more intimate meeting perimeter! In the meantime, I hope you'll enjoy the beaches, the bay, the complementary biking, swimming, and fellowship with your fellow hearing conservationists!

Next year, you'll be in good hands with Dee Hightower and the continuing Program Task Force members in majestic Albuquerque, NM! Thank you, Dee and all of the PTF members and Civica staff for all that you've done this year to create what should be the new bar for NHCA Conference to beat in Albuquerque!

SANDESTIN RESORT MAP

NHCA 2020



NHCA Spectrum · Vol. 37, Supp. 1 · 2020

HOTEL FLOOR PLAN NHCA 2020



NHCA Spectrum · Vol. 37, Supp. 1 · 2020

Wednesday • February 19 • 2020

7:00 AM - 5:00 PM	Course Director Certification & Re-certification Workshop through CAOHC	Terrace Room 2/3

Thursday • February 20 • 2020

7:00 AM - 6:30 PM	Registration Desk Open	Bayview Foyer
7:00 - 8:00 AM	Breakfast	Bayview Room
	Full Day Maylahana	
	Full Day workshops	
8:00 AM - 4:00 PM	The Basics Workshop	Linkside B
	<i>Speakers: James Jerome, Timothy Swisher, Frank Wartinger, Laurie Wells, Richard Stepkin and Theresa Small</i>	
8:00 AM - 4:00 PM	Boothless Audiometry Workshop	Linkside A
	Speakers: Kathy Gates, Jameel Muzaffar, Dirk Koekemoer, Renee Lefrancois, Laura Prigge and Odile Clavier	
	Morning Workshops	
8:00 - 11:00 AM	Selecting Hearing Protection Devices Lising New and Lindated Standards	Linkside D
0.00 11.00 AM	Speakers: Kari Buchanan and Robert Williams	
8:00 - 11:00 AM	Hands-On Workshop: How You (or Your Students) Can Contribute to Wiki4YearOfSound2020	Terrace Room 2/3
	Speaker: Thais Morata	
8:00 - 11:00 AM	Impulsive Noise: Understanding Measuring and Mitigating the Risk of Noise Induced Hearing Loss	Linkside C
	Speakers: William Murphy, Gregory Flamme, Deanna Meinke and Michael Stewart	
11:00 AM - 1:00 PM	Lunch On Your Own	
	Afternoon Workshops	
1:00 - 4:00 PM	What You Don't Hear Can Kill You - The Conundrum of Balancing Hearing Protection and Auditory Situation Awareness: Guidance for the Hearing Conservationist	Linkside D
	Speakers: John Casali and Lee Kichol	
1:00 - 4:00 PM	Noise Exposure Risk Assessment in Various Workplace Environments	Linkside C
	Speaker: Robert Anderson	
1:00 - 4:00 PM	Considering Models and Approaches to Health Behavior Change in the Prevention of Auditory Dysfunction	Terrace Room 2/3
	Speaker: M. Samantha Lewis	
E.20 0.20 DM	Fulcibitory Descention	Linksida Favor
5:30 - 8:30 PM	Exhibitor Reception	Linkside Foyer



Friday • February 21 • 2020

7:00 AM - 5:30 PM	Registration Desk Open	Linkside Foyer
7:00 AM - 5:30 PM	Exhibit Hall Open Linkside Foyer	
7:00 - 8:00 AM	Breakfast Bayside Ballroom	
8:00 - 8:15 AM	AM General Session: Opening Remarks Linkside Ballroom	
	Presented By: Amy Blank, NHCA President & Tanisha Hammill, Program Committee Chair	
8:15 - 8:45 AM	Keynote Address: Hearing, Aging, and Public Health – From Epidemiology to Public Policy	Linkside Ballroom
	Speaker: Jennifer A. Deal	
	Planary Platform Cossions Linksido Pallroom	
9.45 0.15 AM	Healthy Heaving Healthy Aging, Initial Decults	
0.43 - 9.13 AIVI	Reality Reality Aging. Initial Results	
	Speaker: Jan Moore	
9:15 - 9:45 AM	University of Michigan/Apple Hearing Health Study	
	Speaker: Richard Neitzal	
9:45 - 10:15 AM	Break	Linkside Foyer
10:15 - 10:40 AM	Building an Effective Hearing Conservation Program (HCP) and the Value of Pre-	vention
	Speakers: Malisha Martukovich, Theresa Schulz, Kathy Gates and LaKeisha Henry	
10:40 - 11:05 AM	UK Military Hearing Collaboration - An Overview of Progress Across Prevention, and Treatment of Noise Induced Hearing Loss and Tinnitus	Detection
	Speaker: Lt Col Linda Orr	
11:05 - 11:30 AM	Developments in Artificial Intelligence to Prevent and Mitigate Hearing Loss	
	Speaker: Gregory Ciccarelli	
11:30 AM - 12:00 PM	General Session: NHCA Annual Business Meeting	Linkside Ballroom
12:00 - 1:30 PM	Luncheon Speaker: The Fifth Sense	Bayside Ballroom
	Speaker: Dallas Taylor	
Schedule Continued on Next Page		

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Friday • February 21 • 2020

Continued from Previous Page		
1:30 - 2:30 PM	Poster Session	Bayview Room
2:30 - 3:00 PM	Break	Linkside Foyer
3:00 - 3:25 PM	How Do We Know it Works? Evaluating Hearing Loss Interventions for Effectiveness	Linkside Ballroom
	Speaker: Hannah Speaks	
3:25 - 3:50 PM	Words-in-Noise Performance in Normal-Hearing Young Adults with Isolated or Frequent Firearm Exposure	Linkside Ballroom
	Speaker: Sarah Grinn	
3:50 - 4:15 PM	Subjective Evaluation of Hearing Protection Devices in a Military Population	Linkside Ballroom
	Speaker: Douglas Brungart	
4:15 - 4:40 PM	Effectiveness of a Smartphone-Based Hearing Conservation Intervention Among Farm Youth	Linkside Ballroom
	Speaker: Khalid Khan	
4:40 - 5:15 PM	Safe-in-Sound Awards	Linkside Ballroom
6:30 - 9:30 PM	Friday Night Event - Margaritaville at the Harborwalk Busses will start at 6:00 PM outside of the Grand Complex Lobby/Hotel Lobby	Margaritaville at the Harborwalk

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Saturday • February 22 • 2020

			-	
	7:00 AM - 5:00 PM	Registration Desk Open		Linkside Foyer
	7:00 AM - 2:00 PM	Exhibit Hall Open		Linkside Foyer
	7:00 - 8:00 AM	Vendor Appreciation Breakfast - For Att	endees and Exhibitors	Bayside Ballroom
	Breakout Session #1:	Breakout Session #2:	Breakout Session #3:	Breakout Session #4:
	Novel Education Strategies	Novel Measurement Strategies	Novel Protection Strategies	Industry Considerations
	Linkside D	Linkside C	Linkside A	Terrace Room 2/3
		8·10 - 8	R·35 ΔM	
	Comis Dooks to Csiontific	Field Validation Accordment	Characterization of Fireerma	Evaluation of Heaving Dratestion
	Guidelines: Effective Strategie in the Fight Against Noise-Induced Hearing Loss	es of a Portable Auditory Localization Training System for Instilling Azimuthal	Suppressor Performance with a Microphone Array	Device Effectiveness for Musicians
	Speaker: John Eichwald	Localization Skills With and With- out Electronic Hearing Protectors	Speaker. William Murphy	Speaker. Kalinyn Clawiolu
		Speakers: Kara Cave and Brandon Thompson		
		8:40 - 9	2:05 AM	
Just-In-Time Learning and Hearing Conservation Speaker: John Merkley		Effects of Written Instructions on Field Real Ear Attenuation at Threshold Measurements Speaker: Katherine Steffen	Glucocorticoid Therapy for Acute Acoustic Trauma: Current and emerging evidence from the UK Military Hearing Research Program	Preventing Hearing Injury in the Music Industry Speakers: Siobhan McGinnity and Robert Cowen
			Speaker: Jameel Muzaffar	
		9:10 - 9	:35 AM	
	Musical Acoustics and Health A Hands-On Approach to Learning and Applying	: Characterizing the Effects of Occupational Noise Exposure Using Otoacoustic Emissions	Evaluation of Extended Wear Earplugs: Lessons for Hearing Conservation	Noise Exposures in a Meat Processing Facility
	Speaker: Donald Finan	Speaker: Sridhar Krishnamurti	Speaker: Douglas Brungart	
		9:35 – 10:05 AM - Bi	reak – Linkside Foyer	
		Cale and the Counting	rad on Newt Dava	
		Schedule Continu	led on Next Page	





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Saturday • February 22 • 2020

Continued from Previous Page		
10:05 - 11:05 AM	Music Audiology: Updates and Best Practices	Linkside Ballroom
	Speakers: Frank Wartinger, Cory Portnuff, Colleen Le Prell, Heather Malyuk and Michael Santucci	
11:05 - 11:35 AM	Stand-off, Photograph-Based Estimation of Hearing Protection Attenuation and Fit	Linkside Ballroom
	Speaker: Christopher Smalt	
11:35 AM - 1:05 PM	Awards Luncheon	Bayside Ballroom
1:15 - 1:45 PM	Gasaway Lecture: Prevention at the 3	Linkside Ballroom
	Speaker: Jillyen Curry-Mathis	
1:45 - 2:15 PM	Middle Ear Muscle Contractions do not Provide Dependable Protection: Impli- cations for Impulsive Noise Damage Risk Criteria	Linkside Ballroom
	Speaker: Gregory Flamme	
2:15 - 2:45 PM	An Approach to Identification of Middle Ear Muscle Contractions that Controls for the Effect of Incidental Motor Activity	Linkside Ballroom
	Speaker: Stephen Tasko	
2:45 - 3:15 PM	Break	Linkside Foyer
3:15 - 3:45 PM	Understanding Audio Through Audiology and Hearing Conservation	Linkside Ballroom
	Speaker: S Benjamin Kanters	
3:45 - 4:15 PM	Auditory Deficits Associated with Exposure to High-Intensity Blast Waves: Evidence from Military Veterans	Linkside Ballroom
	Speaker: Melissa Papesh	
4:15 - 4:30 PM	General Session: Closing Remarks	Linkside Ballroom
5:00 - 7:30 PM	Executive Council Meeting	Terrace Room 2/3

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Safe-in-Sound Award[™] for Innovation Winner

Christopher S. Allen

International Space Station, NASA Johnson Space Center

Christopher S. Allen is the Acoustics System Manager for the International Space Station (ISS) and Orion, and is the Lead for the NASA Johnson Space Center (JSC) Acoustics Office within the Human Health and Performance Directorate. He is responsible for controlling the noise levels inside the ISS, and is responsible for interior noise levels of Orion and other space flight vehicles. He began his career in 1990 at NASA Ames Research Center conducting wind tunnel aeroacoustics research in the areas of jet noise, and in-flow microphone measurement techniques. Mr. Allen received a B.S. and an M.S., both in Aerospace Engineering from Texas A&M University.





Safe-in-Sound Award[™] Presenter



Margaret M. Kitt, MD, MPH

National Institute for Occupational Safety and Health

Dr. Margaret Kitt is the Deputy Director at the National Institute for Occupational Safety and Health (NIOSH). She shares with the NIOSH Director the responsibility for the Institute's research and program operations. She also oversees the NIOSH Global Health Programs. Dr. Kitt is an Occupational Medicine Physician and has worked for NIOSH since 2002. She was a Senior Flight Surgeon in the U.S. Air Force, serving for 14 years and then spent 16 years in the United States Public Health Service, retiring in 2018 at the rank of Rear Admiral.

Safe-in-Sound Award[™] Committee:

Thais C. Morata, Ph.D. Safe-in-Sound Award[™] Director National Institute for Occupational Safety & Health

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> Kristen Casto, Ph.D US Army

Dennis P. Driscoll, P.E. Associates in Acoustics, Inc. John Franks, Ph.D. Lytlesound

Stephanie Griffin, Ph.D. University of Arizona

Deanna Meinke, Ph.D. University of Northern Colorado

Rick Neitzel, Ph.D., C.I.H. University of Michigan - Ann Arbor, MI The Michael Beall Threadgill Award was established in 1990 to honor those individuals who have contributed in a significant way to the growth and continuing excellence of the National Hearing Conservation Association by their outstanding commitment of time and effort.

Elliott H. Berger

by Vickie Tuten and Susan Cooper



In 2020, the NHCA is proud to present, for the second time, this prestigious award to Elliott Berger. Elliott was first awarded the Michael Beall Threadgill award in 1996 for the many significant contributions he had made to that date.

Elliott has shown no evidence of slowing down in the 24 years since that last award, his con-

tributions so numerous, it simply demanded a 2nd presentation of this award that honors members who contribute to the success and growth of the NHCA.

For some who are newer to our organization, we'd like to share a brief synopsis...okay maybe not so brief...of Elliott's many contributions to the NHCA. He is a previous recipient of the Outstanding Hearing Conservationist Award in 1993, the Michael Beall Threadgill Award in 1996, the Lifetime Achievement Award in 2013, not to mention three Outstanding Lecture Awards in 1993, 1998 and 2001. We didn't have another award that would honor the too-numerous-to-mention contributions by Elliott in recent years. The Michael Beall Threadgill Award is the NHCA award that speaks to an individual's contributions specifically to our organization. Elliott Berger sets the standard for all to emulate, and his contributions have now spanned over three decades.

Elliott has been a member of the NHCA since 1982 and has been involved in nearly every aspect of this organization. Prior to his last award in 1996 he had served as Program Chair three times that culminated in three extremely successful conferences. Some of the more impressive things done at conferences over the years such as the film/video theater some may remember fondly, and the Spectrum supplement conference program, the Outstanding Lecture Award, special luncheon speakers, and of course the specifications for and improving the quality of the a/v support at conference, were conceived of, and developed by Elliott. He has since been at the side of nearly every Program Chair 'behind the scenes' helping to ensure the success of every conference. Of special note, Elliott has secured many of the keynote, luncheon and Don Gasaway speakers that we have enjoyed at our conferences through these many years. To be exact he has found speakers for 21 out of 28 talks including our luncheon speaker for 2020. He lists his favorites over the years in order as Bernie Krause, Gordon Hempton, Murray Schafer, Christopher Clark, Tomlinson Holman, and Johnnyrandom. He single-handedly arranged for that memorable visit from Don Gasaway at our 2019 conference.

If you were to do a historical review of all our conferences, you would find Elliott on the conference speaker list more years than not. Did we mention that he has also received the Outstanding Lecture Award? An excellent workshop he gave the past several years on the 'Art of the Presentation' was absolutely a do not miss workshop. His contributions to the science of hearing conservation as an Acoustical Engineer, have made him a sought-after speaker with much to share with NHCA members.

Public speaking and conference arranging aren't Elliott's only strengths. Add writing and editing as well, and once again, NHCA has been the beneficiary. Elliott has been an invaluable member of the Spectrum editorial board since 1994 and its technical editor since 2014. Elliott is dedicated to identifying current research which is relevant to all hearing conservation professionals. His technical expertise ensures that each manuscript is based on sound science that can be trusted by the readership.

I'm not sure that we can ever allow Elliott to depart the NHCA Executive Council...some individuals truly are irreplaceable. What has he done on the Executive Council you ask? He served three years as Vice President of NHCA, then was elected to the threeyear term of President-Elect, President, and Immediate Past-President of NHCA. He established several ad-hoc committees and has probably been the most consistent contributor to the NHCA Policy Manual that serves as the 'standard operating procedure' document for this organization. Any member who has ever served on the Executive Council has seen Elliott easily reference exactly where a policy can be found in that document.

Unquestionably, the greatest contribution from Elliott has been in his role as the NHCA Historian which he has fulfilled since 1996. We have our very own NHCA Wikipedia in Elliott! No need to do an internet search to get your answers, just reach out to Elliott or check out his detailed documentation. You'll find a meticulous spreadsheet tracking membership, conference attendance, special lectures, and a dozen other statistics, and over 150 pages of Archival Reports of NHCA activities from 1996 to date – truly a wealth of important information that helps provide consistency to new officers and committee chairs! And with a constant flow of volunteer participation, how many organizations have such ready reference to consistent detailed archives? Members can access online historical records of NHCA position statements, workshops and annual meetings. This was truly a labor of love... Elliott collected, sorted, and scanned every available historical record. Members can access PDFs of the professional detailed annual programs Elliott helped pioneer in recent years, all the way back to the humble one-page typed program from NHCA's very first annual meeting held in 1977.

Although not his first rodeo in helping transition through a new management company, our current Civica management team have come to know Elliott over the last two years as one of the most dedicated and passionate volunteer leaders within NHCA. His archive historical data has been invaluable in helping with a smoother transition. Elliott has been their go-to guy for website content and development and has spent countless hours on this project with that continuing even to this day. They cite that one of the greatest contributions to the website, the Robert Dobie Library, came about because Elliott approached the family and received permission to house this incredible online resource on the NHCA website. The Civica staff looks forward to Elliott's correspondence, whether by phone or email, and appreciate his dedication and work which not only boosts NHCA but provides the leadership they need to fulfill their jobs.

Elliott Berger...the man, the myth, the legend. He will always be remembered as:

- E Energetic Brilliant B Learned Ε Earnest L Loyal R Rational L Insightful Gracious L Organized Enduring Е Talented Responsible Т
- **T** Tenacious

It is with great pleasure and gratitude that we honor Elliott Berger with the Michael Beall Threadgill award for his continued contributions to NHCA for the past 38 years. *Congratulations Elliott!*



STUDENT AWARD WINNERS

2020 STUDENT CONFERENCE AWARD WINNERS

Rachel Ehnis, **BA**



Rachel Ehnis completed her Bachelor of Arts at Michigan State University in Linguistics. Currently, she is a third year Doctor of Audiology student at Western Michigan University. Her interest in audiology and hearing conservation comes from a family history of noise induced hearing loss. Upon starting graduate school, she immediately became involved with the Hearing Conservation Program at WMU by conducting annual hearing evaluations for employees. Rachel is currently

working on her capstone research project entitled: Hearing Conservation in a University Setting. For this project, she has worked with WMU's industrial hygienists and audiology faculty to monitor noise exposure levels, write noise survey reports, and evaluate the efficacy of the current Hearing Conservation Program. She is thankful for the opportunity to be at the NHCA conference and is excited to gain as much knowledge as possible.

Jameel Muzaffar, BA, MBBS, MSc FRCS



Dr. Jameel Muzaffar is a UK Ministry of Defence funded PhD student in the Department of Clinical Neurosciences at the University of Cambridge and a Resident in ENT Surgery. His doctoral work forms part of a collaboration between the UK Royal Centre for Defence Medicine, US DoD Hearing Center of Excellence, University Hospitals Birmingham and the Universities of Cambridge and Dalhousie. The project explores the effects of impulse noise and blast on the auditory system, particularly

looking for signs of auditory injury in occupationally exposed populations that are not apparent on routine hearing tests. His work is supported by a Royal College of Surgeons Research Fellowship. He spent his medical school elective at NASA Ames Research Center and has received prizes and awards from the Royal College of Surgeons, Royal College of Physicians, Wellcome Trust, Midland Institute of Otology, Jesus College Cambridge and others.

Brendan Fitzgerald, MM



Brendan Fitzgerald is currently completing his Doctor of Audiology (AuD) degree from the State University of New York at Buffalo in an externship at the Cleveland Clinic. His clinical and research interests include tinnitus, hearing protection, and hearing loss prevention, particularly in musicians. Most recently, he has coordinated and presented for the University at Buffalo Hearing Health Lecture Series and works with patients in the Cleveland Clinic Tinnitus Management Clinic as part of his externship. He also

serves as Director of the contemporary chamber music ensemble Wooden Cities.

Elon Ullman, BA



Elon is a second year M.S. student in Industrial Hygiene at the University of Michigan. He grew up in Berkeley, California and received his B.A. from Bard College in Psychology. Taking advantage of the liberal arts atmosphere, he focused his undergraduate studies on the neuroscience of auditory perception. After graduation, he worked in a psychoacoustics lab while concurrently volunteering with Hearing Education and Awareness for Rockers, a non-profit focused on hearing conservation for

musicians and live music attendees. His current research is on predictors of earplug fit among above-ground miners. In his free time, he enjoys rock climbing, tinkering with bicycles, and attending concerts.

Jenny Rajan, AuD



Dr. Rajan is a PhD. student in the Biomedicine program at Salus University. Her research interest includes hearing loss prevention education in youth. She has over 17 years of experience as a clinical audiologist.She is currently an Assistant Professor at Salus University, where she teaches AuD. students both in the classroom as well as in the on-campus clinic.Her clinical and teaching focus is in pediatric audiology.

2020 STUDENT RESEARCH AWARD WINNERS

Kathryn Crawford, MS, COHC



Kate Crawford is a PhD candidate in the Department of Occupational and Environmental Health (OEH) at the University of Iowa. Kate received a BA in Literature and a BS in Environmental Health from West Chester University in Pennsylvania. After interning with the Environmental Health and Radiation Safety office at the University of Pennsylvania, she decided to pursue Industrial Hygiene and came to Iowa in 2014. As a trainee in the Heartland Center, a NIOSH ERC located in the University of

lowa's College of Public Health, Kate received her MS in Industrial Hygiene in 2016 and is currently pursuing her PhD in OEH. Her research involves evaluating occupational sound exposures and control strategies for music instructors. Kate is a Certified Occupational Hearing Conservationist and secretary-elect for the American Industrial Hygiene Association's Noise Committee.

Siobhan McGinnity, BSc, MClinAud, PhD



Dr. Siobhan McGinnity is a research audiologist at the University of Melbourne, where she recently completed her PhD, "Preventing hearing injury in the music industry." She has earned the NHCA Student Conference and Student Research Awards for her work. Dr. McGinnity is also a clinical tutor, supervising and lecturing students of the Master of Clinical Audiology program. Clinically, her areas of interest include aural rehabilitation, holistic tinnitus management and person-centred care of musi-

cians. She is also passionate about hearing access equality, founding Musicians 4 Hearing in 2015 to fund hearing care projects in the developing world.



Larry Herbert Royster, PhD

September 22, 1936 – March 18, 2019 See Spectrum 36(1), 13-14

Robert A. Dobie, MD

July 26, 1945 – September 4, 2019 See Spectrum 36(3), 12-13





Cheryl Nadeau, AuD February 20, 1958 – February 4, 2020

FINANCIAL DISCLOSURES

Chandran Achutan	No Financial Information to Disclose
William Ahroon	No Financial Information to Disclose
Robert Anderson	No Financial Information to Disclose
Douglas Brungart	No Financial Information to Disclose
Kari Buchanan	No Financial Information to Disclose
John Casali	Salary of Virgina Tech and PI Office of Naval Research Grant from Virginia Tech
Kara Cave	No Financial Information to Disclose
Gregory Ciccarelli	Employment, MIT holds a patent he co-authored on neurocomputational modeling, and intellectual property rights from MIT
Kathryn Crawford	No Financial Information to Disclose
Jennifer Cumming	No Financial Information to Disclose
Jennifer Deal	No Financial Information to Disclose
John Eichwald	No Financial Information to Disclose
Donald Finan	Teaching and speaking and salary from University of Northern Colorado
Brendan Fitzgerald	No Financial Information to Disclose
Gregory Flamme	No Financial Information to Disclose
Kathy Gates	No Financial Information to Disclose
Sarah Grinn	No Financial Information to Disclose
LaKeisha Henry	No Financial Information to Disclose
James Jerome	No Financial Information to Disclose
S Benjamin Kanters	No Financial Information to Disclose
Khalid Khan	Independent Contractor and receives salary and grants from Centers of Disease Control and Prevention
Dirk Koekemoer	No Financial Information to Disclose
Sridhar Krishnamurti	No Financial Information to Disclose
Kichol Lee	No Financial Information to Disclose
Colleen Le Prell	Speaking Fee, Grants, Independent Contractor, Honoraria, Serves on review panels, Hearing Loss Preventions Cross Sector Council - advisory board for NIOSH-CDC, contract to University Texas Dallas to Support Research Salary
M. Samantha Lewis	Pacific University Employment & Salary; VA employment, salary and grants; AAA independent contractor salary; ASHA honoraria and editorial board member; Bethany Athletic Club employment and salary; Hawthorn Farms Athletic Club employment and salary; IDA Institute travel and workshops

Heather Malyuk Malisha Martukovich Siobhan McGinnity Deanna K Meinke John Merkley Jan Moore Thais Morata William Murphy Jameel Muzaffar Richard Neitzel Linda Orr Melissa Papesh Cory Portnuff Micheal Santucci Stephanie Sayler Theresa Schulz Theresa Small **Christopher Smalt** Madeline Smith Hannah Speaks Katherine Steffen **Richard Stepkin** Micheal Stewart **Timothy Swisher** Stephen Tasko **Dallas Taylor** Christa Themann Brandon Thompson Frank Wartinger Laurie Wells

Ownership and salary from Soundcheck Audiology No Financial Information to Disclose Independent contractor for U. of Michigan and received grants from Apple Inc No Financial Information to Disclose **Received Stipend from NIOSH** No Financial Information to Disclose Employment and Salary from NIOSH No Financial Information to Disclose Ownership and receives salary from Earmark Hearing Conservation 3M Salary and Ownership Interest



HEARING LOSS PREVENTION: THE BASICS

Noise Measurement and Control

Presented By: James Jerome, MA, CCC-A

This presentation provides an overview of the principles of noise measurement. Topics discussed include acoustical instrumentation, types of noise surveys, noise exposure criteria, how to conduct a noise survey, and overview of the principles of noise control.

Hearing Loss Recordability Issues

Presented By: Theresa Small, AuD

This section will focus on the basic requirements of MSHA, OSHA and FRA recordkeeping regulations, as well as implications for professional review of audiograms and determination of work-relatedness. Although compliance with recordkeeping rules are 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.

The Audiogram and How to Use It

Presented By: Timothy Swisher, MA, CCC-A, FFFA

The audiogram is the tool used to record hearing test results. It is the primary vehicle used to evaluate the effectiveness of the Hearing Conservation Program. As such, it is necessarily implemented to monitor the hearing sensitivity of noise affected employees. This presentation will discuss the employment of the audiogram, and hearing testing, in Hearing Conservation Programs. The basis for valid audiograms, the different styles of audiograms, purposes for hearing testing, and examples of audiometric results will be shown and deliberated. Standard Threshold Shift (STS) determination will be presented and age correction calculation and influence examined. STS follow-up procedures, to include baseline revision, will be reviewed. The NHCA guidelines for baseline audiogram revision will be examined. In summary, the audiogram will be discussed as an invaluable asset for the Hearing Conservationist during employee education and training.

The Basics: Effective Hearing Protection

Presented By: Frank Wartinger, AuD

Hearing Protection Devices (HPD) are one of the most visible portions of a hearing conservation program, but they are generally considered the last resort intervention after administrative and engineering controls have been implemented and have failed to reduce noise exposures sufficiently. Effective HPD implementation will be reviewed, including proper device selection, fitting strategies, and motivation. Available fit verification methods will be discussed.

Shaping Knowledge, Attitudes, and Behaviors Presented By: Laurie Wells, AuD

Regulations specify that workers in hearing conservation programs must be trained and what content must be covered. However, there is great latitude for how training is done and more importantly, how training can be effective. Hearing conservationists have the opportunity to strengthen the educational impact on workers by adopting public health approaches in shaping knowledge, attitudes and behaviors. This section will address the science and art of enhancing hearing conservation training and education with the goal of motivating noise-exposed workers toward better hearing health care. It will include some theory, practical "ears-on" interactive techniques, and highlight hearing protection fit testing as a best practice in hearing loss prevention.

In Search of "Best Practices Hearing Conservation" -A World-Wide Review of Regulations

Presented By: Richard L Stepkin, MS, CCC-A

Exactly what is a "Best Practice Hearing Conservation Program". The intent of a Regulation is to protect hearing - isn't it? Regulations & Criteria within U.S. vary significantly among Govt, Military, Construction, Railroads, other trades - why so? Aside from the many variances within our own Country, how do other Countries from Asia to the EU handle the issue of protecting hearing? If we are "engaged" in protecting hearing why are we so "disengaged" - It's confusing! Employer's are confused because OSHA (and others) view work related hearing loss and Log 300 "differently" than Workers Compensation and AAO. Employers comply with Regulations feeling good about their program but then get surprised on Workers Compensation. I thought we were protecting our employees hearing - yes? NO! The intent of this presentation is to review all these issues and propose a Best Practices HC Program designed to protect hearing and liabilities.

Boothless Audiometry Workshop

Presented By: Kathy Gates, AuD, Odile Clavier, Jameel Muzaffar, BA(Hons) MBBS(Hons) MSc FRCS(ORL-HNS), Dirk Koekemoer, MD, Renee Lefrancois, Laura Prigge, AuD

A sound booth has long been the gold standard of equipment needed to conduct hearing conservation and audiological examinations. Within the past 10-years, several companies have worked to develop novel approaches to enable hearing assessment outside of the sound booth, to make services more accessible and increase efficiencies. Acceptable solutions must include specialized capabilities to meet additional requirements for specialty populations and markets, including foreign and domestic militaries as well as U.S. Veterans. It can be challenging to keep up with current technological advancements in boothless audiometry products. This workshop will present an overview of boothless audiometry technologies currently available to the hearing conservation professional. In the first part of the session, participants will learn about the military, Veteran, and civilian requirements, including a current summary of technologies available to meet them. It will also include overview presentations from participating boothless audiometry representatives. The second part of the session will include hands-on demonstrations of individual devices, allowing participants to become familiar with each device and how it can be used for hearing conservation services.

Hands-On Workshop: How You (or Your Students) Can Contribute to Wiki4YearOfSound2020

Presented By: Thais Morata, PhD

How can we boost the implementation of evidence-based practices that will improve the health and well-being of the populations we serve? As people are turning to Wikipedia for information, we want the information they find to be complete, up-to-date, and accurate. For the International Year of Sound (IYS 2020), NHCA is supporting Wiki4YearOfSound2020, a campaign by NIOSH and the Acoustical Society of America to improve Wikipedia articles related to sound. IYS 2020 highlights the importance of sound in all aspects of life and aims to improve public awareness of sound-related issues at an international level. One can participate by promoting the project, suggesting a topic that should be a Wikipedia article and improving or translating existing articles. Educational programs can count on Wiki Education Foundation tools to train students to contribute high-quality content to Wikipedia as a course assignment. The Wikimedia outreach dashboard allows anyone to contribute and monitor progress. Workshop attendees will learn the basics of Wikipedia editing, make substantive changes to Wikipedia articles within their area of expertise, and find out more about the Wiki Education Foundation's classroom program. ***Please create a Wikipedia account in advance of the event and bring your computer to the workshop. ***

Impulsive Noise: Understanding, Measuring, and Mitigating the Risk of Noise Induced Hearing Loss

Presented By: Gregory Flamme, PhD; William Murphy, PhD; Deanna K Meinke, PhD, CCC-A; Michael Stewart, PhD, CCC-A

This half-day workshop will provide current information to attendees regarding the effects of impulsive noise, ways to measure it, techniques to mitigate the exposure, and how to assess impulsive noise exposures. Exposure to high-level impulse noises such as firearms and explosions is significant risk factor for noise induced hearing loss. When peak exposure levels exceed 140 dB SPL, the risk of permanent hearing loss increases rapidly. Although Impulse and impact noise are generated through different processes, they are often grouped into impulsive noise. When measuring impulsive, sound level meters may not be the best choice. In many cases, recordings are more beneficial to understand the exposure and to mitigate the risk. Hearing protection devices are not the only tool in the hearing-loss prevention toolbox. Level dependent passive or electronic protectors, mufflers and noise suppressors can provide a range of noise level reductions and improve communication in critical jobs. Estimating the risk of hearing loss has been challenging due to the range of damage risk criteria (DRC) available to the occupational safety and health professional. The advantages and disadvantages of several DRCs will be presented. By attending this workshop, should help the safety and health professional to understand, measure, and mitigate the risk of noise exposure to high-level impulsive noise.

Selecting Hearing Protection Devices Using New and Updated Standards

Presented By: Kari Buchanan, MPH, MA; Robert Williams, M. Eng

Hearing is a critical sense for individuals engaged in many occupations, occupational settings, and related activities. However, noise can interfere with their ability to communicate and to detect, identify, and localize sounds that may be crucial to work performance. Instituting noise controls is the primary method to reduce exposure and allow critical sounds to be heard, though administrative controls and personal protective equipment are often necessary. Hearing protection devices (HPDs) with newer technologies have been introduced with sound localization capabilities. Hearing conservation programs need to know what criteria to use to assess HPD capabilities and when to select newer HPDs. Participants in this course will learn (1) how to identify hearing critical tasks (HCT) in the workplace, (2) how HPDs differ in their abilities to suppress different types of noise, (3) what assessment methods can be used to determine localization, and (4) how to select hearing protection based upon all available information. Participants will also learn how to instruct hearing protection users in the selection of HPDs appropriate for specific tasks.

Considering Models and Approaches to Health Behavior Change in the Prevention of Auditory Dysfunction

Presented By: M. Samantha Lewis, PhD

Exposure to loud noise has the potential to cause auditory dysfunction. Preventing or limiting this exposure could prevent (or at least minimize) noise-induced auditory dysfunction. Researchers and clinicians, therefore, have tried educating the public about noise exposure and hearing conservation practices. Despite these efforts, there remain individuals who do not follow through with these recommendations. Why is that? What can we be doing better to enhance awareness and compliance? These are good guestions. The challenge, however, is not unique to hearing conservation efforts. The literature is full of examples of patients who have failed to start or maintain a recommended behavior change (e.g., exercising, quitting smoking). Recognizing this issue, other fields have evaluated models to understand the behavior change process and have recommended approaches to help support patients in making behavior changes. Researchers have explored the potential applicability of some of these models and approaches, such as the Transtheoretical Stages-of-Change Model (Prochaska & DiClemente, 1983) and the Theory of Reasoned Action/Planned Behavior (Ajzen, 1991), to hearing healthcare, and to hearing conservation practices, specifically. This workshop will review these models and approaches and discuss potential strategies for improving hearing conservation efforts.

Noise Exposure Risk Assessment in Various Workplace Environments

Presented By: Robert Anderson, BME INCE

Worker sound exposure risk assessment is the cornerstone for a successful occupation hearing loss prevention program. Besides being the primary mechanism for determining the nature and degree of sound exposure risk, it can also interrelate with other program elements including tracking progress of a noise control program. Issues that can govern an effective assessment procedure include sufficiency, reliability, utility and cost-effectiveness. Above all, the strategy chosen for exposure assessment must also be failsafe This workshop will reference specific paragraphs of the OSHA regulation covering monitoring and discuss in detail the methodologies covered in ANSI S12.19-1996 (R2016) and evaluation methods contained in other reference books and documents. It will cover monitoring criteria, instrumentation, and the potential impact of both on monitoring results. The workshop will also include examples of multiple work environments ranging in complexity and discuss how different monitoring strategies can lead to varying results. The object is to provide a more complete understanding of how to approach the important process of assessing noise exposure risk. Attendees of the workshop will be given access to a software application useful in computing sound exposures.

What You Don't Hear Can Kill You - The Conundrum of Balancing Hearing Protection and Auditory Situation Awareness:Guidance for the Hearing Conservationist Presented By: John Casali, PhD and Lee Kichol, PhD

Hearing is a critical sense for maintaining vigilance to events in our realm and a keen realization of our surroundings, essentially providing a state of "auditory situation awareness" or "ASA." Protection against noise-induced hearing loss (NIHL) via the use of hearing protection devices (HPDs) or Tactical Communications & Protective Systems (TCAPS), together with concomitant preservation of one's ASA to the surrounding environment, is critical in many dynamic civilian work situations as well as in the military. Devices designed toward this objective should aim to be as auditorially "transparent" as possible to the wearer, with minimal impact of attenuation, occlusion, gain compression and pass-through frequency response on the wearer's auditory perception. This workshop will review and demonstrate various "augmented" HPDs and TCAPS that are intended (but are not always successful) to provide ASA while protecting the wearer. Products which provide either passive or active (battery-electronic) level-dependent attenuation and pass-through of certain sound frequencies will be included. The ASA impacts of these products will be covered, relying on evidence from 14 experiments at Virginia Tech, as well as surveys from elsewhere, that show the sometimes deleterious effects on wearer's detection, recognition/identification, localization and communications abilities, as compared to performance with the open (i.e., natural) ear. Live auditory demonstrations of HPD and TCAPS effects on ASA tasks, including localization, will be provided where possible. The importance and potential effectiveness of training HPD users for ASA skills acquisition, prior to being deployed with the products, will be covered. Guidance for selecting HPDs given certain ASA needs to accommodate given operational tasks will be offered. Examples of actual accidents that stemmed from the loss of ASA, resulting in injury, death and sometimes litigation, will be covered briefly.

Hearing, Aging, and Public Health – From Epidemiology to Public Policy

Presented By: Jennifer Deal, PhD

Medicine and public health have evolved through three eras over the past century. Beginning in the first half of the 20th century, infectious diseases were controlled for the first time in human history through vaccinations, antibiotics, and other strategies. Subsequently, throughout the 20th century, chronic diseases of middle and later life (e.g., cardiovascular disease, cancers) became the leading causes of mortality but have also increasingly been better controlled. These successes of public health have led to a rapidly increasing population of older adults living longer than ever before. In this third era of public health and medicine, we are now confronting the challenges of aging and how to best optimize the health and functioning of a growing population of older adults. In this era, hearing and our ability to engage effectively with the environment around us are critically important but not yet priorities in the spheres of public health and public policy. I will discuss research over the past several years that has demonstrated the broad implications of hearing loss for the health and functioning of older adults, particularly with respect to cognitive functioning, brain aging, and dementia. I will then discuss how this epidemiologic research has directly informed and led to current national initiatives in the United States focused on hearing loss and public health. These initiatives include the Aging and Cognitive Health Evaluation in Elders (ACHIEVE) randomized controlled trial and recent passage of the bipartisan Over-the-Counter Hearing Aid Act in 2017. This federal law overturns over 40 years of regulatory precedent around hearing aids in the U.S. in order to directly improve the accessibility and affordability of hearing care for older adults."

Healthy Hearing, Healthy Aging: Initial Results

Presented By: Jan Moore, PhD

Progressive and permanent sensorineural hearing loss associated with noise exposure (NIHL) is a chronic health condition in agricultural workers. In addition to the impact of hearing loss on communication, hearing loss and exposure to noise have negative impacts on balance, cardiovascular health, mental health, and cognitive skills. Recent large-scale public health studies among elderly and middle-aged persons indicated hearing loss presents a significant and independent risk factor for the development of dementia. This project will examine the hearing status and cognitive skills of aging farmers and ranchers over the age of 50. The research proposal was previously presented at the 2019 NCHA annual conference. This presentation will report the initial findings of data collected since that time including audiological and cognitive screening results. The following screening tests have been used for the first phase of this study: The Montreal Cognitive Assessment (MOCA), Stroop Color and Word Test (STROOP), and the Digit Symbol Digit Symbol Substitution Test (DSS). Our data will provide novel information on the impact of long-term hearing loss on the cognitive status in older agricultural workers.

University of Michigan/Apple Hearing Health Study Presented By: Richard Neitzel, PhD, CIH, FAIHA Co-Author: Lauren Smith, MPH

The impacts of noise-induced hearing loss (NIHL) resulting from excessive noise exposure are extensive, severe, and widespread. However, there is little information available about music exposure levels and listening patterns among adults in the United States. As a result, we do not have a good understanding of the relationship between listening to music and risk of hearing loss. The introduction of new technology and software into mobile devices has created exciting new opportunities for us to learn more about these issues. The University of Michigan School of Public Health has partnered with Apple to take advantage of these opportunities in a new research study. This presentation will provide an overview of the study, and also identify ways in which the results of the study will be useful to hearing conservation practitioners. As part of this study, we will evaluate the levels of sound at which iPhone users listen to music and other media on their mobile devices, as well as how long and how often they listen. We will also measure environmental noise levels, and deliver several different types of hearing tests to participants. We will collect this information from tens of thousands (or more!) of volunteer adults who use iPhones or iPods, and from the subset of volunteers who also use Apple Watches. This unique dataset will allow us to create something the United States has never had: national-level estimates of exposures to music and environmental sound. It will also give us a better understanding of the relationship between these exposures and hearing health. Collectively, this information will help give us a clearer picture of hearing health in America, and will increase our knowledge about the impacts of our daily exposures to music and noise. This information is critical for us to address and reduce the major public health impacts of hearing loss in the United States.

Building an Effective Hearing Conservation Program (HCP) and the Value of Prevention

Presented By: Malisha Martukovich, AuD; Kathy Gates, AuD; LaKeisha Henry, MD; Theresa Schulz, PhD

This presentation will be a DoD Hearing Center of Excellence (HCE) panel/discussion on building effective Hearing Conservation Programs and the value of prevention of hearing loss. Background information will be presented through a case analysis example of the following: In 2013, the HCE led efforts to standardize accession (entry onto active duty) and separation audiometric testing standards across the DoD.Because of this effort, the USAF (US Air Force), through HCE funds set up accession testing using Defense Occupational Environmental Hearing Readiness System-Hearing Conservation (DOEHRS-HC) at Basic Military Training (BMT) at Lackland AFB TX and Officer Training School (OTS) at Maxwell AFB AL. Prior to implementation, a Capabilities Based Assessment (CBA) was conducted to identify gaps in the process in the USAF. Past and current data will be presented that validates the effectiveness of the program. This led to the AF taking over financial and manning responsibility for testing in 2018.Additionally the USAF adopted the Separation History and Physical Examination (SHPE) process. This was the first time, every Airman in the USAF would receive an initial DOEHRS-HC exam and separation exam. Policy change became effective in Feb 2016 with AFI 48-127 including requirements for accession and separation hearing tests. Cost savings and return of investment data of the DoD/AF accession hearing test program will be presented. Discussion of the value of audiometric monitoring as a component of an effective HCP will follow.

UK Military Hearing Collaboration - An Overview of Progress Across Prevention, Detection and Treatment of Noise Induced Hearing Loss and Tinnitus

Presented By: Lt Col Linda Orr, FRCS (ORL-HNS) OBE

Prevention, detection and treatment of NIHL and tinnitus are the core mission of the UK Military Hearing Research Collaboration (UK-MHRC). The UK-MHRC brings together partners across government, academia, industry and NATO allies with the aim of coordinating and stimulating research activity in this area. This presentation will provide an overview of current UK-MHRC activities including studies of a new model of occupational hearing screening incorporating telemedicine and endoscopic examination of the ear, investigation of boothless audiometry, studies of hidden hearing loss in blast and acutely noise exposed personnel, efforts to understand the anatomical site of lesion in sensorineural hearing loss and drug treatments for tinnitus and acute acoustic trauma. The second part of the presentation will identify near and medium term goals across all three key areas for the UK-MHRC and discuss projected steps to meet these.

Developments in Artificial Intelligence to Prevent and Mitigate Hearing Loss

Presented By: Gregory Ciccarelli, PhD

Al holds promise for empowering the lay individual and trained clinicians to better prevent hearing loss and mitigate its effects. However, despite the substantial press Al has received, it is often unclear how it may shape one's own field. This overview will provide a description of the Al space, the technologies that have driven its recent success in multiple domains, and future Al trends and challenges in a manner accessible to working professionals in audiology, engineering, and healthcare. We will then show examples of how work at MIT Lincoln Laboratory and other research centers are harnessing Al for hearing loss. These examples include fast, efficient feedback on hearing protection status and re-imagining (and making real) the "hearable" of the future.

Luncheon Keynote: The Fifth Sense Presented By: Dallas Taylor

Our world is dominated by the five senses, but why does hearing get the short straw? Everything around us is designed for sight, touch, taste, and smell-but when it comes to hearing, intentionality goes in one ear and out the other. Sound so often gets overlooked. We tend to address a smelly shoe or indulge in that tasty piece of pie but we tend to ignore that squeaky door or the loud hum of a refrigerator. Taking it even further, what are the possibilities if we begin to address sound in more intentional ways? Sound is the next frontier in wellness and luxury. It has the ability to influence your mind in ways we never thought possible and our culture is just beginning to harness it. Dallas explore these ideas and share some of the most impactful moments from his podcast, Twenty Thousand Hertz.

How Do We Know it Works? Evaluating Hearing Loss Interventions for Effectiveness

Presented By: Hannah Speaks, MSPH Co-Author: Thais Morata, PhD

Hearing conservation by nature is a preventative field, rooted in implementing behavioral and technical interventions. Although epidemiological outcomes have been monitored for hearing loss, those statistics have not been tied to interventions for promoting behavior change or reducing noise exposure. This presents a dilemma for the field, as many classic interventions, such as hearing protection devices or educational efforts, have yet to be proven as widespread, effective preventative measures. Attempts to implement new research and controls have become complex, as there is no current model for comparison. However, with combined efforts from the multiple professions involved in the field, the quest for effective hearing conservation can be achieved. This review covers generalized strategies for evaluating interventions for various facets of hearing conservation including: how to set up programs to collect meaningful data, how to interpret and analyze outcomes, how to collaborate to continue to enhance intervention effectiveness, and how to continue to monitor effectiveness over time. Moving forward, hearing conservationists should not only work towards developing solutions for hearing loss prevention but also focus on evaluating interventions for long and mid-term impacts on behavior and hearing health outcomes.

Words-in-Noise Performance in Normal-Hearing Young Adults with Isolated or Frequent Firearm Exposure

Presented By: Sarah Grinn, PhD, AuD Co-Author: Colleen Le Prell, PhD

Audiology's greatest present-day mystery concerns real-world, auditory performance deficits observed in patients who meet "normal-hearing" criteria for audiometric examination. As such, the audiogram, which detects peripheral auditory dysfunction, is under intense scrutiny as researchers and practitioners look past explanations of peripheral-auditory injury in favor of possible central-auditory injury. Of specific interest is the site of synaptic connectivity (or disconnectivity) between hair cells and the auditory nerve, following a dangerous noise-exposure. Studies of severely noise-exposed animals (mice, guinea pig, non-human primates) provide evidence that such an injury can occur at this site without affecting the peripheral-auditory system; however, attempts at human translational studies have yielded highly inconsistent conclusions and heated controversy. The last decade of literature surrounding the search for evidence of this disconnectivity - a noise-induced cochlear synaptopathy (NICS) ("hidden hearing loss") - in humans suggests that subsequent investigations should be reasonably limited to populations who endure severe isolated or frequent temporary threshold shift (TTS). Firearm discharge is the most similar, real-world noise-exposure that would be able to induce the severe degree of TTS that is necessary to observe NICS in animal science. Studying central-auditory injury in firearm users presents a challenge in that many already exhibit peripheral-auditory injury (i.e., overt

hearing loss) from frequent firearm use, which masks the present ability to reveal any central-auditory injury that may have preceded it. Therefore, a young, normal-hearing, firearm-using population constitutes the highest potential for identifying an "at-risk" NICS population. We conducted a retrospective study enrolling 92 normal-hearing adults (.5-8 kHz thresholds & lt;15 dB-HL, 18-25 years), including frequent and infrequent firearm users, and non-firearm users as a control measure. We analyzed correlations between participant's noise-exposure history, hearing protection use, audiometric thresholds .5-18 kHz, otoacoustic emission amplitude 1-12 kHz, 90 dB-nHL cochlear nerve response to click, 1 and 4 kHz tone-burst stimuli, ear-level and free-field Words-in-Noise objective performance, and self-reported speech-in-noise subjective performance. These correlations contribute important developments towards a damage-risk criteria for human synaptopathic injury.

Subjective Evaluation of Hearing Protection Devices in a Military Population

Presented By: Douglas Brungart, PhD Co-Authors: Julieta Scalo and Rob Williams

To assess their experiences with and attitudes toward different types of hearing protection devices (HPDs), Service members were asked to complete a brief survey either 1) at the time of training for using a Tactical Communication and Protection Device (TCAP); 2) at their annual hearing-conservation auditory exam; or 3) after a recent deployment during which HPDs were used. In addition to answering questions about job duties, noise exposure, and type of hearing protection currently used, participants rated their satisfaction with their HPDs in several dimensions, including comfort, protection, communication, and localization. Participants were also asked to indicate their willingness to accept some degradation in certain HPD features in exchange for improvement in other features. Analyses to be presented will include regression modeling to evaluate relationships between satisfaction and type of hearing protection used, while controlling for location, experience, and other covariates. In preliminary evaluations, satisfaction scores were higher for electronic hearing protectors than for passive hearing protection devices, particularly with regard to factors related to situation awareness. The views expressed in this abstract are those of the author and do not reflect the official policy of the Department of Army/Navy/Air Force, Department of Defense, or U.S. Government.]

Effectiveness of a Smartphone-Based Hearing Conservation Intervention Among Farm Youth

Presented By: Khalid Khan, PhD; Marjorie McCullagh, PhD Co-Authors: Marjorie McCullagh, PhD, and Jayna Kozlowski

Farm and rural youth experience noise-induced hearing loss (NIHL) from a very young age. Interventions using technologies such as smartphone applications and text messaging, and other Internet-based resources have been conducted among youth in various community settings. However, evidence regarding the effectiveness of these approaches is weak due to multiple methodological shortcomings of studies. Furthermore, it is unclear whether these interventions are feasible in hard-to-reach rural and agricultural populations. To address these gaps in knowledge, we will compare the effectiveness of a novel intervention (i.e., smartphone apps plus printed NIHL prevention leaflets and a control intervention (printed NIHL prevention leaflets only) in changing hearing conservation knowledge and behavior. Students from six high schools in rural Indiana are participating is this intervention study. We will report on preliminary data of this study, in progress.

Comic Books to Scientific Guidelines: Effective Strategies in the Fight Against Noise-Induced Hearing Loss

Presented By: John Eichwald, MA; Lauren Benet

The CDC National Center for Environmental Health (NCEH) developed a strategic program plan to support the reduction of hearing loss, tinnitus and other non-auditory health effects resulting from non-occupational noise exposure. NCEH has developed a suite of materials using creative formats (interactive infographic, fact sheets, and graphics) and communication channels (twitter, Facebook, Instagram) to engage individuals, organizations, and communities in prevention efforts. To ensure that these important messages reached teens and young adults, NCEH developed partner advisories and a promotional toolkit to support partners and intermediaries in disseminating these materials. Sharing these materials during national health observances, e.g., World Hearing Day, allows NCEH to capitalize on the momentum of these events. NCEH is gathering information on current evidence, methods and practical approaches for development of a public health guideline(s) on exposure to excessive sound levels outside of a working environment-at home, recreational venues and in the community. NCEH is seeking collaborative relationships with subject matter experts and potential representatives from public health partner organizations, industry, academic institutions, and other relevant Federal agencies.

Field Validation Assessment of a Portable Auditory Localization Training System for Instilling Azimuthal Localization Skills With and Without Electronic Hearing Protectors

Presented By: Kara Cave, PhD; Brandon Thompson, PhD Co-Authors: John Casali, PhD and Kichol Lee, PhD

This study assessed training transfer from azimuth localization training conducted in-lab to a field localization test. Specifically, the studies evaluated the sensitivity of in-lab training, using a broadband tonal complex, and in-field testing, using live blank gunshots, to differences among three listening conditions. The listening conditions included two currently-fielded military Tactical Communication and Protective Systems (TCAPS) and the open ear. Localization performance was compared between trained and untrained participants using an in-lab pretest with the dissonant signal and a field-conducted posttest using gunshots. Participants assigned to the training group underwent training under each listening condition. Participants in the untrained group only underwent the pretest and posttest. Results showed a statistically-significant effect for listening condition. Open ear localization accuracy was significantly better than either TCAPS condition. No significant effect existed in localization accuracy between the two TCAPS conditions. At posttest, the trained group performed significantly better than the untrained group. The open ear showed significantly fewer front-back reversals compared to either TCAPS condition.Implications for military and worker populations will be discussed.

Characterization of Firearms Suppressor Performance with a Microphone Array

Presented By: William Murphy, PhD

In 2017, firearm suppressors were evaluated with several rifles and pistols firing low- and high-velocity ammunition. Peak-impulse level reductions, ranged between 13 and 31 dB at the ear for low-velocity ammunition and 13 to 29 dB for high-velocity ammunition. Integrated-energy levels reductions at the ear, were between 10 and 31 dB and 9 and 25 dB for low- and high-velocity ammunition. The noise reductions at twelve microphone locations on a 3-m ring are compared with the muzzle microphone (1-m left) and microphones 15 cm from the shooter's right and left ears. The between correlations of the one-third octave band noise reduction spectra suggested that positions behind the shooter provided the best agreement with the microphones at the shooter's left and right ears. The microphone at 3 meters, and 15 degrees in front of the firing line to the right of the shooter in front of the firing line was better than the 3-m microphones to the left of the shooter 15 degrees in front and behind the firing line.

Evaluation of Hearing Protection Device Effectiveness for Musicians

Presented By: Kathryn Crawford, MS, COHC

Hearing protection devices (HPD) may offer protection to musicians, including some designed to provide uniform attenuation across frequencies. Even though these are available, studies find that musicians, especially students and instructors, do not wear them. Additionally, there is evidence indicating that many users do not achieve good fit and adequate sound reduction with HPD, which has led to recommendations for fit-testing in the workplace. Understanding the effectiveness of different HPD in combination with musicians' opinions about wearing them, we can make better recommendations for which types may be the most effective options for reducing excessive sound exposures. Twenty-four musicians were recruited and provided with three HPD: formable foam, non-custom uniform attenuation earplugs (UAE), and custom UAE. Audiometric testing was used to obtain personal attenuation levels at nine frequencies (125-8000 Hz) for each HPD which were compared to manufacturer ratings. The coefficient of variation of attenuation across frequencies was used to determine the uniformity of attenuation. Participants completed surveys over six months regarding HPD use, and perceptions regarding the positive and negatives aspects of wearing HPD.

Just-In-Time Learning and Hearing Conservation

Presented By: John Merkley, AuD

Learners today expect to get information guickly and in a format that is easy to access, easy to understand, available at a time and place of the learner's choice, and relevant to what the learner needs to know at the moment. Training no longer needs to take place just once every month, quarter, or even year. Effective learning can take place throughout the workday, workweek, or even work year. In fact, even one minute of effective just-in-time learning delivered weekly to a worker on any particular subject can be as effective or even more effective than a one-time 52-minute-long training event on the subject. This presentation will introduce learners to the just-in-time learning theory and how it can be effectively applied to the required hearing conservation program training as explained in OSHA, MSHA, FRA, DoD, and a variety of other regulations. Tips for developing just-in-time learning events will be discussed including training that is being developed and used by the Army Hearing Program and DoD Hearing Center of Excellence.

Effects of Written Instructions on Field Real Ear Attenuation at Threshold Measurements

Presented By: Katherine Steffen, BA Co-Authors: Deanna Meinke, PhD, CCC-A, Kathryn Bright, PhD and Tina Stoody, PhD

Hearing protector fit-testing is an essential part of a hearing conservation program to ensure that hearing protection devices are effectively protecting the wearer from hazardous noise. The NIOSH HPD Well-Fit[™] device was used to measure the personal attenuation rating for each individual's 3M EAR Classic hearing protection device. The NIOSH HPD Well-Fit[™] does not have official instructions for finding the personal attenuation rating. The purpose of this capstone research project was to investigate if there was a difference between Personal Attenuation Rating (PAR) scores utilizing different methods of instruction (Ascending, Descending, or Békésy). Each method required the participant to go through different steps to obtain a threshold at each octave from 125-8000 Hz to calculate a PAR score. Three different written instruction methods were used to obtain PAR scores on 29 participants. A repeated measures analysis of variance showed there was not a significant difference for PAR scores based on instruction method (F = 2.46286, .05). These results suggested that no method of instruction used in this study produces a different PAR score than another and that any of these methods of instruction would be appropriate to complete fit-testing. These results may be used to help simplify the process for completing fit-testing in real-world situations and streamlining hearing conservation programs.

Glucocorticoid Therapy for Acute Acoustic Trauma: Current and emerging evidence from the UK Military Hearing Research Program

Presented By: Jameel Muzaffar, BA, MBBS, MSc FRCS Co-Author: Linda Orr, MB ChB DM FRCS, FRCS

Acute Acoustic Trauma remains an ever lurking hazard for military populations amongst other high risk occupational groups. Whilst a number of therapeutic options have been suggested for the treatment of AAT the evidence base for their effectiveness is limited. This has resulted in a wide variety of strategies currently in place across NATO partners, ranging from watchful waiting through oral, intratympanic and intravenous treatments. This presentation will describe the historical context of AAT before describing UK efforts to mitigate acute acoustic trauma illustrated by data from a series;30 patients treated with steroid therapy, including by intratympanic injection. The presentation will include discussion of the challenges involved in early identification, access and treatment and measures taken to expedite this process.

Preventing Hearing Injury in the Music Industry

Presented By: Siobhan McGinnity, BSc, MClinAud, PhD; Robert Cowen, BSc, MSc, MBA, PhD, DipAud, FAudA, FICRA, FAAA, GAICD Co-Authors: Elizabeth Beach, BA, PHD and

Johannes Mulder, FHEA, PhD, MA

Sound levels in the live music industry have been demonstrated to reach levels capable of causing harm to the auditory system. This research investigated approaches to reducing the incidence of hearing injury in the Australian music industry. Methods: Four studies were conducted. Study 1: Audiologists and manufacturers completed surveys investigating the delivery of clinical care for musicians; 2: Musicians rated satisfaction with audiological services as delivered across four treatment conditions; 3: A hearing assessment was completed by 27 live-music sound engineers (LMSEs); and 4: Use of a commercial sound level management (SLM) system in six indoor live-music venues was trialled. Results: there was a high incidence of reporting of hearing loss and tinnitus in musicians. Inconsistencies in clinical procedures were found for both audiological care for musicians, and recommendations made by manufacturers for fitting musicians' hearing protectors. For LMSEs, a substantial proportion reported constant tinnitus and reduced sound tolerance. No reduction in mean sound level (LAeq,T) was found with use of SLM software in live music venues, however the number of nights on which extreme volume levels were recorded was reduced. Conclusions: The results confirm the risks of hearing injury for patrons and staff attending live music venues in Australia.

Musical Acoustics and Health: A Hands-On Approach to Learning and Applying

Presented By: Donald Finan, PhD Co-Author: Deanna Meinke, PhD

Learning fundamental knowledge is typically approached as a gauntlet to be run instead of an opportunity to generalize and connect related concepts. However, the ability to apply knowledge to complex and new situations, "transfer of learning", is critically important in the real world. To that end, we have developed a novel interdisciplinary undergraduate course: Musical Acoustics and Health Issues. The course covers biophysics of sound production and reception and associated hearing and vocal health issues by utilizing a hands-on project-based approach to teaching and learning in the context of music. The overarching theme of course topics is "sound as energy". Issues related to auditory and vocal mechanism health are presented from preventative perspectives. This active learning class is structured on the 5e pedagogical model, with principles of Engage, Explore, Explain, Elaborate, and Evaluate. Real-world activities are utilized so as to maximize transfer of learning. Projects include building musical instruments (cigar box guitars & PVC pipe didgeridoos), researching and interpreting parameters of sound capture and playback systems, sound level measurement (including dosimetry), hearing protector use, and acoustic voice assessment and interpretation. The course design will be presented, and projects will be described and linked to the 5e pedagogical model.

Characterizing the Effects of Occupational Noise Exposure Using Otoacoustic Emissions

Presented By: Sridhar Krishnamurti, PhD; Katie Wells, BS Co-Author: Shabnam Habibi, BS

Evoked otoacoustic emissions (EOAEs) may provide a more direct and reliable measurement than audiometric testing to investigate early changes in inner ear function. EOAEs can detect outer hair cell damage related to Noise Induced Hearing Loss in manufacturing workers, even when audiometric thresholds are not affected (Helleman et al., 2010). In this study, we evaluated the diagnostic effectiveness of two types of OAEs: 1) Transient Evoked Otoacoustic Emissions (TEOAEs) in 192 exposed and 120 control ears and 2) Distortion Product Otoacoustic Emissions (DPOAEs) in 128 exposed and 80 control ears. The Signal to Noise Ratio (SNR) was used as the criterion to evaluate the effectiveness of OAEs; optimal SNR was defined as 6 dB (TEOAE amplitude-Noise Floor>6 dB; DPOAE amplitude-Noise Floor>6 dB). Statistical Analysis of variance (ANOVA) showed significant differences in SNR between ears in the exposure group versus control group for both: a) DPOAEs (dF=1, 288; F=61.54; p<0.01) b) TEOAEs (dF=1, 193; F=72.93; p<0.01). Only 27.3% of ears with noise exposure passed while 82.5% of control ears passed TEOAE analysis criteria. In contrast to the TEOAEs, 64% of ears with occupational noise exposure passed DPOAE analysis criteria, as opposed to 87% of control ears.

Evaluation of Extended Wear Earplugs: Lessons for Hearing Conservation

Presented By: Douglas Brungart, PhD Co-Author: Nathaniel Spencer, PhD

The extended-wear hearing aid is a commercially-available linear amplification device that is inserted deeply in the ear canal by an audiologist and can be worn continuously for extended periods lasting 60 days or more. The device has two potential advantages that have major implications for hearing conservation. First, the device fits deeply enough that it does not require venting to avoid issues with the occlusion effect. This means the device provides substantial attenuation when it is inserted in the ear in the "off" mode, and substantial protection from impulse or blast exposure when it is inserting in the ear in Active mode. Second, the device fits deeply enough in the ear canal that it has no effect on the directional characteristics of the head-related transfer function. This means that the device should be capable of providing attenuation without having an effect on localization accuracy. We have just completed a multi-year evaluation of these devices to determine their suitability as hearing protection devices, and the results show that the devices have the potential to provide persistent protection from intermittent noise exposure with only a minimal impact on situation awareness. The evaluation also has provided some valuable insights with broad implications in many areas with relevance to hearing protection. [The views expressed in this abstract are those of the author and do not reflect the official policy of the Department of Army/Navy/ Air Force, Department of Defense, or U.S. Government.]

Noise Exposures in a Meat Processing Facility

Presented By: Chandran Achutan, PhD Co-Authors: Abolore Idris, MPH, Tika Nepal, MPH, Elizabeth Lyden, MS, Marissa Pepper and Olakunle Olarenwaju, MS

We evaluated personal noise exposures at a meat processing facility, where a majority of workers did not speak English. We collected full-shift personal dosimetry on thirty-six production floor employees, one quality control employee, and four maintenance employees. We also collected point source noise measurement at eight workstations from precook. We administered a questionnaire to assess employees' hearing loss perception and non-occupational source of noise exposure. We also documented how well employees inserted earplugs. Thirty-three of the measured personal noise level exceeded the NIOSH Recommended Exposure Limit. The point source noise levels ranged from 81.5 dBA to 97.5 dBA. Only 15% of the workers inserted earplugs correctly. Thirteen reported they experience ringing in the ear, and of these nine reported improvements in the ear over time. There was a significant association (p-value 0.002) between employees' use of hearing protection device (HPD) outside of work around loud noise and the way they inserted earplugs. Production floor employees and maintenance employees are exposed to excessive loud noise level, and they are at risk of developing noise-induced hearing loss. Better training on the proper use of earplugs, and provision of varieties of earplug may increase employees' compliance with the proper use of hearing protectors.

Music Audiology: Updates and Best Practices

Presented By: Frank Wartinger, AuD; Cory Portnuff, AuD PhD; Colleen Le Prell, PhD; Heather Malyuk, AuD; Michael Santucci, AuD

Music Induced Hearing Disorders (MIHD) are pervasive among music industry professionals as well as the music-listening public. Hearing impairment which results from music and noise exposure can lead to communication difficulties and health related quality of life degradation in the general population. To professionals in the music industry, hearing disorders can pose a severe threat to their career stability, artistic performance, and personal satisfaction from involvement in music. These risks are generally not well appreciated by the at-risk individuals, and best practice guidance from professional organizations has been sparse. This session will introduce best practice and position statement documents pertaining to the Music Audiology, namely the NHCA 2018 Position Statement on "Recreational Music Exposure" and the AAA "Guidelines for Audiological Treatment of Musicians and Music Industry Personnel" (pending publication). A panel of co-authors of the papers will highlight clinical recommendations and considerations for the care of those who experience occupational and recreational music exposures. Further research directions and needs will be emphasized in an effort to promote the field of Music Audiology. Additional resources will be discussed, including the NHCA "Hearing Wellness for Musicians and Music Industry Professionals" educational brochure (2019).

Stand-off, Photograph-Based Estimation of Hearing Protection Attenuation and Fit

Presented By: Christopher Smalt, PhD Co-Authors: William Murphy, PhD and Gregory Ciccarelli, PhD

The Occupational Safety and Health Administration guidelines for noise exposure require protecting workers for noise levels over 90 dBA based on a worker's time weighted average over an 8-hour day(29 CFR 1910.95) while the National Institute for Occupational Safety and Health recommends hearing protection for noise levels over 85 dBA averaged over an 8-hour workday. Industrial and military noise environments are frequently above these sound levels, so in addition to other noise controls, hearing protection devices (HPDs) are often used to prevent permanent, non-reversible hearing damage. One challenge with the use of hearing protection is training and maintaining compliance, particularly in industrial settings. In this study, we estimated the adequacy of fit of a foam hearing protector using only a photograph of the inserted foam plug. An image-based classifier was trained with 200 photographs and associated attenuation data and tested with 40 additional images. The classifier, which predicted either "good or "bad" fit, achieved 73% accuracy for earplugs that had an average of 35 dB attenuation across freguencies. This algorithm could be incorporated in an application for training as well as for automated compliance monitoring in noisy environments for preventing hearing loss.

Gasaway Lecture: Prevention at the 3

Speaker/Awardee: LTC Jillyen Curry-Mathis

The Army has achieved remarkable success in hearing conservation (HC) metrics over the last 10 years, success demonstrated by an overall downward trend in hearing injury rates. Its HC strategy (i.e., doctrine) was completely re-written by audiology leadership between 2004 and 2008, providing the officer on the ground with a foundation for establishing effective programs. Individual success, however, has been mixed for a variety of reasons. In many cases, the intent and motivation is present but as the guidance is necessarily broad, the audiologist is often left guessing at the best approach. By breaking down my career into specific pieces that contributed to successes, I hope to pull out common threads that will translate not only to different military settings, but also to the much bigger civilian sector. Can we stand shoulder to shoulder? Yes, I believe so. I'm standing at your 3.

Middle Ear Muscle Contractions do not Provide Dependable Protection: Implications for Impulsive Noise Damage Risk Criteria

Presented By: Gregory Flamme, PhD Co-Authors: Stephen Tasko, PhD, Kristy Deiters, AuD, Madeline Smith, BA, William Murphy and Heath Jones, PhD

Numerous damage-risk criteria (DRC) for impulsive noise have assumed a protective role for middle ear muscle contractions (MEMC). However, there is scant empirical evidence to support MEMC inclusion in DRC. The aim of this presentation is to summarize the results of a multi-year, multi-site, multi-method series of laboratory and field studies involving live fire of military rifles. Studies included epidemiological estimates of acoustic reflexes, identification of reflexive responses to brief tones, noise, and recorded gunshots, attempts to condition an early/ warned contraction, and assessments of MEMC status among soldiers while firing military rifles. Results indicate that MEMC are not dependable, either in anticipation of, or in response to an impulsive noise. Therefore, MEMC should not be included in DRC for impulsive noise.

An Approach to Identification of Middle Ear Muscle Contractions that Controls for the Effect of Incidental Motor Activity

Presented By: Stephen Tasko, PhD Co-Authors: Gregory Flamme, PhD, Kristy Deiters, AuD, Madeline Smith, BA, William Murphy and Heath Jones, PhD

Evidence that motor activity can reliably elicit middle ear muscle contractions (MEMC) is increasing. This observation complicates the interpretation of experiments that focus on acoustically elicited MEMC. For example, is a given MEMC due to the acoustic elicitor, concomitant motor activity or both? This question is particularly relevant since some damage risk criteria (DRC) for impulsive sound suggest a protective role of MEMC. Recently, our research team described a multiple regression approach to quantify associations between electromyographic (EMG) activity recorded from muscles in the head, neck and upper extremity and middle ear activity. For a substantial minority of participants, 20-60 percent of the variance in middle ear activity was predicted by EMG activity in the head, neck and upper extremity. The current study expands these methods to the detection of MEMC in response to brief acoustic elicitors that controls for possible EMG-related contributions. The results suggest that facial muscle activity may inflate estimates of the prevalence of MEMC for brief sounds. Results will be discussed in the context of DRC for impulsive noise that include MEMC as a protective mechanism.

Understanding Audio Through Audiology and Hearing Conservation

Presented By: S Benjamin Kanters, MM

The HearTomorrow "Audio of Hearing Workshop" will explore audio systems theory in the context of hearing physiology, disorders and conservation. Attendees will learn about basic audio systems and principles of sound engineering as well as gain new perspectives on the hearing mechanism. The ear IS and audio system and we are using modern audio technologies in the development of hearing assist and conservation products. The language and mindset of each informs the other. The workshop will cover the following topics pertinent to these areas: microphones & loudspeakers, analog and digital signals and circuits, and signal processing in the spectral and dynamic domains. Wherever possible, audio principles will be explained using the language and theories of hearing physiology, psychoacoustics and cognition.

Auditory Deficits Associated with Exposure to High-Intensity Blast Waves: Evidence from Military Veterans

Presented By: Melissa Papesh, PhD, AuD

Military Veterans who have been exposed to high-intensity blast waves often experience auditory difficulties that persist long after the blast incident, even in the absence of hearing loss. The unprecedented use of improvised explosive devices in ongoing military conflicts has helped to fuel a substantial increase in the number of Veterans seeking help for auditory processing difficulties, as well as growing interest among VA audiologists in clinical assessment and management strategies for this population. Research in our labs and others reveals that many different types of processing deficits may arise following blast exposure, and that additional comorbid health factors are very common in this patient population. This presentation will review the unique nature of blast-exposure injuries and the complex factors that may underlie auditory processing deficits in the Veteran population, including potential associations with other comorbid health factors such as post-traumatic stress disorder. We will discuss the findings from previous research studies exploring hearing-related outcomes following blast exposure as well as the current state of clinical care for these patients.

SpEAR: A Speech Database for the Advancement of Hearing Protection Devices Equipped with In-Ear Microphones

Presenter: Jérémie Voix, PhD

With the rise of hearing protection devices that use in-ear microphones, accessibility to an in-ear speech database in adverse conditions is essential. Speech captured inside the occluded ear is limited in its frequency bandwidth and has an amplified low frequency content. In addition, occluding the ear canal affects speech production, especially in noisy environments. These changes to speech production have a detrimental effect on speech-based algorithms. Yet, to the authors' knowledge, there are no speech databases that account for these changes. This paper presents a speech-in-ear database, of speech captured inside an occluded ear in noise and in quiet. The database is bilingual (in French and in English) and is intended to aid researchers in developing algorithms for intra-aural devices utilizing in-ear microphones.

A 10th Anniversary Look at the NIOSH Noise Twitter Account

Presenter: Ursula Brogan

The @NIOSHNoise twitter account run by the Noise and Bioacoustics team at the National Institute for Occupational Safety and Health was created in 2010, and since has gained over 5,000 followers. While the account has been active since its conception, it has never been formally evaluated for its direct or indirect impact on workers. This study measured engagement (e.g. "liking" a post, retweeting a post, or mentions of the @ NIOSHNoise twitter account on other platforms) as a function of twitter practices (e.g. partnering with external organizations, formality of posted tweets, inclusion of visual media in posts, targeting of audiences, and hashtag use) and their impact on level of engagement. The study then examined accounts with similar messaging, such as @NIOSH, @CDC, @USCPSC and @CPWR to determine the most impactful practices for reaching their targeted audiences. Practices that resulted in the highest engagements were identified and incorporated into the @NIOSHNoise daily posting schedule. The level of engagement with the @ NIOSHNoise Twitter account was then reevaluated to determine the impact of these changes. Increasing the engagement not only gives the account more visibility, but is a measureable tool to prevent hearing loss in a modern digital age.

Too Loud! An Analysis of Community Noise Ordinances Presenter: Yulia Carroll, MD, PhD

Introduction: Noise exposure is an environmental health problem that affects millions in the U.S. and even more across the globe. Since the defunding of the U.S. Office of Noise Abatement and Control, local and state governments are tasked with the responsibility of creating policy to abate noise. There is a need to analyze the different noise control methods and laws in the U.S. Methods: 60 community noise ordinances in the U.S. were surveyed using the legal assessment framework developed by LawAtlas. A 22-question coding scheme was created to identify key aspects of noise ordinances. Geospatial mapping was used to find regional patterns and a word cloud visualization was produced by analyzing the frequency of terms for the different sound sources used in ordinance language. A literature review was conducted to find gaps and develop recommendations. Results: After analyzing the primary reasons for the noise ordinances, 72% list annoyance or nuisance while 60% list health. Only 50% of noise ordinances include quiet zones as a noise control method. Conclusions: Listing health as a primary reason in ordinances can help citizens understand the implications of noise. Quiet zones, or noise-sensitive zones, could be used in ordinances to protect vulnerable communities.

Distinguishing Between Middle Ear Muscle Contractions and the Eye-Blink Startle Response: A Preliminary Study

Presenter: Kristy Deiters, AuD

Intense acoustic stimuli and brief somatosensory stimuli can elicit middle ear muscle contractions (MEMC). However, the same stimuli can produce relatively short latency motor responses in other motor systems such as the muscles that close the eyelids. This is commonly termed the eye-blink startle response. The relationship between these response classes is not well understood. The aim of the current study is to examine the relationships between MEMC and eye-blink startle activity in response to somatosensory stimuli. Responses to bursts of air delivered to four areas on the face were obtained from over 190 adults with no signs of active middle ear disorders. Results will be discussed with specific reference to MEMC in the context of damage-risk criteria for impulsive noise.

Correlations Between Headphones Output in Decibel and Electronic Devices Volume

Presenter: Bankole Fasanya, PhD

Co-Authors: Reeves Efrem and Francis L. Alexander

Hearing loss among the younger generation is escalating every year along with the rate of sales of headphones and its usage. An American Osteopathic Association report confirmed the rate of hearing loss in teens to be 30% higher than it was in the 1990s before headphones became incredibly common. Today, many students are in the habit of using headphones on daily basis when studying or doing other activities. This study investigated the average sound level (LAeg) output of two cellphone connected with eight different headphone types. A GRAS 45CB acoustic test fixture (ATF) was used to measure the headphone output. Output on the right ear at 40% volume level on an Android Blackberry cellphone produced 60.1 dB(A) with Panasonic earbuds, 58.3 dB(A) with Philips earbuds, 61.7 dB(A) with Samsung earbuds. And 48.1 dB(A) with both Inland and Snug circumaural headphones, 59.6 dB(A) with Billboard earbuds, 83.6 dB(A) with Audioflex Bluetooth wireless, and 68.4 dB(A) Pasonomi Bluetooth. With iPhone 6x, Panasonic earbuds produced 39.5 dB(A), 41.3 dB(A) with Philips earbuds, 41.2 dB(A) with Samsung earbuds, 38.5 dB(A) with Inland circumaural headphones, 39.3 dB(A) with Snug circumaural headphones. Billboard earbuds produced 42.4 dB(A), Audioflex Bluetooth wireless produced 64.6 dB(A), and 52.8 dB(A) with Pasonomi Bluetooth. Findings from this study could be a useful tool for audiologists during headphone usage counseling.

Impacts of HPDs on Ear Canal Acoustics During Music Performance

Presenter: Brendan Fitzgerald, MM (Master of Music)

Musicians are routinely exposed to environments and situations that reach potentially hazardous sound pressure levels, which contribute to an increased risk for music induced hearing disorders. Because hearing protection can perceptually alter the timbre and subtle spectral qualities of music for musicians, many express negative attitudes toward the use of hearing protection. This ongoing study investigates the specific acoustic properties of the ear canal when naturally open and occluded with hearing protection in performing and non-performing conditions for woodwind and brass instrumentalists and vocalists (target n=15).In this population, ear canal resonance can create even greater perceptual difficulties due to the fact that their means of sound production depends on contact with the body or the body being the instrument itself. By utilizing Real Ear Measures (REM) and self-rating scales, we will compare various playing and listening conditions with musicians. First, changes in ear canal acoustics with three different hearing protection devices will be measured using REM. Musicians will then rate their performance and the willingness to accept or tolerate the perceptual changes. We hypothesize that differences in ear canal acoustics created with various hearing protection devices will predict musicians' preference and acceptance of those devices.

Patient and Public Involvement in Research for Hearing and Balance

Presenter: Amy Gosling, BSc(Hons) MSc

Considerable resource is committed to research and delivery of studies relating to noise induced hearing loss and tinnitus. Historically patients have been involved in studies only as subjects with their views typically sought through validated questionnaires. Whilst there has been an encouraging general trend towards increasing patient and public involvement in research this has been much less marked in the field of hearing research. This presentation will describe our group's efforts to improve patient and public engagement in military hearing research through every stage of the research process, including setting the research agenda by identification of key topics, grant writing, contributing to the design and delivery of studies, subsequent dissemination of results and the lessons learned from this process.

Relationship Between Noise Exposure, Hearing Loss, and Tinnitus Among Service Members and Veterans Using the Lifetime Exposure to Noise and Solvents Questionnaire (LENS-Q)

Presenter: Tanisha Hammill

Tinnitus and hearing loss are the two most prevalent service-connected disabilities among Veterans in the United States. Little is known about the etiology of these conditions among Service members and Veterans. There is a need to accurately document the types and amounts of noise and solvent exposures before, during, and after military service as well as other risk factors (such as age, gender, years of service, TBI, blast injuries, and other morbidities) to better understand their individual and combined effects on tinnitus and hearing loss. The Noise Outcomes in Servicemembers Epidemiology (NOISE) Study is a longitudinal epidemiologic study designed to examine longterm effects of military and non-military noise exposures on auditory functioning among Service Members and Veterans. To date over 900 Service members and Veterans have enrolled in this study. The Lifetime Exposure to Noise and Solvents Questionnaire (LENS-Q) was designed to obtain a comprehensive lifetime history of exposure to noise and solvents. Exposures before, during, and after military service are obtained including duration, frequency, and use of hearing protection, all included in an 18-page, scannable instrument. The LENS-Q is described and results from baseline data collected from 690 NOISE Study participcants are presented.

A Hearing Conservation Education Program for Early Career Music Professionals

Presenter: Jiong Hu, PhD, AuD

Previous research has shown that music professionals are routinely exposed to hazardous levels of occupational noise. Musical instruments commonly seen in practice rooms and auditoriums often produce noise levels that meet or exceed those deemed safe by industrial standards (e.g., OSHA regulations). In addition, most musicians are not fully aware of the damaging effects associated with prolonged noise exposure in their occupational setting. As such, the aim of this study is to provide music majors with information pertaining to hearing loss, noise exposure, and hearing protection use during practice and performance sessions where exposure to loud noise exists. Specifically, this study will provide students majoring in music at the University of the Pacific with information on hearing conservation and occupational noise exposure through an educational program. The objective is to examine whether knowledge, attitudes, and/ or beliefs will change after completing such a program. Attitudes and beliefs about noise exposure will be investigated during the dean's seminar that these students (n=75) will attend. A questionnaire will then be administered before and immediately after the dean's seminar as well as one year after the educational intervention program has been completed. The Perception on Hearing Protection and Hearing Loss Questionnaire was adapted from the U.S. National Institute for Occupational Safety and Health (NIOSH) for this study. Eight subcategories of questions will be analyzed including: 1) perceived susceptibility to hearing loss, 2) perceived severity of consequences, 3) perceived benefits of preventive action, 4) perceived comfort, 5) perceived important sound awareness, 6) social norms, 7) behavioral intentions, and 8) self-efficacy. The program will focus on the potential causes of hearing loss, hearing conservation, and occupational noise exposure. Finally, a non-parametric Wilcoxon Ranked Test will be utilized to examine the statistical significance of any change in the above mentioned eight categories. In summary, this study will investigate the efficacy of a hearing conservation program as it is used to educate early career music professionals about the dangers of occupational noise exposure. If successful, this program could be adopted and used with other early-stage professionals who may be exposed to occupational noise in their future careers.

Evaluating Effects of Insertion and Measurement Techniques on Attenuation Characteristics of Industrial Earplugs

Presenter: Sridhar Krishnamurti, PhD

Industrial workers often use the wrong technique to insert their ear plugs, making the hearing protection values lower than predicted by the earplug manufacturer labels. Noise Reduction Rating (NRR) is a single number printed on labels by manufacturers that do not accurately reflect the frequency-specific attenuation offered by ear plugs. In the current study, personal attenuation ratings (PARs) were first computed in two conditions: 1) self-insertion by worker and 2) insertion by experienced investigator. A paired samples T-Test showed significant differences between self-insertion and investigator-insertion conditions (df= 22; t=-8.56; p < .01). These results show that training for proper insertion must be considered strongly during the fitting process. In the second phase of the study, an objective measure of hearing protection offered by ear plugs was evaluated by use of probe microphone testing in real ears of participants in two conditions. Sound pressure levels (SPLs) In the first open ear (unoccluded) condition were compared with SPLs in a plugged (occluded) condition for all participants. There were significant effects of frequency (df=8; f=10.45; p< .01); with the highest noise reduction seen at 3000 Hz. These results indicate that a frequency-specific NRR value can be used to effectively label hearing protectors.

Prevalence of Hearing Loss among Noise-Exposed Workers within the Services Sector, 2006-2015

Presenter: Elizabeth Masterson, PhD, CPH, COHC

Background: The purpose of this study was to estimate the prevalence of hearing loss among noise-exposed U.S. workers within the Services sector. Methods: Audiograms for 1.8 million workers (158,436 within the Services sector) from 2006-2015 were examined. Prevalence and adjusted risk for hearing loss as compared with the reference industry (Couriers and Messengers) were estimated for the Services sector and sub-sectors, and all industries combined. Results: The prevalence of hearing loss within the Services sector was 17% compared to 16% for all industries combined. Many sub-sectors exceeded the overall prevalence by large margins (10-33% higher) and/or had adjusted risks significantly higher than the reference industry. Within Solid Waste Combustors and Incinerators, 44% of workers had hearing loss and more than double the risk, the highest of any sub-sector. Some sub-sectors traditionally viewed as 'low-risk,' such as those grouped u nder Professional, Scientific and Technical Services, and under Educational Services, also had high prevalences and risks. Conclusions: Large numbers of workers within the Services sector have an elevated risk of hearing loss and need immediate hearing conservation efforts. Additional research and surveillance are also needed for sub-sectors for which there is low awareness of hearing hazards or a lack of hearing data.

Assessing the Need for Hearing Conservation Programs in Agriculture-Based Organizations to Improve Self-Awareness of Purdue University Students

Presenter: Abby Maurer, BS

There are an estimated 3.2 million farmers in the United States (2% of the population) and an additional several million that work in direct contact with the field of agriculture. Previous research reveals individuals that work in the field of agriculture are exposed to dangerous noise levels while on the job (e.g. tractors, animals, grain bins, equipment, etc.) and during recreational activities (e.g. gunfire, concerts, ATVs, etc.). Currently, there is no standardized education program on hearing conservation or unsafe noise levels for this population. We are conducting this research study to determine if there is a need for hearing education and hearing conservation programs within the Purdue University College of Agriculture, Indiana FFA, Indiana 4-H, and Indiana public schools. To do this we will be conducting research through surveys with Purdue University College of Agriculture undergraduate students, the current Indiana FFA advisor, current Indiana 4-H leaders, and current Indiana agriculture teachers. These surveys will assess respondents' exposure to harmful sounds and their confidence level in their understanding of the hearing system and hearing conservation. After the surveys are analyzed the need f or hearing conservation programs in these programs will be determined and educational tools and support will be developed.

Distributed Leaning Hearing Technician Training -A Joint Incentive Fund Initiative

Presenter: John Merkley, AuD

Distributed learning (DL) is a model of instruction permitting the instructors, students, and course content to be located in different areas and for learning to take place independent of time and place. Increasing pressure to move education into an online format, and greater need for trained hearing technicians (HT) in the Department of Defense (DoD) and Veterans Administration (VA), has prompted the organizations to support a Joint Incentive Fund (JIF) initiative to pilot a HT training course through DL.Efforts to improve access to care prompted the VA to change policies allowing certified HTs to conduct pure tone audiometric exams on established patients. Changes in DoD regulations have increased the need for certified HTs across the DoD and especially the Army Reserve and Army National Guard. The DoD Hearing Center of Excellence (HCE) in collaboration with the Army Hearing Program and with support of Council for Accreditation in Occupational Hearing Conservation (CAOHC), submitted a proposal for JIF funding to pilot a DL HT training course consisting of a didactic phase of instruction through DL followed by a practical phase completed on-site with either a CAOHC certified Course Director or trained audiology practicum instructor. The Pilot study started in April 2019 and will continue through April 2021. This presentation will introduce the JIF program, discuss DL methods and how they can be applied to HT certification training, and review briefly the progress of the pilot study.

Comparison of Hearing Protector Test Results Presenter: William Murphy, PhD

During the development of the ANSI S12.68 standard for estimating effective A-weighted sound pressure levels when hearing protector device (HPD) are worn, the need to provide a mechanism to compare HPD ratings was identified. The current Noise Reduction Rating (NRR) is a single number that describes the potential of a product to reduce noise at the user's ears. The Noise Reduction Statistic for A-weighting (NRSA) developed in ANSI S12.68 describes a range of protection performance and estimate the uncertainty associated with the protector's rating. The uncertainty for the NRSA is estimated using a bootstrap procedure (sampling with replacement). The bootstrap technique can be applied to the current protector ratings (e.g. NRR) and comparisons between rating evaluations from different laboratories can be compared. This paper will discuss the error bars for NRR and NRSA ratings and present a modification of the bootstrap method to estimate directly the statistical significance of ratings from different laboratories. Data from the NIOSH/EPA interlaboratory study and other published studies will be used to illustrate how the method is applied.

Optimized Passive Hearing Protection

Presenter: Kirk Ohnstad, BS Physics

BACKGROUND: The US NAVY funded development of the FDC helmet which provides the highest passive sound-attenuation available on the market; this is accomplished via a complete cranial-seal which isolates human head tissues from air and bone conduction. KEY RESULTS: An independent third-party Norwegian laboratory (SINUS AS) tested the FDC alongside other helmet competition. These key results yielded selection of the FDC helmet by several Norwegian hygienists for their personnel. Currently, there are over 330 FDC users over 5 countries. Norwegian heli-crew clients include: CONOCOPHILLIPS, STATOIL, SHELL, CHC, OSM, etc. USA heavy industrial clients include: DOW, TRANSCANADA, SHELL, MOTIVA, etc. SIGNIFICANCE: Due to the unmatched hearing protection of the FDC and the adoption by oil and gas industries, the US NAVY (NAVAIR) has reengaged FDC program, and is currently in phase 2.5. The FDC helmet design allows for longer noise-exposure times, critical for optimizing work-time limitations for key crew-members such as pilots and SAR.Increased communication abilities, due to optimized sound-protection, yield many additional benefits to the use of the FDC helmet. The FDC has been acquired by individual clients with issues such as inner-ear psoriasis, tinnitus and hyperacusis.

Exploring the Prevalence of Noise-Induced Hearing Loss in Children and Youths. A Literature Review

Presenter: Jenny Rajan, AuD

Noise-induced hearing loss (NIHL) is a public health issue that is preventable. Hazardous noise exposure is one of the major causes of preventable permanent hearing loss throughout the world. Children and youth may participate in activities, which put them at risk for auditory damage. Such as attending concerts, listening to personal audio systems, riding recreational vehicles and attending sporting events. It is challenging to fully understand the ideal metrics for quantifying NIHL in youth in the context of epidemiological trends. A literature review was performed to gain an understanding of the prevalence of noise-induced hearing loss (NIHL) in youth (aged 6 to 19 years). This poster will provide historical insight and perspectives on this topic. Peer-reviewed articles which date back as early as 1943 to the more recent in 2019 were reviewedDespite the evidence suggesting a decrease in the prevalence of NIHL, the actual numbers of youth at risk of NIHL in the U.S. is high. Hearing health promotion and education has been called for in response to these outcomes. There is a need for the U.S. to work towards disseminating a nation-wide, evidence-based public health intervention program to prevent NIHL in youth.

Military Operational Medicine Research Program: Current and Future Needs of Auditory Injury Prevention Research

Presenter: Richard Shoge, PhD

The US Army Military Operational Medicine Research Program (MOMRP) areas of concentration include medically driven research on medical criteria that will drive the development of better passive and active hearing and vestibular-cochlear protection devices, guantification of impulse noise, blast, and acceleration, assessment of auditory and vestibular effects of hazardous exposures, and computer modeling to predict hearing protection in known hazard environments and with known auditory thresholds. Current and future needs of the Department of Defense to succeed in Multi-Domain Operations (MDO) are enhanced capabilities to protect the Warfighter against performance degradation and injury from hazardous noise, pressure, and extreme acceleration. The Warfighter will need to be able to shoot, move, and communicate in all types of environments to include subterranean spaces and dense urban environments. MOMRP will continue to look for laboratory-based research, coupled with field studies, injury epidemiology, and engineering expertise that will lead to the development of optimal prevention strategies for peripheral and central auditory and vestibular disorders and hearing protection recommendations that will minimize performance degradation on the modern battle field.

Does Knowledge of an Impending Impulse Elicit Early Middle Ear Muscle Contractions?

Presenter: Madeline Smith, BS

Multiple damage-risk criteria (DRC) for impulsive noise have included middle ear muscle contractions (MEMC) as a protective mechanism. One DRC proposes that if an individual expects an impulse, an MEMC will occur in the listener in anticipation of the impulse. In this study, we examined whether knowledge of an impending impulse influences the likelihood of an early MEMC (i.e., prior to weapon discharge) in a group of 59 adult participants with good hearing. Participants attended to downrange targets and were assigned to either a shooter or spotter role. Early MEMC were identified by changes in the sound levels developed in the ear canal from a click-based probe signal. Results of MEMC for warned and unwarned conditions will be described and compared with related lab-based results and observations made with soldiers firing weapons loaded with live ammunition.

An Approach to Identification of Middle Ear Muscle Contractions that Controls for the Effect of Incidental Motor Activity

Presenter: Stephen Tasko, PhD

Evidence that motor activity can reliably elicit middle ear muscle contractions (MEMC) is increasing This observation complicates the interpretation of experiments that focus on acoustically elicited MEMC.For example, is a given MEMC due to the acoustic elicitor, concomitant motor activity or both?This question is particularly relevant since some damage risk criteria (DRC) for impulsive sound suggest a protective role of MEMC. Recently, our research team described a multiple regression approach to quantify associations between electromyographic (EMG) activity recorded from muscles in the head, neck and upper extremity and middle ear activity. For a substantial minority of participants, 20-60 percent of the variance in middle ear activity was predicted by EMG activity in the head, neck and upper extremity. The current study expands these methods to the detection of MEMC in response to brief acoustic elicitors that controls for possible EMG-related contributions. The results suggest that facial muscle activity may inflate estimates of the prevalence of MEMC for brief sounds.Results will be discussed in the context of DRC for impulsive noise that include MEMC as a protective mechanism

Prevalence of Noise Exposure and Hearing Loss: Data from U.S. Health Surveys

Presenter: Christa Themann, MA, CCC-A

Although exposure hazardous noise is generally considered to be the major cause of preventable hearing loss among adults, the U.S. does not have a measurement-based surveillance system to track noise exposure. However, several national health survey systems collect self-reported noise exposure information as well as self-rated and/or audiometrically-measured hearing data. This presentation will provide estimates of exposure to loud workplace noise, very loud workplace noise, non-work noise, and firearm noise among a nationally-representative sample of U.S. adults based on data from the National Health Interview Survey and the National Health and Nutrition Examination Survey. Prevalence of self-reported and measured hearing impairment as well as tinnitus will also be reported and examined in relation to the various types and combinations of exposure. In addition, the frequency of hearing protector use and audiometric monitoring among individuals exposed to various types of noise will be examined to evaluate their possible influence on the prevalence of auditory symptoms and identify groups in particular need of targeted interventions. This presentation will provide a snapshot of the noise exposure problem in the U.S., illustrate its effects on hearing ability among U.S. adults, and highlight the most significant hearing-related public health needs.

Agreement Across Different Measures of Noise Exposure in College Students

Presenter: Jennifer Tufts, PhD

Increased interest in noise-induced subclinical changes to the human auditory system has prompted discussions about how to quantify noise exposure in human populations. In our recent studies of the physiological and functional correlates of routine noise exposure, we have used a seven-day dosimetry protocol to characterize the noise exposure of our study participants. However, questions have been raised about whether one week of dosimetry provides a representative snapshot of exposure. This concern motivated the current study, in which 33 college students wore noise dosimeters for three non-consecutive weeks, spread over multiple months. Additionally, participants completed the Noise Exposure Questionnaire (NEQ; Johnson et al., 2017) and the Lifetime Exposure of Noise and Solvents Questionnaire (LENS-Q; Bramhall et al., 2017), which are designed to capture annual and lifetime noise exposure, respectively. Results showed that dosimetric measures were consistent across measurement weeks, suggesting that weeklong personal noise dosimetry may be a reliable tool for capturing current noise exposure patterns in some populations. However, preliminary analyses indicate that noise exposure estimated via dosimetry did not correlate with the NEQ dose nor the LENS-Q score, nor did the NEQ and LENS-Q metrics correlate with each other. Implications for capturing noise exposure history will be discussed.

Predictors for Hearing Protection Attenuation Among Miners

Presenter: Elon Ullman, BA

Noise exposure is among the most prevalent occupational hazards in the United States. Excessive noise exposure can lead to hearing loss and tinnitus and has been linked with additional chronic diseases such as cardiovascular disease. Hearing protection devices (HPDs), such as earplugs and earmuffs, are required by law to be used in occupational environments with hazardous noise levels. A measure known as the Personal Attenuation Rating (PAR) is currently considered to be the gold standard for measuring how well an earplug is fit by calculating the attenuation achieved by an individual wearing an HPD. PARs are commonly calculated using "Real Ear at Threshold" (REAT) systems, which measure the threshold that an individual can hear across a range of frequencies with and without their HPD. Despite being the gold standard for measuring earplug fit, there is a current gap in knowledge concerning the predictors of PARs. This study utilized data collected under a larger study on noise exposure and injury rate among miners to investigate the predictors of PARs, with a focus on the association between hearing loss and personal attenuation ratings. Hearing loss was assessed using both audiometric testing and a speech-in-noise test. PARs were assessed using a REAT system. Predictors of PARs were modeled using both simple and multiple linear regression, with hearing loss as the primary predictor of interest. The main objective of this study is to shed light on risk factors for poor earplug fit. This knowledge can be integrated into hearing protection programs to target individuals most at risk for excessive noise exposure due to poor earplug fit.

The Connected Protected Worker at the Age of IoT Presenter: Jérémie Voix, PhD

At this age of Internet of Things (IoT), wearables are now everywhere, sometimes even in your earcanal. The research team from the NSERC-EERS Industrial Research Chair in In-Ear Technologies (CRITIAS) has been actively developing various in-ear technologies designed to complement the human ear, from "smart" hearing protection against industrial noises, to advanced inter-individual communication systems, to hearing health monitoring devices using otoacoustic emission (OAE), to in-ear EEG Brain Computer Interface (BCI). More fundamental research has also been conducted, particularly on the micro-harvesting of electrical power from inside the earcanal to power future auditory wearables. Current state of the research conducted within CRITIAS will be presented in this poster.

PRESENTER BIOGRAPHIES



Chandran Achutan, PhD University of Nebraska Medical Center

Dr. Chandran Achutan is an Associate Professor at the University of Nebraska Medical Center College of Public Health.



Robert Anderson, BME, INCE Robert Anderson Group, Inc.

Robert Anderson is Principal and Co-Founder of Anderson Consulting Associates, a noise control consulting firm in Lansing, Michigan. He has been actively involved in the field of noise control for over 40 years, supervising and participating in projects related to control

of occupational and community noise in industry. His experience includes noise control within the agricultural implement, appliance, automotive, brewing, chemical, logistics, glass container, petroleum, pharmaceutical, plastics and rubber manufacturing industries. He has been a guest lecturer at The Eugene Applebaum College of Pharmacy and Health Sciences of Wayne State University and at the University of Michigan's School of Public Health; and is currently an adjunct faculty member of Central Michigan University, where he teaches sound exposure monitoring and hearing loss prevention programs to audiology graduate students.



Ursula Brogan

National Institute for Occupational Safety and Health

Ursula "Asha" Brogan is currently an ORISE research fellow on the Noise and Bioacoustics team at the US National Institute for Occupational Safety and Health (NIOSH). She is a recent graduate from the University of

Cincinnati where she received a BA in health communication and a certificate in public relations. While in school Asha helped launch a brand new Instagram account for the Communication department, as well as helping to analyze and improve existing social media account. She completed an internship for NIOSH in 2018 completing numerous communication tasks, and is happy to be back and continuing work and research on social media and other communication projects.



Douglas Brungart, PhD Walter Reed NMMC

Douglas S. Brungart, PhD, is the Chief Scientist of the National Military Audiology and Speech Pathology Center at Walter Reed and is currently also serving as the Chief Scientist for the Department of Defense Hearing Center of Excellence. From 1993 to 2009,

he was a research engineer at the Air Force Research Laboratory with research focusing on advanced auditory displays for spatial and speech information. Since 2009, he has been at Walter Reed focusing on the application of advanced technology to improve the prevention, diagnosis, and treatment of hearing loss and other hearing and speech disorders. He holds a MS and PhD in Electrical Engineering from the Massachusetts Institute of Technology and a BS in Computer Engineering from Wright State University.



Kari Buchanan, MPH, MA zCore Business Solutions/

DoD Hearing Center of Excellence

Kari Buchanan, M.P.H., M.A. is a retired U. S. Navy Industrial Hygiene Officer providing contract support through zCore Business Solutions to the DoD Hearing Center of Excellence. Ms. Buchanan is currently managing

efforts on developing a hearing protective device evaluated products list and associated assessment methods for hearing protective devices. She received her M.P.H. in Environmental Health Sciences from Columbia University and her M.A. in National Security and Strategic Studies from the U.S. Naval War College. She has a broad background in military operations, occupational hazards in the military, DoD organization and risk assessment.



Yulia Carroll, MD, PhD CDC / National Center for Environmental Health

Yulia Carroll serves as the Associate Director for Science at the Division for Environmental Health Service and Practice at the Centers for Disease Control and Prevention (CDC), National Center for Environmental Health (NCEH).

She advises on various scientific environmental health issues, including health effects of noise, promotion and prevention. She has been instrumental in the development of the noise-induced hearing loss initiative at CDC. Dr. Carroll started her CDC career as an EIS officer at the National Institute for Occupational Safety and Health (NIOSH) in 2007, where she led investigations into emerging work related diseases. She then worked as the Division epidemiologist at the Agency for Toxic Substances and Disease Registry, where she assisted in the development of toxicological profiles, exposure level recommendations, and field investigations. Prior to joining the CDC, Dr. Carroll worked as a research scientist at the University of Cincinnati Center for Health Relate.



John Casali, PhD, CPE Virginia Tech & HEAR LLC

Dr. John Casali is the Grado Chaired Professor of Industrial & Systems Engineering at Virginia Tech and Director of the Auditory Systems Lab. He also is Founder of Hearing, Ergonomics and Acoustics Resources (HEAR) LLC, a product design, testing, and litigation

support company. A Fellow of the Human Factors & Ergonomics Society and the Institute of Industrial Engineers, he received the NIOSH-NHCA Safe-in-Sound Award for Innovation (auditory situation awareness-ASA) in 2016, and the NHCA Outstanding Hearing Conservationist Award in 2009. He has directed over 110 research projects sponsored by U.S. government/military agencies as well as many corporations, totaling over \$14M. Many of the 200+ publications emanating from his research concern hearing protection, ASA, military hearing scenarios, and auditory displays/ warnings. Dr. Casali also holds 6 Patents. During the past decade, he led the development of the "DRILCOM" indoor ASA test facility and the "PASAT" ASA training system.



Kara Cave, PhD U.S. Army Aeromedical Research

Laboratory MAJ Kara Cave is currently assigned to the U. S. Army Aeromedical Research Lab at Fort Rucker, AL. Currently, her research interests include human factors issues involved in

tactical communication and protective systems use, auditory localization, blast related noise-induced hearing injury, and fitness-for-duty standards. Her previous assignments include: Walter Reed Army Medical Center, Washington, D.C.; Army Research Laboratory, Aberdeen Proving Ground, MD; 10th Combat Support Hospital, Baghdad, Iraq; William Beaumont Army Medical Center, Fort Bliss, TX; Blanchfield Army Community Hospital, Fort Campbell, KY; and Martin Army Community Hospital, Fort Benning, GA;. She received her B. A. from Boston College in 1999 and her Ph.D. in Audiology from James Madison University in 2005.



Gregory Ciccarelli, PhD

Massachusetts Institute of Technology

Gregory Ciccarelli performed his doctoral research in electrical engineering and computer science at the intersection of speech, neuroscience, and computational modeling at the Massachusetts Institute of Technology. Since joining the Human Health

and Performance Systems group at MIT Lincoln Laboratory, he has engaged in various sensorimotor applications leveraging modeling, high performance computing, and artificial intelligence techniques. His research interests also include auditory attention decoding and EEG signal processing.



Kathryn Crawford, MS, COHC University of Iowa

Kate Crawford is a PhD candidate in the Department of Occupational and Environmental Health (OEH) at the University of Iowa. Kate received a BA in Literature and a BS in Environmental Health from West Chester University in Pennsylvania. After

interning with the Environmental Health and Radiation Safety office at the University of Pennsylvania, she decided to pursue Industrial Hygiene and came to Iowa in 2014. As a trainee in the Heartland Center, a NIOSH ERC located in the University of Iowa's College of Public Health, Kate received her MS in Industrial Hygiene in 2016 and is currently pursuing her PhD in OEH. Her research involves evaluating occupational sound exposures and control strategies for music instructors. Kate is a Certified Occupational Hearing Conservationist and secretary-elect for the American Industrial Hygiene Association's Noise Committee.



Jennifer Deal, PhD Johns Hopkins University

Jennifer A. Deal is an epidemiologist and gerontologist with expertise in hearing loss and cognitive aging. She is an Assistant Scientist of Epidemiology and Otolaryngology-Head & Neck Surgery at the Johns Hopkins University and Core Faculty and Associate Director

for Academic Training with the Johns Hopkins Cochlear Center for Hearing and Public Health, a first-in-kind research center dedicated to training a generation of clinicians and researchers to understand and address the impact of hearing loss on older adults and public health. Dr. Deal completed an undergraduate degree in biology from Indiana University and received Master of Health Science and Doctor of Philosophy degrees from the Johns Hopkins Bloomberg School of Public Health. Trained in the epidemiology of aging, Dr. Deal studies how hearing loss and vascular factors impact the aging brain and cognition to provide insight into mechanistic pathways involved and to inform development of public health prevention strategies.



Kristy Deiters, AuD SASRAC

Kristy K. Deiters, Au. D. is a research audiologist working with Stephenson and Stephenson Research and Consulting (SASRAC). Prior to her work with SASRAC, she was a research audiologist and study coordinator in the Department of Speech Pathology and Audiology

at Western Michigan University and a clinical audiologist at Hearing Services and Systems in Portage, MI. She completed her Au.D. at Western Michigan University. Her research interests include evaluating damage-risk metrics for impulsive noise, the epidemiology of hearing impairment, and the evaluation of hearing status.



John Eichwald, MA Centers for Disease Control and Prevention (CDC)

John Eichwald is an audiologist within the Office of Science in the Centers for Disease Control and Prevention (CDC) National Center for Environmental Health, working on non-occupational noise induced hearing loss.

John has over 40 years' experience in the field of Audiology. He has published extensively and made numerous presentations on the early identification of hearing loss in newborns and most recently the prevention of non-occupational noise induced hearing loss. Prior to CDC, he spent nearly 20 years at the Utah Department of Health serving in both clinical practice and administrative positions.



Bankole Fasanya, PhD Purdue University Northwest

Dr. Fasanya has more than 10 years' experience in noise control and auditory process research. His long-term research interests involve the development of a comprehensive model and guidelines to reduce environmental hazards and to improve human safety

and health in the environment. Dr. Fasanya is an OSHA authorized train-the-trainers personnel and is a Certified Occupational Hearing Conservationist. His academic training and research experience to date have provided him with an excellent background in Ergonomics and Human Factors specifically, environmental and occupational noise control, and auditory protection and prevention. Dr. Fasanya has developed and taught courses on noise control at graduate level during his faculty position at North Carolina Agricultural and Technical State University in the department of Built Environment. He has also developed and taught Industrial Hygiene course in his current position at Purdue University Northwest, a course that demonstrate good practice



Donald Finan, PhD University of Northern Colorado

Don Finan is a Professor of Audiology and Speech-Language Sciences at the University of Northern Colorado. His research interests include measurement of noise and associated auditory exposure, normal speech motor control, technology use in clinical and

research settings, and developing innovative tools and pedagogies for instruction in the speech and hearing sciences.



Brendan Fitzgerald, MM University at Buffalo/ Cleveland Clinic

Brendan Fitzgerald is a currently a student at the State University of New York at Buffalo in his externship year at the Cleveland Clinic. Formerly a music educator, his clinical and research interests in audiology include tinnitus and hearing conservation,

particularly for musicians.



Gregory Flamme, PhD SASRAC

Gregory A. Flamme, Ph. D. is a Senior Scientist with Stephenson and Stephenson Research and Consulting (SASRAC). Prior to joining SASRAC, Dr. Flamme held faculty positions at Western Michigan University and The University of Iowa. He completed his Ph. D.

in Audiology at The University of Memphis and conducted post-doctoral studies in Epidemiology and Biostatistics at The University of lowa. His research interests include the assessment of hearing status and the identification and mitigation of risk factors for hearing impairment.



Kathy Gates, AuD DoD Hearing Center of Excellence

Kathy Gates, Department of Defense (DoD) Hearing Center of Excellence (HCE): Dr. Gates supports the Prevention and Surveillance Branch for the DoD Hearing Center of Excellence (HCE). Her primary role is to promote hearing loss prevention initiatives and total

worker hearing health promotion. Her passion for hearing loss prevention began in 1987 when she was commissioned in the U.S. Army as an Army Audiologist. Colonel (Retired) Gates served over 26 years in the Army. Today she serves as the associate coordinator, Specialty Interest Group (SIG 8), American Speech Language and Hearing Association (ASHA). She holds certification as a CAOHC Course Director and Professional Supervisor.



Amy Gosling, BSc, MSc UK Military Hearing Research Collaboration

Miss Amy Gosling is the Program Manager for the UK Military Hearing Research Collaboration. She holds a Bachelor's degree in Psychology and a Master's degree in Health, Bioethics and Law. Her previous projects

include the Human Feasibility of an Implantable Middle Ear Microphone and a number of clinical trials for cancer therapies.



Sarah Grinn, PhD, AuD Central Michigan University

Dr. Grinn is a new faculty member at Central Michigan University, having recently earned her Ph.D. at The University of Texas at Dallas, and her Au.D. and The University of Florida. Her research interests include the role of pre-cochlear amplification in NIHL vulnera-

bility, and the auditory effects of isolated and frequent recreational noise insults sustained in normal hearing populations. Dr. Grinn first joined and presented research at the NHCA as an Au.D. student, then earned the NHCA Student Research Award as a Ph.D. student, and is proud to continue supporting and promoting the NHCA at the faculty-academic level.



Tanisha Hammill, PhD Department of Defense Health Agency

Dr. Tanisha Hammill currently serves as a Senior Health Scientist for the Department of Defense Health Agency's Research and Development Directorate. In this position, Dr. Hammill develops and oversees research programs and policies to support the military's

medical research needs. Her previous research experience spans bench to bedside to population/community research and policy development in military hearing science. Dr. Hammill earned her a Ph.D. program in Translational Science from the University of Texas at Austin with a focus and dissertation exploring pharmaceutical interventions for hearing loss.



Jiong Hu, PhD, AuD University of the Pacific

Jiong "Joe" Hu, PhD earned his bachelor of science in physics from Nanjing University in China. He became interested in the field of audiology and continued his education at Ohio University where he earned his doctor of philosophy in 2013, and his doctor of clinical

audiology in 2016. Dr. Hu is a member of the American Academy of Audiology. His primary research interests are auditory electrophysiology and neuroplasticity. Most recently his research has focused on examining the impact of bilirubin-induced neurotoxicity on the auditory system in newborns and infants, as well as the effect of long term auditory exposure on pitch coding ability at the brainstem level in adults with different language backgrounds.



Jim Jerome, AuD Workplace Integra

James (Jim) Jerome is a senior occupational audiologist for Workplace Integra, working out of the Indianapolis office since 2007. Prior to that, he worked as an occupational audiologist for an IH and safety group for four years, a US Army audiologist for 21 years, and

a school audiologist for 5 years. Jim has been an active member of the NHCA since 1999. He served as Secretary on the NHCA Scholarship Foundation (NHCASF), Secretary/Treasurer on the NHCA Executive Council, Program Chair for the 2012 and 2015 Annual NHCA Conferences, President of NHCA, and currently President of the NHCASF. Under CAOHC, he has been a Course Director since 1985 and a Professional Supervisor since 2014.



S. Benjamin Kanters, MM Columbia College Chicago

Benj has been a professor at Columbia College since 1993, after 20 years in the audio and music industries, including 14 years teaching audio at Northwestern University. Through the 70s, he was partner and sound engineer with the Chicago area concert club,

Amazingrace. During the 80s, he was partner and head engineer of Studiomedia Recording Company. After studying hearing physiology during graduate studies at Northwestern University, he developed the course Studies in Hearing in 2000 to teach physiology and conservation to audio students. In 2007, he founded The Hearing Conservation Workshop, and has presented over 100 seminars on hearing physiology and conservation to students and professionals in the audio, music and hearing sciences.



Khalid Khan, PhD Indiana University Bloomington

Khalid Khan is an Assistant Professor of Environmental and Occupational Health at the Indiana University School of Public Health at Bloomington. His research interests are centered on the broad area of environmental epidemiology with specific emphasis on pre-

vention of environmental and occupational exposures in vulnerable populations including youth. Also, he examines how these exposures affect neurobehavioral functions in children and adolescents. Dr. Khan obtained his doctoral degree from Columbia University Mailman School of Public Health and has about 10 years of research experience in rural, agricultural and low-income communities.



Sridhar Krishnamurti, PhD Auburn University

Dr. Sridhar Krishnamurti is Professor of Audiology in the Department of Communication Disorder and also serves as Graduate program coordinator. Prior to his appointment as assistant professor at Auburn in 1996, Sridhar Krishnamurti completed a clinical fellowship

in audiology at the Massachusetts Eye and Ear Infirmary at Harvard Medical School. He currently serves on the research grants review panel for the Alzheimer's Association and is also on the review board of several agencies and journals including Ear and Hearing, American Journal of Public Health, and Journal of the American Academy of Audiology. Dr. Krishnamurti has authored and co-authored journal articles and book chapters that cover the areas of electrophysiology, aging, hearing conservation, auditory processing disorders, and hearing aids.



M. Samantha Lewis, PhD

Pacific University

M. Samantha Lewis, PhD, is an associate professor in the School of Audiology at Pacific University located in Hillsboro, Oregon. She joined the School of Audiology in 2017, after a 15-year career as a research investigator/ audiologist at VA Rehabilitation Research

and Development (RR&D) Service National Center for Rehabilitative Auditory Research (NCRAR) at the VA Portland Health Care System in Portland, Oregon. During her time at the NCRAR, she received funding for her research activities through the VA RR&D Service, the Department of Defense, industry, and foundation. Dr. Lewis maintains her affiliation with the NCRAR today, as well as an affiliation with the Department of Otolaryngology/Head & Neck Surgery at the Oregon Health & Science University in Portland, Oregon. Her areas of specialty include auditory rehabilitation, audiologic counseling, (central) auditory processing, geriatrics, and tinnitus.



Malisha Martukovich, AuD

Major Malisha Martukovich serves as the Air Force Audiology Liaison to the Defense Hearing Center of Excellence at Joint Base San Antonio-Lackland, Texas. As an advocate for hearing health issues within the DOD, she works on outreach activities, prevention

branch initiatives and is a member of several DoD working groups. Maj Martukovich earned her Doctoral degree in Audiology from Arizona School of Health Sciences, A. T. Still University in Mesa, Arizona, as well as a Master's and Bachelor's degree from The Ohio State University.



Elizabeth Masterson, PhD, CPH, COHC

National Institute for Occupational Safety and Health

Elizabeth (Liz) Masterson is an Epidemiologist in the Health Informatics Branch (previously Surveillance Branch) of the Division of Field Studies and Engineering at the National

Institute for Occupational Safety and Health, Cincinnati, Ohio. She is the Project Officer for the NIOSH Occupational Hearing Loss Surveillance Project and serves as an Assistant Coordinator for the NIOSH Hearing Loss Cross-sector Prevention. She also serves on the NIOSH Hearing Loss Prevention Cross-sector Council. Liz has a PhD in Environmental Health/Epidemiology from the University of Cincinnati and is certified in Public Health and Occupational Hearing Conservation.



Abby Maurer, BS Purdue University

Abby Maurer is a third year Doctorate of Audiology Candidate at Purdue University. She was born and raised in a rural community in central Ohio near the foothills of the Appalachian Mountains. She then earned her Bachelor of Science degree in Communica-

tion Sciences and Disorders at Ohio University in Athens, Ohio. As graduation from Ohio University drew closer she knew she wanted to pick a school that had a strong agriculture community so she could use her passion for audiology to educate and assist rural communities just like the one she was raised in. This lead her to begin earning her Doctorate of Audiology at Purdue University in West Lafayette, Indiana. Since starting at Purdue she has been able to network and build relationships with academic faculty in both Human and Health Sciences and Agriculture to help bring hearing health awareness to all involved.



Siobhan McGinnity, BSc, MClinAud, PhD

University of Melbourne

Dr. Siobhan McGinnity is a research audiologist at the University of Melbourne. She lectures, tutors and provides clinical supervision to the Master of Clinical Audiology program students. Her clinical areas of specialty

include musicians' hearing care, tinnitus management and aural rehabilitation. Siobhan completed her PhD in 2019, where she investigated preventing hearing injury in the music industry. This included engagement with a wide range of industry stakeholders, from sound engineers to music peak bodies.

Siobhan's interest in hearing conservation led to her founding nonfor-profit, Musicians 4 Hearing, utilizing music events in Australia to fund access to hearing care in the developing world. Siobhan is also a member of several advisory panels, including for Music Victoria and Tinnitus Australia.



John Merkley, AuD U. S Army Public Health Center

LTC John 'Andy' Merkley is an Army Audiologist currently serving as the Army Hearing Division Chief at the Army Public Health Center in Aberdeen, Maryland. He holds a Master of Science in Communicative Disorders from Utah State University and a Doctor of Audiol-

ogy from Central Michigan University. LTC Merkley's professional associations include American Speech-Language-Hearing Association (ASHA), the Military Audiology Association (MAA) and the National Hearing Conservation Association (NHCA). LTC Merkley represents the MAA on the Council for Accreditation in Occupational Hearing Conservation (CAOHC) and serves as the vice-chair of education on the CAOHC Executive Committee.



Jan Moore, PhD

University of Nebraska Kearney

Jan Allison Moore received graduate degrees from the University of Illinois (Ph.D.) and Purdue University (M.S.) and her undergraduate degree from the University of Central Arkansas. She also completed a graduate certificate program in Public Health at the University of

Nebraska Medical Center. She was a Fulbright scholar to Canada in 1993. She is a full Professor at the University of Nebraska Kearney. Her research interests include prevention of noise-induced hearing loss in persons attending contemporary worship services. In addition, she is investigating cognitive and balance changes in aging agricultural workers with histories of noise-induced hearing loss.



Thais Morata, PhD

National Institute for Occupational Safety and Health

Thais C. Morata is a Research Audiologist at the National Institute for Occupational Safety and Health (Cincinnati, OH, USA). Her pioneering work in the area of noise interactions in the workplace has influenced national and international occupational safety and health

policies. She has published and lectured extensively in the United States and abroad, having presented keynotes in international fora. Dr. Morata is recognized as a mentor and collaborator with researchers all across the globe. She has been a Founding Associate Editor for the International Journal of Audiology since 2003, and a founding member of the Cochrane Work review group. Dr. Morata also directs the Safe-in-Sound Excellence in Hearing Loss Prevention Awards[™]. In 2008 she received the Outstanding Hearing Conservationist Award from the National Hearing Conservation Association for her contributions to hearing loss prevention.



William Murphy, PhD National Institute for Occupational Safety and Health

William J. Murphy is a Captain in the United States Public Health Service Commissioned Corps and is coordinator for the Hearing Loss Prevention cross sector for the National Institute for Occupational Safety and Health. He is

an active member of the National Hearing Conservation Association and a Fellow of the Acoustical Society of America. He is currently the chair for the ASA's American National Standards Institute (ANSI) Accredited Standards Committee S3 for Bioacoustics. He has provided leadership to the ASA as chair of the Technical Committee on Noise and through work with the national and international standards on noise.



Jameel Muzaffar, BA, MBBS, MSc FRCS

UK Military Hearing Research Collaboration

Dr Jameel Muzaffar is a Royal College of Surgeons Research Fellow at the UK Military Hearing Research Collaboration. His clinical background is in ENT and alongside this he

is currently in the final year of a PhD in the Department of Clinical Neurosciences at the University of Cambridge investigating the effects of noise and blast on the auditory system.



Richard Neitzel, PhD, CIH, FAIHA University of Michigan

Richard L. Neitzel, PhD, CIH is an Associate Professor and Associate Chair of the Department of Environmental Health Sciences at the University of Michigan (UM) School of Public Health. He has published nearly 100 peer-reviewed manuscripts focused on exposures to,

and impacts of, noise and other occupational and environmental hazards. He is particularly interested in incorporating new methodologies and exposure sensing technologies into research and has a strong interest in translating his research findings into occupational and public health practice. He has created a job-exposure matrix for occupational noise exposures in the U.S. and Canada, available at http://noisejem.sph.umich. edu/. Dr. Neitzel is Chair of the ACGIH® Threshold Limit Values for Physical Agents (TLV®-PA) Committee. He is also a Fellow of the American Industrial Hygiene Association and has been a Certified Industrial Hygienist since 2003.



Kirk Ohnstad, BS Physics Composite Materials Research and Development

Kirk Ohnstad is a physicist at CMR-D, a small business located in Salem, Oregon. Mr. Ohnstad spearheaded the commercialization of the flight deck cranial (FDC) developed by the US NAVY. Because of the commercial success

(particularly via working with industrial hygienists), the NAVY has re-engaged the development of the helmet for use by NAVAIR F-35 ground crew operators. Only the passive FDC solution can provide the NRR values required by the NAVY.



Lt Col Linda Orr, FRCS, OBE UK Military Hearing Research Collaboration

Lt Col Linda E Orr BSc (Hons) MB ChB DM FRCS(Eng) FRCS (ORL-HNS) is a serving Ear, Nose and Throat - Head and Neck Surgeon in the British Royal Army Medical Corps. She has served operationally over the last 30 years

initially as a doctor within the infantry and SF and more latterly as a trauma surgeon. Her clinical work is based at the Queen Elizabeth Hospital Birmingham, the UK Role 4 facility where she leads on neck trauma and noise induced hearing loss. Her doctoral research utilized both her chemistry and medical degrees by focusing on the use of Ramen Spectroscopy for the diagnosis of laryngeal dysplasia. More recently her research has been primarily on noise induced hearing loss, both as a collaborator in research studies and as the Director of the hearWELL Collaboration. The latter being the organization through which UK Defence coordinates all research into NIHL and tinnitus. She serves on the Royal College of Surgeons of England Research Committee.



Melissa Papesh, PhD, AuD VA RR&D National Center for Rehabilitative Auditory Research

Dr. Papesh is a research investigator at the VA RR&D National Center for Rehabilitative Auditory Research in Portland, OR. Her research focuses on diagnosis and rehabilitation of Veterans and Service Members with audi-

tory processing disorders (APD). Her credentials include a clinical doctorate of audiology (Au.D.) and a dual Ph.D. in Hearing Science and Neural Science, as well as a postdoctoral Advanced Research Fellowship in Polytrauma and Traumatic Brain Injury Rehabilitation awarded by the VA Office of Academic Affiliations. Currently, Dr. Papesh is the Principal Investigator on a VA RR&D Career Development Award entitled "Physiological Assessment of Auditory Processing Disorders in TBI", and is a co-Investigator on several other projects related to hearing difficulties in patients with clinically normal hearing thresholds.



Jenny Rajan, AuD Salus University

Dr. Rajan s a PhD student in the Biomedicine program at Salus University. Her research interest includes hearing loss prevention education in children and youth. She has over 17 years of experience as a clinical audiologist. She is currently an Assistant Professor at Salus

University, where she teaches AuD students both in the classroom as well as in the on-campus clinic. Her clinical and teaching focus is in pediatric audiology.

Stephanie Sayler

University of Michigan

Stephanie Sayler is a doctoral pre-candidate at the University of Michigan School of Public Health. She is a CAOHC-certified Occupational Hearing Conservationist, Certified Industrial Hygienist, and has a Master of Science degree in Industrial Hygiene from the University of Michigan. While her research has primarily focused on noise and hearing loss, she is also involved in global industrial hygiene research and outreach that aims to identify and address health and safety issues among underserved workers.



Richard Shoge, PhD US Army Medical Research and Development Command

Dr. Richard O. Shoge is the Injury Prevention and Reduction Portfolio Manager at Military Operational Medicine Research Program (MOMRP) within the US Army Medical Research and Development Command

(MRMC) at Ft. Detrick, MD. His current duties include managing multiple blast, neurosensory and musculoskeletal injury prevention programs for MOMRP and the Defense Health Agency. Previously, Dr. Shoge did his post doctoral fellow at Walter Reed Army Institute of Research (WRAIR) for two years investigating pre-clinical animal models of blast related mild traumatic brain injury. He obtained his B. S. in mechanical engineering from the University of Maryland, Baltimore County and his Ph.D. from the joint Biomedical Engineering Program at the University of North Carolina-Chapel Hill and North Carolina State University.



Theresa Small, AuD Associates In Audiology, Inc.

Theresa H. Small, AuD, CPS/A is an occupational audiologist consultant, CAOHC certified professional supervisor and course director and owner of Associates In Audiology, Inc., a professional consulting firm specializing in occupational audiology, and hearing loss

prevention. Dr. Small has been practicing audiology since 1999, with a 100% focus on hearing loss prevention since 2007. She wrote an article for the CAOHC Update in June 2013, "Applying GINA in the Occupational Hearing Conservation Program". Dr. Small has been a member of NHCA since 2007 and has attended every conference since. She is currently on the NHCA executive council as the secretary/treasurer.



Christopher Smalt, PhD

MIT Lincoln Laboratory

Christopher J. Smalt is a technical staff member in the Human Health and Performance Systems Group at the MIT Lincoln Laboratory. His current work focuses on computational modeling of hearing damage mechanisms and the effect of noise exposure on hearing

and cognitive performance. As part of this research, he has developed a personal noise monitoring technologies for industrial and tactical environments. Dr. Smalt received a BS degree in computer engineering from Clarkson University and earned both MS and PhD degrees in electrical engineering from Purdue University. Dr. Smalt's other research interests include 3D virtual audio, cognitive load, machine learning, and electrophysiology.



Madeline Smith, BS

Stephenson and Stephenson Research and Consulting, LLC (SASRAC)

Madeline Smith is a research consultant for Stephenson and Stephenson Research and Consulting, LLC (SASRAC). Madeline's hearing-related research experiences include data collection and analysis at Western Michigan

University and the United States Army Aeromedical Research Laboratory. Madeline is currently a second-year graduate student at MGH Institute of Health Professions. Madeline will graduate from MGH Institute of Health Professions in September 2020 with a Master of Science degree in Communication Sciences and Disorders. She plans to pursue a PhD in Speech Science.

Hannah Speaks, MSPH NIOSH

Hannah Speaks is currently an ORISE research fellow on the Noise and Bioacoustics team at the US National Institute for Occupational Safety and Health (NIOSH). She holds a MSPH from the University of Miami and a BS in chemistry and industrial hygiene from the University of North Alabama. She has been involved on and off with hearing conservation and fit-testing since her first IH internship in 2014. While attending the University of Miami she began volunteering with the Ear Peace Save Your Hearing Foundation, and is now on the board of directors. Her research interests include epidemiology of occupational hearing loss and evaluating preventative interventions for effectiveness.



Katherine Steffen, BA.

University of Northern Colorado

Katherine Steffen, B.A., is a 4th year audiology doctoral student/research assistant and will graduate from the University of Northern Colorado in May 2020 with her Au.D. She is currently completing her externship at Denver Hearing Specialists in Lone Tree,

Colorado. Katies's interests lie in working in hearing conservation and vestibular diagnostics

Richard Stepkin, MS, CCC-A NoNoys II Inc.

Eagle Scout; U. S. Naval Submarine Service 1964 - 1967; Florida State University, Audiology MS, 1972ASHA Certs 1973; U. S. Army Medical Service Corps 1972-1975Major, Military Audiologist Initiating and Maintaining Hearing Conservation Programs at Ft. DevensMA and Ft. Drum NY; Worked at Hearing Conservation Noise Control (HCNC)1975-1977Occupational Audiologist with Dr. Joseph Sataloff, MDConsulting Industry Nationwide in Hearing Conservation -- ENVIROMED CORP 1977to 2018, Lindenwold NJ - Founder & CEOAII areas of Hearing Conservation, Loss Prevention & OSHA Compliance, Nationwide Mobile Audiometry, STS Determination's; Educational Training; Noise Surveys; CAOHC Course Director since 1973, Served on CAOHC Board; NHCA since 1980; Served on NHCA Board as PSP Representative; NHCA Editor; Many local, regional, national presentations on Best Practices Hearing Conservation.



Timothy Swisher, MA, CCC-A, FFFA Hearing Safety

Tim is an occupational audiologist and president of Hearing Safety. He received his B.S. at Indiana University of Pennsylvania and his M.A. in Audiology at Western Illinois University. He began his audiological career as an Army audiologist, retiring as a major after

20 years service. He credits his time in the service as developing his primary interest in hearing conservation and expanding his skills as a hearing conservationist. In his current capacity he provides full time hearing conservation consultant services. Tim has been a long term member of NHCA and is an active CAOHC course director.



Stephen Tasko, PhD SASRAC, Western Michigan University

Stephen Tasko, Ph.D. is an Associate Professor in the Department of Speech, Language and Hearing Sciences at Western Michigan University and Research Consultant with Stephenson and Stephenson Research and Consulting (SASRAC). Dr. Tasko earned his

Ph.D. in Communication Disorders from the University of Wisconsin-Madison and completed post-doctoral work in the Audiology and Speech Center at Walter Reed Army Medical Center. Dr. Tasko has a wide range of research interests that include assessment of firearm noise, mechanisms of middle ear muscle function, and normal and disordered speech motor control.



Dallas Taylor

Twenty Thousand Hertz

Dallas Taylor is the host of Twenty Thousand Hertz, a podcast revealing the world's most recognizable and interesting sounds. Each show draws 100,000 listeners and since it's start in 2016, more than 7 million people have downloaded the podcast. It also won last

year's Webby Award for Best Sound Design and Music. Through the show, Dallas has explored the stories behind Siri, Game of Thrones, THX's booming introduction, the NASA Voyager program, what cochlear implants really sound like, forensic audio, and many more. Dallas first cut his teeth as a sound designer/mixer for networks including NBC, Fox, G4, and Discovery. He then went on to launch Defacto Sound, a sound design agency that works on major advertising campaigns, promos, and trailers. He and his team have collaborated with HBO, Netflix, Nike, ESPN, Nat Geo, and hundreds more. Dallas is a sought-after speaker at conferences, a regular contributor to major industry publications, and a respected thought leader on the narrative power of sound.



Christa Themann, MA, CCC-A National Institute for Occupational Safety and Health

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 and is a doctoral can-

didate in epidemiology. Her research experience includes animal studies on the effects of impulse noise on hearing, new methods for assessing hearing protector attenuation, and developing effective hearing loss prevention strategies for workers with impaired hearing. Currently, Christi manages audiometric testing for several large epidemiologic studies including the National Health and Nutrition Examination Survey, the Early Childhood Longitudinal Study, and the Reykjavik Study of Healthy Aging for the New Millennium. Christi is also interested in promoting public health practice in audiology and raising awareness about healthy hearing through social media, education, and outreach.



Jennifer Tufts, PhD University of Connecticut

Jennifer Tufts, Ph.D. is a professor of audiology in the Department of Speech, Language, and Hearing Sciences at the University of Connecticut. Previously, she completed postdoctoral clinical and research training at Walter Reed Army Medical Center in Washington

DC. She is a past-president of the National Hearing Conservation Association (NHCA) and a winner of NHCA's Outstanding Lecture Award (2014) and Outstanding Poster Award (2010). Her current research areas include hearing loss prevention and auditory fitness for duty in diverse populations.



Elon Ullman, BA. University of Michigan

Elon is a second year Master of Science candidate in Industrial Hygiene at the University of Michigan. He obtained his bachelor's degree in psychology from Bard College, where he wrote his undergraduate thesis on the neural correlates of hearing loss and tinnitus. Before

attending the University of Michigan, Elon worked as a Research Associate developing novel tests for audiology clinics. His passion for hearing loss prevention stems from his experience volunteering with Hearing Education and Awareness for Rockers, a nonprofit that focuses on preventing hearing loss in musicians and live music attendees.



Jérémie Voix, PhD Universite du Quebec (ETS)

Professor Jérémie Voix is an acoustics specialist with over 20 years of experience in occupational noise control. He has authored or co-authored over 100 scientific publications as well as over a dozen awarded patents and contributed significantly to several Amer-

ican (ANSI S12/WG11), Canadian (CSA Z94) and ISO (TC43/WG17) standards. Professor Voix is President of the Canadian Acoustical Association (CAA), and Associate Director (Scientific and technological research) at the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT), housed at McGill University's Schulich School of Music, where he is also an Adjunct Professor. He is as well an associate member of the International Laboratory for Brain, Music and Sound Research (BRAMS) and co-founder of the ÉTS-IRSST joint infrastructure laboratory for acoustic research (ICAR-Infrastructure communeen acoustique pour la recherche). Prof. Voix leads the NSERC-EERS Industrial Research Chair in In-Ear Technologies (CRITIA



Frank Wartinger, AuD

Children's Hospital of Philadelphia and Earmark Hearing Conservation

Frank Wartinger is a clinical audiologist at Children's Hospital of Philadelphia, a certified CAOHC course director, and owner of Earmark Hearing Conservation, a private practice serving musicians in Philadelphia.

He is an active member of the American Academy of Audiology (AAA) and the National Hearing Conservation Association (NHCA) for which he served as Director of Communications 2017 - 2019. He received a Bachelors of Music degree in Studio Production from Purchase Conservatory and a Doctorate in Audiology degree from Salus University. Dr. Wartinger co-authored the AAA 2019 "Guidelines for Audiological Treatment of Musicians and Music Industry Personnel", the NHCA 2018 Position Statement on "Recreational Music Exposure", and has been published in Hearing Journal, Journal of the Acoustical Society of America, NHCA Spectrum, and Audiology Today. Outside of the clinic, he is also an active professional musician with hundreds of credits as performer, composer, producer, and engineer.



Laurie Wells, AuD 3M Personal Safety Division

Laurie Wells, Au.D., is a Doctor of Audiology and Senior Regulatory Affairs Specialist for 3M Personal Safety Division. Laurie works with hearing protection and hearing conservation program regulatory issues, such as developing evidenced based standards,

around the globe. Laurie has been a long-time co-presenter for the highly regarded 3M Hearing Loss Prevention Seminars and enjoys presenting and teaching about hearing and preventing noise-induced hearing loss. Before coming to 3M, she worked for Associates In Acoustics, Inc., a consulting firm providing professional audiology review, hearing conservation services and guidance to employers and employees. Highlights of her many professional activities include representing the American Academy of Audiology on the Council for Accreditation in Occupational Hearing Conservation (CAOHC). She is a Past-Chair of CAOHC and a Past-President of the National Hearing Conservation Association.

CONTINUING EDUCATION CREDIT INFORMATION



The National Hearing Conservation Association's 44th Annual Conference, February 20 - 22, 2020, is approved for 1.55 CEUs from the organizations listed below. This information is also available online at nhca.civicaconferences.com.

Instructions for receiving CEUs:

1) Each day, you must sign-in at the beginning of the day and sign-out at the end of the day, by completing the sign-in/sign-out sheet at the NHCA Booth across from the registration desk in the Linkside Foyer.

2) You must complete the presentation assessments online using the code provided to you at the end of each presentation. Be sure to document the codes so you can submit them in the assessment, as it's required.

NEW! NHCA has a new Learning Management System (LMS). You will access the LMS to complete the presentation assessments in order to receive your certificate(s) of attendance. The presentations/sessions will be grouped by day because we are approved to offer partial CEU credit by day. Best practice would be to complete the assessment at the end of each day. Benefit: The LMS system will also automatically save your CEU credits to your profile in the NHCA database and you can pull a transcript whenever you need to. And, you can manually add CEUs you earn from other events/entities to your NHCA profile, so you have all of them in one place for easy access when you need to report them.

To visit the NHCA LMS and complete the conference presentation assessments:

a) Visit nhc.mclms.net

b) Click on the login button in the upper right-hand corner. After you login, you will be returned to the same webpage in the LMS. (Note: You need to login because only conference attendees have access to the conference information on the Learning Management System.) You will login using your NHCA Username and Password typically your email and a password. If you are having trouble logging in, click on "Retrieve Username" or "Reset Password." If you are still having trouble, visit us at the Registration Desk or NHCA Booth or contact the NHCA office at nhcaoffice@hearingconservation.org.

c) There will be three packages listed in the LMS - one for each day of the conference. Click on the day you are completing assessments for. Complete assessments for the sessions you attended then take the "Final Survey For Certificate" to receive your CEUs and your certificate via email. The "Final Survey" will ask you for your AAA and/or ASHA Member ID number. You must provide your Member ID number to receive credit as this will need to be provided to AAA and/or ASHA with the final participant report. If your Member ID is not provided you are not guaranteed to receive credit.

d) Once you complete the assessments and take the "Final Survey" you will receive an email that says "Congratulations, You've earned a Certificate." The email will include your certificate of attendance for that day noting the CEUs you earned.

Day 1 = .5 CEUs Day 2 = .6 CEUs Day 3 = .45 CEUs TOTAL CEUs for conference is 1.55

e) If you are attending the entire conference, you will need to complete the assessments for each day to get the three certificates that total 1.55 Total CEUs for the entire conference.

3) Following the conference you will receive an email with a link to an online survey to evaluate the conference overall and submit ideas for future content. As part of the CEU approval process we are required by AAA and ASHA to conduct a needs assessment survey for planning and development purposes.

4) For ASHA, you must complete a Program Participant Form. These are available at the registration desk and at the NHCA Booth in the Linkside Foyer.



APPROVED PROVIDER ASHA CONTINUING EDUCATION

American Academy of Audiology

National Hearing Conservation Association is seeking approval by the American Academy of Audiology to offer Academy CEUs for this activity for a maximum of 1.55 CEUs. Academy approval of this continuing education activity is based on course content only and does not imply endorsement of course content, specific products, or clinical procedure, or adherence of the event to the Academy's Code of Ethics. Any view that are presented are those of the presenter/CE Provider and not necessarily of the American Academy of Audiology.

The National Hearing Conservation Association is approved by the Continuing Education Board of the American Speech-Language-Hearing Association (ASHA) to provide continuing education activities in speech-language pathology and audiology. See course information for number of ASHA CEUs, instructional level and content area. ASHA CE Provider approval does not imply endorsement of course content, specific products or clinical procedures.

This course is offered for 1.55 ASHA CEUs (Intermediate level, Professional area).

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