

## A DIFFERENT LOOK AT NOISE EXPOSURE AND HEARING LOSS



Emily S. Drott, Purdue University and CSTI Acoustics and Robert D. Bruce, CSTI Acoustics

Noise exposure and the hearing loss it causes have been a concern since at least the 1940's, yet even as the years (and legislation) have passed, it is still not understood by the majority of people who are affected by it. Part of the confusion lies in the use of the decibel scale; it is hard to perform the necessary calculations unless you have either years of experience or a calculator. Therefore, a different way of looking at noise exposure is being proposed that uses units of Pascals-squared-seconds, or PASQUES (PASS ks), as the limits for Sound Exposure (SE). Pascals are the metric unit for pressure; 14.7 pounds per sq. in. equals 101,353 Pascals. This use of SE as the metric has been suggested for day-night sound exposure near airports (Ref. 1), but extra benefits come from applying it to industrial noise control.

ANSI Standard S3.44-1996 (Ref. 2) defines SE in Pascals-squared-seconds, or PASQUES. The squared pressure can be calculated (if you are so inclined) from the sound pressure level through equation 1.

$$p_{exp}^2 = 10^{(L_p/10)} * p_{ref}^2 \quad (1)$$

Where:  $p_{exp}^2$  is the square of the exposure sound pressure, in Pa<sup>2</sup>  
 $p_{ref}^2$  is the square of the reference sound pressure 20 µPa, in Pa<sup>2</sup> and

$L_p$  is the sound pressure level, dB

The SE is then calculated by equation 2.

$$SE = (p_{exp}^2) \times (\text{length of exposure in seconds}) \quad (2)$$

With this approach, it is simple to calculate the noise dose a person has received. The following table presents the 1-second sound exposure for sound levels from 80 to 100 dB.

Sound Exposures for One Second	
Sound Level, dB	SE, PASQUES
80	0.04
81	0.05
82	0.06
83	0.08
84	0.10
85	0.13
86	0.16
87	0.20
88	0.25
89	0.32
90	0.40
91	0.50
92	0.63
93	0.80
94	1.00
95	1.26
96	1.59
97	2.00
98	2.52
99	3.18
100	4.00

Using the table, the math becomes easy. The SE for 80 dB for 1 second is 0.04 PASQUES, so for 100 seconds of exposure it would be 4 PASQUES. For 8 hours (8hrs x 60 minutes/hr x 60 seconds/minute), the sound exposure would be 1152 PASQUES. If the level were 10 dB higher, the exposure in PASQUES would be 10 times as much.

There are many advantages to using this method for determining sound exposure. First, expressing the sound exposure in a unique unit, as opposed to in dB per 8 hours, provides flexibility in the calculations. Instead of interpolating the sound exposure from information in OSHA tables, the exact exposure of a worker can be determined. In addition, irregular noises can be included in calculations. Occupational Hearing Conservationists (OHCs) and/or workers can calculate exposures using simple arithmetic. For example, the following table identifies the sound level to which the worker is exposed in the left column. The next column identifies the length of time the noise exposure lasts. The third column converts the length of exposure into seconds. The fourth column presents the 1-second SE for that sound level. The fifth column gives the SE for that length of time. These individual SEs can be summed to give SE for the worker on that day.

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*Published by the Council for Accreditation in Occupational Hearing Conservation, a not-for-profit organization dedicated to the establishment and maintenance of training standards for those who safeguard hearing in the workplace.*

*Articles should be submitted with a black and white photograph of the author. The UPDATE is available to individuals not certified by CAOHC at an annual subscription rate of \$30.*

*Payment must accompany request:*

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## Chair's Message

By: Lee D. Hager

# The Complete Hearing Conservationist

A lot of what we focus on within the CAOHC Council and we assume a lot of what you all do in practice each day pertains to the measurement of hearing. Measuring the hearing ability of noise-exposed workers is a key aspect of compliance with regulations and is an important part of effective hearing conservation programs.

But – and it's a BIG but – hearing testing is only part of the picture, and frankly, it is a lagging (after the fact) measure of how well hearing conservation programs work. Measuring hearing is measuring the effect of noise on a person's ability to hear. By the time we actually find that hearing loss has occurred the damage has already been done. As my mother would say, "closing the barn door after the horse is already out." A truly effective hearing conservation program will do what it says – "conserve hearing." It will prevent hearing loss from occurring by taking steps ahead of the hearing test to assess and manage risk. So what are those steps and how can you participate?

**Noise exposure measurement** should likely be step one. A current and comprehensive noise survey and noise exposure survey should tell you a lot about what is going on with your workers. It should identify people who are exposed to high noise and should be included in your program – people for whom you should be providing hearing tests each year. The survey should tell you something about the level of risk in your facility – how much noise is out there and where? Maybe most importantly, the survey should give you and your Professional Supervisor some guidance as to whether a hearing loss you detect in your program is potentially related to workplace noise exposure. If you don't have this noise exposure information, find out why and do what you need to get a grasp on noise exposure conditions. If we do not understand risk (noise exposure), it is very hard for us to understand results (work-related hearing loss). If you are looking for support to get a noise exposure survey done, keep an eye out for an upcoming web-based offering from CAOHC – an online noise measurement course is in the works and should be available soon.

**Training** is another key aspect of effective hearing conservation – but is training the right word or the right way to think about this process? In all likelihood, your workers know a bit about noise, the anatomy of the ear, etc. It could be what they need is not more "training" (which in too many cases amounts to showing the video and handing out the pamphlet again and again) but more **motivation**. Do your workers understand what it is like to live with a hearing loss or tinnitus? Are they aware of the variety of hearing protectors that could help them? Are they fully up to speed on how to most effectively protect their hearing on the job and off? Maybe it's a question of:

- finding something that will motivate them
- making sure they understand what is at stake when they lose hearing
- ensuring they have the tools readily available to protect themselves

Hearing loss simulators may be a great motivational tool to communicate to people what it is like to live with a hearing loss. The NIOSH Hearing Loss Simulator (HLSim), available by Googling "NIOSH HLSim," can be a graphic and compelling demonstration of what happens to your ears and to your communication ability from a steady diet of too much noise. The Unfair Hearing Test (one version is at <http://beemp3.com/download.php?file=1425104&song=Unfair+Hearing+Test>) is another useful tool to help motivate people to protect themselves. Use these tools and any of the hundreds more that are available online and elsewhere, but use them thoughtfully. It's one thing to play an audio clip with filtered speech, but another thing altogether to add to that "OK, so you get 2 words out of 10. What's going to happen if you come to work tomorrow and understand" – dramatic pause – "TWO WORDS OUT OF 10!" Make it relate to your life and your workers' lives. Make it relate to their jobs and to their families. Help them understand what they will miss if their hearing goes away. Use testimony from your own experience with hearing loss to make the case. This is important and it should be treated that way.

I mentioned earlier that the CAOHC Council assumes that hearing testing is the main thing you all do in your roles as OHCs. We are in the process of researching this further to better help you in your efforts to prevent hearing loss as we develop a generalized "job description" for the OHC. This initiative will help us develop better tools to help you in your jobs and will let us fine-tune our

## The Complete Hearing Conservationist... – continued from page 2

educational offerings on what you do today and what you need to learn to do your jobs better. Keep an eye out for this new effort from CAOHC and let us know what you think we could or should provide to give you better weapons in your fight against noise-induced hearing loss. We need to hear from you and are always available at [info@caohc.org](mailto:info@caohc.org).



Lee D. Hager • CAOHC Chair



## Hearing Conservation Resources for Occupational Health Nurses

By Diane S. DeGaetano, BSN, RN, COHN-S, FAAOHN

One of the most exciting, networking activities of being an Occupational Health Nurse is the sharing of resources. This is actually a learned skill. First, you have to leave your ego home on the shelf and remember we all have the same mission—PREVENT NOISE-INDUCED HEARING LOSS. Naturally, when it comes to hearing conservation, sharing resources makes great business sense. Any idea that you can use that has been tested and proven someplace else can improve the performance of your program. Often attendance at a CAOHC approved Occupational Hearing Conservation Course provides OHCs with resources to assist with the challenges of conducting quality audiometric testing and tools to use in training employees in the basics of hearing conservation in the workplace. Sharing in this part of the course among the participants is very valuable. Search out those who are experienced and “pick their brains.”

Another resource is the best practice reference manual produced by CAOHC and widely used by academia--the Hearing Conservation Manual written by Alice Suter. In its 4th printing, it provides dynamic information regarding the practice of hearing conservation and components of a best practice hearing conservation program. If this is an unfamiliar resource, please visit [www.caohc.org](http://www.caohc.org) to look into ordering this book as a “must have” item on your bookshelf.

A third resource and a very good one is the National Institute for Occupational Safety and Health (NIOSH), the research arm of the National Institutes of Health that deals with workplace health and safety. There are numerous articles, publications, and tools to be found on the NIOSH website, <http://www.cdc.gov/niosh/topics/noise>, and they are all free! The site provides multiple sub-topics such as how to choose a hearing protector or an audio-visual tool, the noise meter. The noise meter simulates the noise made by specific tools and/or activities such as a jack hammer or a jet airplane. Employees respond to both the visual as well as the auditory examples recorded. The recorded samples can be downloaded for use on a laptop or PC.

There are several fact sheets such as “Noise-Induced Hearing Loss - Attitudes and Behaviors of U.S. Adults” and “Sound Advice—Protect Your Ears in Noisy Work Environments.” One of the most helpful publications is the **Preventing Occupational Hearing Loss - A Practical Guide** (DHHS (NIOSH) Publication No. 96-110). The site

provides a link to [www.freehearingtest.com](http://www.freehearingtest.com) which provides additional noise simulators and demonstrations. There are many more resources, but this site should be on your list of great resources!

The National Aeronautical and Space Administration (NASA) has done some very interesting research on noise and hearing conservation. NASA’s Auditory Demonstration Library, <http://adl.grc.nasa.gov>, provides several educational tools available for download. One of these tools, **JeopEARDy**, is an interactive multimedia training application that supports effective education in occupational hearing conservation programs. One of the more “creative and colorful” sites includes The Noise Addicts, in which you can download free samples of animal sounds such as the American Bison and the beaver (to name a few, as there are over 200 animals from all over the world represented on this site) <http://www.noiseaddicts.com/free-samples>.

To assure the maintenance of the most up-to-date information on hearing conservation, your professional organization may be a last, but not least source. For nurses, the American Association of Occupational Health Nurses (AAOHN) Journal provides professionally written articles on hearing conservation programs and noise-induced hearing loss. Dr. Bonnie Rogers and Associates wrote the article in the August 2009 issue of AAOHN Journal, “What Makes a Successful Hearing Conservation Program?” She and her colleagues cite a list of several resources for information on noise-induced hearing loss. In addition, the American Society of Safety Engineers (ASSE) members have written several articles in their journal, Professional Safety. One of these articles, “Hearing Conservation Training: Closing the Gap Between Compliance and Performance” (B. Witt and R. S. Bessette. Nov. 2008: pp.46-48) is worth a read. Learning about the annual audiogram is so critical; the challenge is in finding other ways to get the message through to workers and supervisors so that they can prevent noise-induced hearing loss.

So expand your resources and share with colleagues. Professionals have been trying to accomplish the elimination of noise-induced hearing loss the USA for more than 50 years!

*Diane S. DeGaetano, a certified Occupational Health Nurse – Employed with Merial, Limited (International Animal Health Company; headquartered in Duluth, Georgia), as the Occupational Health Manager for North America.*

### Additional Online Resources

- [www.hearforever.org](http://www.hearforever.org)
- [www.hearingconservation.org](http://www.hearingconservation.org)
- [www.dangerousdecibels.org](http://www.dangerousdecibels.org)
- [www.e-a-r.com/hearingconservation](http://www.e-a-r.com/hearingconservation)
- [www.lhh.org/noise/](http://www.lhh.org/noise/)
- <http://www.osha.gov/dts/osta/otm/noise/index.html>
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- <http://www.hhmi.org/biointeractive/neuroscience/cochlea.html>
- [http://www-nmcphe.med.navy.mil/occupational\\_health/audiology/hearingconservation\\_toolbox.aspx](http://www-nmcphe.med.navy.mil/occupational_health/audiology/hearingconservation_toolbox.aspx)



OHC Spotlight



## Spotlight on an OHC



### CAOHC Spotlight~ Dan Marshall, ASI

As Dan Marshall completed his Bachelor's degree in Speech Pathology and Audiology at the University of Texas at Dallas in 2005, he decided to get some real world experience before going on for additional

academic training. Dan became an Occupational Health Technician at ASI in 2005 and traveled nationwide doing hearing and respiratory testing in industries.

Dan became a CAOHC certified Occupational Hearing Conservationist and NIOSH certified for spirometry testing. **Dan Marshall saw a need and had ideas about how to address that need. This led to an opportunity for him to create his own career path.**

Within the first year, he identified a need for continued training for the Technicians to help apply their new skills in the real world and to keep up to date with best practices and policies. He started training

other technicians and then took on scheduling and management of day-to-day operations of ASI. He is constantly looking for efficiencies, better practices and ways to improve quality of the ASI health services.

His new title Corporate Operations Manager, really means he has a variety of responsibilities and that every day is a little "out of control" keeping the job interesting and fulfilling. He continues to do some field work to keep current on the issues and challenges of the OHCs that are on the road.

His interest in hearing came from spending time with his nieces who, after being adopted from Russian orphanages, were getting speech therapy and hearing health services.

Dan encourages OHCs to "look past what's right in front of you and see where you can contribute to your company." There are opportunities every where but many of them are disguised as hard work. Dan saw just such an opportunity and seized it to create a new position and a promotion that led to a happy employee, a happy employer and many happy customers.

## CPO Update



### American Industrial Hygiene Association Update

Update from the American Industrial Hygiene Conference

The American Industrial Hygiene Conference and Exposition (AIHCE), the annual conference of the American Industrial Hygiene Association and the American Conference of Governmental Industrial Hygienists, was held May 22-27, 2010, in Denver, Colorado. The conference offered a diverse array of technical programs in the areas of noise and hearing loss including professional development courses (PDCs), platform and round table sessions, and posters.

The conference started with four day-long PDCs offered over the weekend: Community noise, Noise control engineering, Noise exposure assessment: Sampling strategy and data acquisition, and Ramping up your hearing protection and Jazzing up hearing conservation. These PDCs were very well received by the attendees, with most of them rated among the best ten of the conference.

There were three platform sessions:

1. *Noise: Measure the Hazard, Then Implement and Evaluate Controls.* Topics included evaluating the effectiveness of fit testing HPDs in coal mines, the latest information on hearing protection labeling and testing, and noise assessments control for a small jet engine.
2. *Noise Exposure and Scientific Assessment Techniques:* There were six presentations covering topics as diverse as discussing hybrid assessment techniques to improve noise exposure estimates, construction, impulse, community noise case studies, and a study

looking at the design of a noise delivery system for a chamber where the ototoxicity of JP-8 jet fuel on rodents would be tested.

3. *Ionizing and Non-Ionizing Radiation and Noise Case Studies.* This session had two papers on noise: a noise survey in patient rooms of a hospital and a comprehensive noise assessment in the Coast Guard Small Boat Community.

The conference also featured "Tech Talks," where representatives from AIHA technical committees are available to hold small, interactive group discussions. The AIHA Noise Committee hosted a tech talk on the topics of hearing conservation, HPDs, ototoxic chemicals, and impulse noise.

For the first time, in its history, the AIHCE organized a science symposium. The title of the symposium was *Advances in Science for Understanding, Managing, and Controlling Noise Exposure*. This symposium; through five presentations, highlighted recent research and knowledge related to assessing, managing, and preventing noise-induced hearing loss. Topics included an overview of noise and hearing loss, the various technical aspects of collecting noise data, discussions of sampling strategies – task-based versus full-shift approaches, a discussion of how to determine if your hearing protection program is effective, and a discussion of approvals for controlling noise exposures.

Product Demonstrations: Many hearing conservation related products are highlighted in the exhibit hall. For example, one manufacturer demonstrated their quantitative fit-test system which can be used to determine the noise reduction that an individual employee receives for a specific ear protector application.

There were two noise posters. One was on noise exposure in mass transit and the other was a description of a system that can capture and analyze impact sounds. There was also a roundtable session centered on the theme of implementing a "buy quiet" policy in workplaces.



## Special Interest Feature-Interview on How Hearing Loss Effects Daily Life

Recently Bob Bruce and David Lee, both CAOHC Council members, discussed Dave's hearing loss.

**Bob:** Dave, thank you so much for agreeing to discuss your hearing loss. This is a subject which OHCs need to understand thoroughly, and I hope that by the end of this interview, we will have shed some light on the subject. Before discussing your hearing loss, tell us a little about your hearing as a youngster.

**Dave:** As a youngster, my hearing was good. I could hear teachers in the classroom and talk on the phone without any difficulty. With regard to music, I grew up with Elvis and Rock & Roll. I tried to learn to play the guitar...but didn't do too well at it. I enjoyed nighttime sounds like crickets and frogs.

**Bob:** Did you think you were invincible (like most young males)?

**Dave:** But of course!!!

**Bob:** Tell us about when you first noticed difficulty with hearing.

**Dave:** I was about 20 years old and serving in the military when I noticed a sudden constant ringing in my ears. I later learned that this was called tinnitus.

**Bob:** What kind of activities and social gatherings did you enjoy?

**Dave:** I enjoyed hunting and fishing and solitude so I did not spend much time with either small or large groups of people.

**Bob:** When did your hearing impairment get in the way of your lifestyle?

**Dave:** In my late twenties, shortly after my first children were born. My children's voices when playing (squealing, etc.) aggravated my tinnitus to a painful level.

**Bob:** Tell us about your hearing loss.

**Dave:** I have a copy of the audiogram at the time of my military discharge. I was 22 yrs old at the time. It does not represent what my hearing is today. At 4000 Hz, I had a 60 dB threshold in the left ear and a 40 dB threshold in the right ear. My hearing in both ears was slightly better at 6000 Hz. I now have great difficulty following conversations while in large groups of people or in busy places such as bars or restaurants. As a consequence I tend to avoid going to such places when possible. A person has to be talking directly to me while I can see them in order for me to catch the whole conversation. My wife cannot ask me a question from another part of the house and get an answer from me....I don't understand what she's saying. I hear her voice, know it's her speaking but have no idea of what she's saying. I find that when people look away while talking I can't understand everything they are saying.

**Bob:** What do you do when you can't understand what people say?

**Dave:** I've long since taken to ignoring conversations that I can't understand.

**Bob:** On a scale of excellent, good, fair, poor, and deaf, where would you rank your hearing?

**Dave:** Fair

**Bob:** How has hearing loss impacted your life? Rank impact on your life: no impact, small inconvenience, significant impact, major impact, drastic impact.

**Dave:** My hearing loss has had a significant impact on my life.

**Bob:** How did you lose your hearing?

**Dave:** I fired military rifles (M16), grenade launchers (M79), etc. on several days each year to qualify with the weapon.

**Bob:** Did you use hearing protection?

**Dave:** My military service predated OSHA; no hearing protection was provided at the rifle range. I would field strip cigarette butts and use the filter materials as ear plugs (didn't do much good). Today I wear HPDs religiously when in noisy situations.

**Bob:** In our world today, many terms are used to describe people with hearing difficulty such as: hard of hearing, hearing disabled, hearing handicapped, hearing impaired, near-deaf, and deaf. What term would you prefer?

**Dave:** If I had to be called anything, I guess I would prefer "hard of hearing."

**Bob:** Compare your social interactions before and after hearing loss.

**Dave:** Although I sometimes enjoy meeting new people, in general, I am not very social—definitely less outgoing now than before the hearing loss.

**Bob:** How do you react when you miss something that is said in conversation?

**Dave:** I usually tune out.

**Bob:** Have any aspects of your personality changed since your hearing loss that you or other people close to you have noticed?

**Dave:** My wife would say I'm grouchy.

**Bob:** What are your favorite leisure activities now?

**Dave:** Motorcycle riding and target practice.

**Bob:** How have the other people in your life reacted?

**Dave:** My wife still doesn't understand that we can't be in different rooms and hold a conversation. Today, I just ignore her or wait until she comes and repeats what she was asking. My children never could understand that dad couldn't tolerate their noise when playing.

**Bob:** What are the most difficult tasks for you to perform, because of your hearing loss?

**Dave:** Conversing in crowded noisy locations.

**Bob:** How would you describe the general public's perception to the hearing disabled?

**Dave:** Blissfully ignorant.

**Bob:** It has been suggested that hearing loss causes personality shifts, e.g. If a person can't hear clearly what is said, they may respond with inappropriate remarks. What kind of responses did you have in situations where you are having difficulty communicating?

**Dave:** I get frustrated, withdraw, and become less interactive, sometimes becoming isolated and more cautious.

**Bob:** Why haven't you been fitted with hearing aids?

**Dave:** My last audiometric exam was probably 6 to 10 years ago. At that time the doctor told me that I didn't need hearing aids yet. Since then my hearing has changed very little if at all.

**Bob:** Since you are a veteran, will they provide the hearing aids for you?

**Dave:** I have filed a claim with the VA for my tinnitus. It is considered a compensable disability. I believe when the time comes they will provide hearing aids.

**Bob:** Dave, thanks very much for taking the time to share your experience of having hearing loss. I hope that this interview has given our readers a better understanding of some of the effects that hearing loss has on people—not only the person with hearing loss but also those around them since hearing loss is such an important problem in the United States and likely to become even more prevalent.

## Taking It to the Tweens: NIDCD's Noisy Planet Campaign Broadens Outreach to Schools, Communities Across D.C. Region

For nearly two years, the National Institute on Deafness and Other Communication Disorders (NIDCD) has been working to educate parents of tweens—kids ages 8 to 12—about the causes and prevention of noise-induced hearing loss through its national campaign *It's a Noisy Planet. Protect Their Hearing*. Now, the campaign is taking its prevention message to the tweens themselves, in schools, churches, camps, and other venues across the D.C. Metro region.

"Tweens are at a great stage in life," said Patricia Blessing, chief of NIDCD's Office of Health Communication and Public Liaison and the mother of a daughter who, having just entered double digits, is at the pinnacle of tweenhood. "They're figuring out who they are and what they like to do—and let's face it, a lot of the things they like to do can be pretty noisy. Our goal is to reach them while they're still young, so they can learn how to protect their hearing at home, at school, on the job, and throughout their lives."

As part of May Is Better Hearing and Speech Month, the Noisy Planet campaign and one of its partners, the American Speech-Language-Hearing Association's (ASHA's) Listen to Your Buds campaign, joined forces to bring the hearing protection message to elementary and middle schoolers. Staff from the two organizations pooled their time and resources to reach out to kids as young as pre-kindergartners all the way up to the Justin Bieber crowd. With ASHA sponsoring safe-listening concerts for the younger students and NIDCD offering in-class presentations for the tweens, more than 2000 children received the hearing protection message in their schools.

NIDCD staff are currently scheduling presentations for tweens at schools, camps, churches, health fairs, and other locations throughout the summer and fall. In addition, Noisy Planet presentations and materials are being offered to parents of tweens through workplaces, parenting organizations, and churches. If you are in the Metro D.C. region and would like to schedule a presentation, please contact Robert Miranda-Acevedo at (301) 496-7243 or [Miranda1@mail.nih.gov](mailto:Miranda1@mail.nih.gov) to learn more.

### It Takes Two (or More)

The Noisy Planet campaign understands that, in order to extend its outreach, collaboration is key. So far, three national organizations are partnering with the Noisy Planet campaign to help get the message out, and several other organizations are also exploring the opportunity to collaborate. Activities that are being sponsored by our partners include:

- American Speech-Language-Hearing Association (ASHA)  
ASHA's Listen to Your Buds campaign has sponsored numerous safe-listening concerts in schools and auditoriums around the country. The concerts are held in collaboration with the Noisy Planet campaign, Parents' Choice Foundation, and the Consumer Electronics Association.
- Deafness Research Foundation (DRF)  
DRF's Summer 2009 issue of *Hearing Health* magazine featured a cover story on the Noisy Planet campaign. They also have developed a Noisy Planet page for their Web site, distributed Noisy Planet materials to more than 7,500 professionals and supporters of DRF, and, during this year's May Is Better Hearing and Speech Month, sponsored a drawing contest for kids, called "It's a Noisy Planet. What are you doing to protect your hearing?"

### • 4-H

4-H, which is part of the United States Department of Agriculture, reaches youth and adults in agricultural environments. 4-H is working with the Noisy Planet campaign to develop materials for a rural audience to disseminate through 4-H program's extensive network of professional staff and volunteers, including 4-H youth members, parents, extension agents, and others.

Since the campaign began, the NIDCD has experienced substantial leaps in the numbers of materials that have been disseminated, from roughly 5000 publications during the initial three months of the campaign, to nearly 91,000 for 2009 and just over 100,000 materials for the first six months of 2010.

In addition, more than 850 people have subscribed to the Noisy Planet e-bulletin,

a listserv that offers periodic news updates on the campaign. Finally, activity on the Noisy Planet Web site has tallied nearly 250,000 user sessions and more than 36,000 file downloads of fact sheets, tip sheets, and other materials. In addition, the Web site and materials have earned several awards, including the 2009 Media Award from the National Hearing Conservation Association, a 2009 Silver W3 award in the Family/Parenting category, a 2009 Blue Pencil Award from the National Association of Government Communicators, and a 2009 Plain Language Award, Gold category, from the National Institutes of Health.

To learn more about the Noisy Planet campaign and its partner activities, go to [www.noisyplanet.nidcd.nih.gov/](http://www.noisyplanet.nidcd.nih.gov/). Sign up for the Noisy Planet e-bulletin, at [www.nidcd.nih.gov/news/subscribe](http://www.nidcd.nih.gov/news/subscribe), to keep informed about the availability of new materials, including Spanish materials, as well as other activities.



**National Institute on Deafness and  
Other Communication Disorders**



## A DIFFERENT LOOK AT NOISE EXPOSURE AND HEARING LOSS... – continued from page 1

Sound Exposure for Day				
Sound Level	Length of Time	Seconds	1-Second Sound Exposure	Sound Exposure at this Level (Time in seconds multiplied by 1-Second Sound Exposure)
85	7.5 hours	27000	0.13	3415
95	29 minutes	1740	1.26	2201
100	60 seconds	60	4.00	240
Total Exposure for Day				5856

Workers or OHCs could track the amount of noise a worker receives over his lifetime by adding the sound exposure linearly, much simpler and more intuitive than working in decibels. In the same way that dieters count their calories until they have reached their quota for a day, concerned workers could count their sound exposure over their working life time, until they had reached a limit past which hearing loss is probable.

The question arises with the new units of PASQUES, “What should be the limit for lifetime noise exposure?” The first step in this is to look at previous standards and recommendations. NIOSH recommends 85 dBA as an 8-hr TWA for a 40-year working lifetime to reduce the risk of noise-induced hearing loss (Ref. 3). The OSHA limit is 90 dBA for an 8-hour duration per day (Ref. 4). Finally, the EPA recommends a level of 75 dBA over 8 hours to prevent all hearing loss (Ref. 5), but a level of 80 dBA to ensure that only 5% of the population has a 5 dB threshold shift (Ref. 6). Over an average working lifetime of 40 years, these levels, in PASQUES, are as follows:

Sound Exposure					
Regulating Organization	Sound Level, dBA	Daily (8 hrs)	Yearly (250 days)	Lifetime (40 years)	% Increased Risk
OSHA	90	11,520	2,880,000	115,200,000	22%
NIOSH	85	3,643	910,736	36,429,439	12%
EPA - 1978	80	1,152	288,000	11,520,000	5%
EPA - 1974	75	364	91,074	3,642,944	0%

Bruce, et. al proposed defining one Lifetime Occupational Noise Exposure (1 LONE) as 11.5 million PASQUES. The following table presents the yearly exposure that it would take to reach 1 LONE in 40 years at different sound levels (Ref. 7).

A-weighted Sound Level	Hours of Exposure/Year to Reach 1 LONE in 40 yrs
80	2000 hrs
85	632 hrs
90	200 hrs
95	63 hrs
100	20 hrs
105	6 hrs
110	2 hrs
115	0.6 hrs (38 minutes)

OHCs and workers are concerned about hearing loss induced by noise. Looking at SE in terms of PASQUES can help to reinforce the importance of proper hearing protection, annual audiometric evaluations, noise surveys of facilities, and proper record keeping. Overall, this is intended to lead to a better understanding of and further protection from hearing loss.

## REFERENCES

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2. ANSI S3.44-1996. “Determination of Occupational Noise Exposure and Estimation of Noise-Induced Hearing Impairment.” American National Standards Institute. 1996.
3. “Criteria for a Recommended Standard: Occupational Exposure to Noise, Revised Criteria 1998.” National Institute for Occupational Safety and Health (NIOSH) in the Department of Health, Education, and Welfare. 1998.
4. 29 CFR §1910.95. “Occupational Noise Exposure.” Occupational Health and Safety Administration.
5. “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety.” Environmental Protection Agency. 1974.
6. “Protective Noise Levels, Condensed Version of EPA Levels Document,” Environmental Protection Agency. Report 550/7-70-100. 1978.
7. Bruce, R. D., Bommer, A. S., Lefkowitz, K. A., & Hart, N. W. “Safe Lifetime Occupational Noise Exposure - 1 LONE.” *Proceedings of NOISE-CON*. 2010.

Emily Drott is a senior at Purdue University; she is expected to receive her BS and MS from the College of Engineering in 2011. Emily has been working in acoustical related jobs since graduating from high school as co-valedictorian in May of 2006. During her summers, she has worked at CSTI acoustics, the Office of Naval Research at the Naval Research Laboratory in Washington, DC, and with Southwest Research Institute in San Antonio. After graduation she plans to work as an acoustical consultant.

Bob Bruce has worked in industrial noise control for over 40 years. He has shared his knowledge on noise measurements and control through chapters in 12 books and over 50 technical papers. Bob is one of the INCE representatives serving CAOHC; he is the Secretary Treasurer of the Council.

## Special Thanks

Over the summer months CAOHC requested the assistance of Course Directors (CD), Certified Professional Supervisors (PS) and Certified Occupational Hearing Conservationists (OHC), to help with two major projects, the Council is truly appreciative of their commitment to their profession and to occupational hearing conservation.

The following individuals assisted the Quality Assurance committee with a pilot program which addressed the current reporting process in place for Course Directors. A full report of this project will be addressed in the winter issue of Update.

John Elmore, AuD MBA CCC-A  
Georgia Holmes, AuD  
James (Jim) Jerome, MA CCC-A  
Laura Kauth, MA CCC-A  
Melette Meloy, MS CCC-A  
Timothy (Tim) Swisher, MA CCC-A  
Thomas (Tom) Thunder, AuD FAAA INCE Bd.Ct.

# UPCOMING OCCUPATIONAL HEARING CONSERVATIONIST (OHC) COURSES 2010

Below is a listing of all OHC certification and re-certification courses from October–December as of October 1, 2010. Please note that new courses are added daily, for the most up-to-date information please check the OHC Course Listing section of the CAOHC website, [www.caohc.org](http://www.caohc.org).



Start Date	End Date	State	City	Course Director	Phone
*10/19/2010	10/19/2010	CA	Irvine	Kirsten R. McCall, AuD CCC-A	425-254-3833
10/20/2010	10/22/2010	CA	Irvine	Kirsten R. McCall, AuD CCC-A	425-254-3833
*10/19/2010	10/19/2010	IL	Chicago/Schaumburg	Thomas D. Thunder, AuD FAAA INCE Bd.Ct.	847-359-1068
10/20/2010	10/22/2010	IL	Chicago/Schaumburg	Thomas D. Thunder, AuD FAAA INCE Bd.Ct.	847-359-1068
*10/19/2010	10/19/2010	ME	Waterville	Anne Louise P. Giroux, AuD CCC-A	207-872-0320
*10/19/2010	10/19/2010	MN	Minneapolis	Ted K. Madison, MA CCC-A	651-575-5575
*10/20/2010	10/20/2010	MI	Farmington Hills	Thomas H. Simpson, PhD CCC-A	313-577-3339
10/20/2010	10/22/2010	LA	Baton Rouge	Thomas L. Hutchison, MA, MHA	800-869-6783
*10/21/2010	10/21/2010	LA	Baton Rouge	Thomas L. Hutchison, MA, MHA	800-869-6783
10/20/2010	10/22/2010	LA	Baton Rouge	Johnny L. Sanders, MA CCC-A	800-869-6783
10/20/2010	10/22/2010	TX	Dallas/Ft Worth	John H. Elmore, AuD MBA CCC-A	800-357-5759
*10/21/2010	10/21/2010	TX	Dallas/Ft Worth	John H. Elmore, AuD MBA CCC-A	800-357-5759
10/20/2010	10/22/2010	VA	Glen Allen	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
*10/21/2010	10/21/2010	VA	Glen Allen	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
*10/21/2010	10/21/2010	LA	Baton Rouge	Johnny L. Sanders, MA CCC-A	800-869-6783
10/25/2010	10/27/2010	NJ	Piscataway	Timothy A. Swisher, MA CCC-A	412-367-8690
*10/26/2010	10/26/2010	NJ	Piscataway	Timothy A. Swisher, MA CCC-A	412-367-8690
10/27/2010	10/29/2010	AZ	Phoenix	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
*10/28/2010	10/28/2010	AZ	Phoenix	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
10/27/2010	10/29/2010	NC	Greensboro	A. Gregg Moore, MS CCC-A	336-834-8775
*10/28/2010	10/28/2010	NC	Greensboro	A. Gregg Moore, MS CCC-A	336-834-8775
10/27/2010	10/29/2010	TN	Nashville	Michele Alexander, MS CCC-A	336-834-8775
*10/28/2010	10/28/2010	TN	Nashville	Michele Alexander, MS CCC-A	336-834-8775
*11/3/2010	11/3/2010	MA	Auburn	Steven R. Fournier, AuD CPS/A	508-832-8484
11/3/2010	11/5/2010	CA	Sacramento	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
*11/4/2010	11/4/2010	CA	Sacramento	Kathryn M. Deppensmith, MS CCC-A	800-869-6783
11/3/2010	11/5/2010	MD	Baltimore	Timothy A. Swisher, MA CCC-A	412-367-8690
*11/4/2010	11/4/2010	MD	Baltimore	Timothy A. Swisher, MA CCC-A	412-367-8690
11/3/2010	11/5/2010	MI	Detroit	John H. Elmore, AuD MBA CCC-A	800-357-5759
*11/4/2010	11/4/2010	MI	Detroit	John H. Elmore, AuD MBA CCC-A	800-357-5759
11/3/2010	11/5/2010	MO	St. Louis	James J. Jerome, MA CCC-A	317-841-9829
*11/4/2010	11/4/2010	MO	St. Louis	James J. Jerome, MA CCC-A	317-841-9829
11/3/2010	11/5/2010	WI	Green Bay	Paul F. Kurland, MA	920-499-6366
*11/4/2010	11/4/2010	WI	Green Bay	Paul F. Kurland, MA	920-499-6366
11/8/2010	11/10/2010	DC	Washington	Diane M. Brewer, MA CCC-A	202-994-7167
*11/9/2010	11/9/2010	DC	Washington	Diane M. Brewer, MA CCC-A	202-994-7167
11/10/2010	10/12/2010	TX	Houston	Johnny L. Sanders, MA CCC-A	800-869-6783
11/10/2010	11/12/2010	AR	Little Rock	Jane Prince, PhD	870-972-1166
*11/11/2010	11/11/2010	AR	Little Rock	Jane Prince, PhD	870-872-1166
11/10/2010	11/12/2010	GA	Alpharetta	Jason M. Feld, MCD CCC-A	770-475-2055

\*indicates a one-day recertification course



## UPCOMING OCCUPATIONAL HEARING CONSERVATIONIST (OHC) COURSES 2010, continued

*11/11/2010	11/11/2010	GA	Alpharetta	Jason M. Feld, MCD CCC-A	770-475-2055
11/10/2010	11/12/2010	GA	Columbus	Michele Alexander, MS CCC-A	336-834-8775
*11/11/2010	11/11/2010	GA	Columbus	Michele Alexander, MS CCC-A	336-834-8775
11/10/2010	11/12/2010	OR	Portland	Rodney M. Atack, PhD	503-614-8465
*11/11/2010	11/11/2010	OR	Portland	Rodney M. Atack, PhD	503-614-8465
*11/11/2010	11/11/2010	TX	Houston	Johnny L. Sanders, MA CCC-A	800-869-6783
*11/12/2010	11/12/2010	NC	Morrisville	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
11/16/2010	11/18/2010	MA	Mansfield	Pamela J. Gordon-DuPont, MS CCC-A	860-526-8686
*11/17/2010	11/17/2010	MA	Mansfield	Pamela J. Gordon-DuPont, MS CCC-A	860-526-8686
11/17/2010	11/19/2010	IN	Ft Wayne	James J. Jerome, MA CCC-A	317-841-9829
*11/18/2010	11/18/2010	IN	Ft Wayne	James J. Jerome, MA CCC-A	317-841-9829
11/17/2010	11/19/2010	OH	Dayton	Chris M. Pavlakos, PhD	937-436-1161
*11/19/2010	11/19/2010	OH	Dayton	Chris M. Pavlakos, PhD	937-436-1161
11/17/2010	11/19/2010	TX	San Antonio	John H. Elmore, AuD MBA CCC-A	800-357-5759
*11/18/2010	11/18/2010	TX	San Antonio	John H. Elmore, AuD MBA CCC-A	800-357-5759
11/18/2010	11/21/2010	PA	Pittsburgh	Roger M. Angelelli, PhD	412-831-0430
*11/19/2010	11/19/2010	PA	Pittsburgh	Roger M. Angelelli, PhD	412-831-0430
11/30/2010	12/2/2010	MA	Auburn	Steven R. Fournier, AuD CPS/A	508-832-8484
12/1/2010	12/3/2010	IL	Chicago/Oak Park	Robert C. Beiter, PhD	708-445-7171
*12/2/2010	12/2/2010	IL	Chicago/Oak Park	Robert C. Beiter, PhD	708-445-7171
12/1/2010	12/3/2010	NC	Greensboro	Cheryl S. Nadeau, MEd FAAA	336-834-8775
*12/2/2010	12/2/2010	NC	Greensboro	Cheryl S. Nadeau, MEd FAAA	336-834-8775
12/1/2010	12/3/2010	OH	Cincinnati	Timothy A. Swisher, MA CCC-A	412-367-8690
*12/2/2010	12/2/2010	OH	Cincinnati	Timothy A. Swisher, MA CCC-A	412-367-8690
12/1/2010	12/3/2010	SC	Columbia	Michele Alexander, MS CCC-A	336-834-8775
*12/2/2010	12/2/2010	SC	Columbia	Michele Alexander, MS CCC-A	336-834-8775
12/1/2010	12/3/2010	TX	Houston	John H. Elmore, AuD MBA CCC-A	800-357-5759
*12/2/2010	12/2/2010	TX	Houston	John H. Elmore, AuD MBA CCC-A	800-357-5759
12/6/2010	12/8/2010	FL	West Palm Beach	Herbert J. Greenberg, PhD CCC-A	678-352-0312
*12/7/2010	12/7/2010	FL	West Palm Beach	Herbert J. Greenberg, PhD CCC-A	678-352-0312
*12/8/2010	12/9/2010	IL	Chicago/Schaumburg	Thomas D. Thunder, AuD FAAA INCE Bd.Ct.	847-359-1068
12/8/2010	12/10/2010	IL	Chicago/Schaumburg	Thomas D. Thunder, AuD FAAA INCE Bd.Ct.	847-359-1068
12/8/2010	12/10/2010	AL	Birmingham	Georgia W. Holmes, AuD CCC-A	205-934-7178
12/8/2010	12/10/2010	CT	Windsor	Pamela J. Gordon-DuPont, MS CCC-A	860-526-8686
*12/9/2010	12/9/2010	CT	Windsor	Pamela J. Gordon-DuPont, MS CCC-A	860-526-8686
12/8/2010	12/10/2010	GA	Atlanta	Melette L. Meloy, MS CCC-A	678-363-9897
*12/9/2010	12/9/2010	GA	Atlanta	Melette L. Meloy, MS CCC-A	678-363-9897
12/8/2010	12/10/2010	OH	Columbus	James J. Jerome, MA CCC-A	317-841-9829
*12/9/2010	12/9/2010	OH	Columbus	James J. Jerome, MA CCC-A	317-841-9829
12/9/2010	12/11/2009	NC	Morrisville	Thomas H. Cameron, PhD CCC-A CPS/A	919-459-5255
*12/15/2010	12/15/2010	OR	Aloha	Michael H. Fairchild, MS JD CCC-A F-AAA	503-259-2685
12/15/2010	12/17/2010	OR	Aloha	Michael H. Fairchild, MS JD CCC-A F-AAA	503-259-2685
12/15/2010	12/17/2010	TX	San Antonio	John H. Elmore, AuD MBA CCC-A	800-357-5759
*12/18/2010	12/18/2010	TX	San Antonio	John H. Elmore, AuD MBA CCC-A	800-357-5759

\*indicates a one-day recertification course

## Letters to CAOHC



Dear CAOHC,  
As part of the UC Davis Medical Surveillance Program, and accredited by CAHOC I perform hearing tests on the CAL Fire (California Department of Forestry and Fire Protection) firefighters all winter. The younger guys are often coming on the force with already impaired hearing from non-work related

sources--shooting guns, running chainsaws. It has been a revelation to me just how fragile our hearing is and how much we take it for granted. I believe that hearing protection needs to be taught in school and not left up to a future employer when the damage might already be present.

Signed, CAL Fire OHC

Dear CAL Fire OHC,

You are so right that noise is all around us, not just at work! There are hearing conservation efforts in some schools and you can get involved. I recommend you go to [www.hearingconservation.org](http://www.hearingconservation.org) and click on "Resources" where you'll find information and tools to bring hearing conservation to your schools. There are several national campaigns to make everyone (young and old) aware of the hazards of loud noise, including:

Dangerous Decibels ([www.dangerousdecibels.org](http://www.dangerousdecibels.org))

American Speech Language and Hearing Association ([www.ListenToYourBuds.org](http://www.ListenToYourBuds.org))

Operation Bang ([www.militaryaudiology.org/site/bang](http://www.militaryaudiology.org/site/bang))

Also see the article about "It's a Noisy Planet" an effort by National Institute on Deafness and Other Communication Disorders (NIDCD) in this issue of CAOHC Update.

If you have other questions you would like addressed, please submit them to [info@caohc.org](mailto:info@caohc.org), your question and answer will be posted in the next issue of UPDATE

## Congratulations to our newest Certified Professional Supervisors

CAOHC would like to congratulate the following individuals for successfully completing the Professional Supervisor of the *Professional Supervisor of the Audiometric Monitoring Program* workshop and exam, held during the American College of Occupational and Environmental Medicine, conference in April.

William L. Bray, MD, FAAFP, CPS/A  
Deanna D. Coker, DO, CPS/A  
Jean F. Cyriaque, MD, MPH, CPS/A  
A. Clarke Darlington, MD, MD, MPH, CPS/A  
Burt Glazier, DO, CPS/A  
Cynthia J. Manfredi, MD, MS, CPS/A

Gregory A. Ornella, MD, MS, CPS/A  
Jeffrey D. Russell, AuD, CCC-A, CPS/A  
Sajjad Savul, MD, MS, CPS/A  
Steven P. Taubkin, MD, MPH, FACOEM, CPS/A  
Mary Ellen, Toothaker, AuD, CPS/A

Thank you for your commitment to the prevention of Occupational Noise Induced Hearing Loss!

## Special Thanks

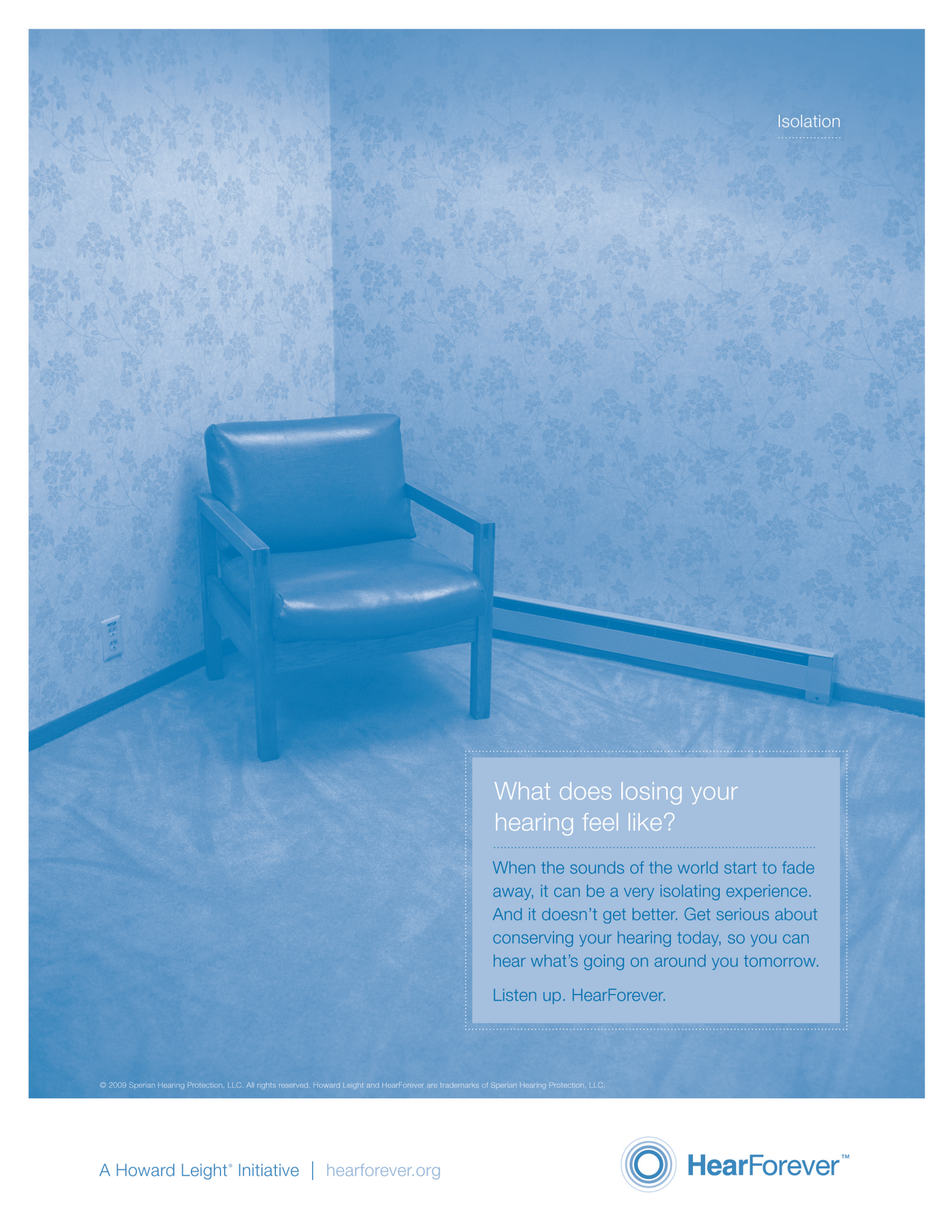
The following individuals are assisting the OHC Exam Task Force; their role thus far has been to review the current OHC course curriculum to create a Job Task Analysis survey which will be distributed to all current COHC's. CAOHC is in the process of updating the OHC exam, which is scheduled to be launched during the second quarter of 2011.

Sandra J. Adams, PhD RN COHN-S/CM  
Elizabeth Adegbulugbe, RN BSN COHC  
Rodney M. Attack, PhD  
Corrado Avarino, COHC  
John T. Barringer, MD  
Carl Bishop, MS RN COHC  
Christina T. Burns, COHC  
Cheryl Y. Cameron, MS CCC-A MAA  
Kara M Cave, PhD  
Nancy Craft, RN BSEH COHN-S  
Michael H. Fairchild, MS JD CCC-A F-AAA  
Charles E. Fankhauser, PhD

Jim Jerome, MA CCC-A  
Marion R. Juarez-Bedzyk, COHC  
Laura Kauth, MA CCC-A  
Ronald W. Kieper, BS COHC  
Jeanne A. Kirk, RN COHC  
Alice M. LeBeau, RN BSN COHC  
Mary M. McDaniel, AuD CCC- CPS/A  
Pam Mason, M.ED, CCC-A  
John A. Merkley, MS CCC-A  
Scott A. Mitchell, COHC  
Rebecca F. Moreland, PhD MPH BSN  
David T. Nelson, AuD FAAA CCC-A CPS/A

Christine C. Nevinski, RN MSN MED COHC  
Thomas W. Norris, PhD CPS/A  
Donna L. Pitts, CCC-A FAAA  
Jane Prince, PhD  
Feliz C. Ramos, MA COHC  
Vishakha Rawool, PhD CPS/A  
John Ribera, PhD, MCD  
Tim A. Swisher, MA CCC-A  
Robin Tourigian, RN FNP MSN COHN COHC  
Patricia J. Vincent, BA COHC



The background of the advertisement is a blue-tinted photograph of a room. The walls are covered in a light blue floral wallpaper. A dark blue leather armchair is positioned in the corner of the room. A white electrical outlet is visible on the wall to the left of the chair. A long, thin, light-colored object, possibly a piece of wood or a decorative element, lies on the floor against the wall to the right of the chair.

Isolation

What does losing your  
hearing feel like?

When the sounds of the world start to fade away, it can be a very isolating experience. And it doesn't get better. Get serious about conserving your hearing today, so you can hear what's going on around you tomorrow.

Listen up. HearForever.

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## Upcoming 2010

### Upcoming **Course Director** Workshop

Saturday, November 6, 2010  
Sheraton Gateway Suites O'Hare  
Rosemont, IL

Monday, February 21, 2011  
Phoenix Marriott Mesa,  
Mesa, Arizona

To register go to [http://www.caohc.org/cd\\_workshop/](http://www.caohc.org/cd_workshop/)

## Upcoming 2010

### Upcoming **Professional Supervisor** Workshop

Saturday, November 6, 2010  
Sheraton Gateway Suites O'Hare  
Rosemont, IL

Register at [www.caohc.org](http://www.caohc.org)

Registration now open see CAOHC website [www.caohc.org](http://www.caohc.org) for further details.

CAOHC-0910-595

*Summer/Fall 2010*

Look for CAOHC  
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