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Canadian Hearing Report

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Vol. 3 No 2

Revue canadienne d'audition

Hearing Protection Devices: A Double Noise Reduction Rating?

Founders of Our Profession: EAG Shaw

Canadian Academy of Audiology
Heard. Understood.
Academie canadienne d'audiologie
Entendus. Compris.

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Commitment, Nostalgia, and Other Belongings

The mosaic of hearing health care and certainly of audiology is quite simply a force to be reckoned with. With regulators, associations, lobby groups, stakeholders, ministries, political parties, nothing short of professional martyrdom would be required to join all of these groups. Thankfully many audiologists have decided to give a portion back to a profession that has treated them well and has subsequently been quoted as one of most rewarding health professions to be sought after by students. This brings me to an important point: who better to promote a profession and advocate for a profession that its own professionals. However, as children are not born with a sense of commitment to, well, much of anything, neither do audiologists enter into the profession with a sense of commitment and responsibility unless they are provided with the proper knowledge and tools to do so. During a recent meeting with several colleagues from universities across Canada, it was refreshing to hear that audiology programs were either already involved with, or in the process of creating significant mandatory professional practice components within their curricula to emphasize the role of audiologists in their professional, social, and political contexts. The future certainly looks bright as, along with other necessary realignments to our profession, we can be assured that young audiologists will be actively committed to their profession.

Since the beginning of 2008, *CHR* has been profiling university programs in Canada. The audiology program at the University of British Columbia was profiled in our last issue (Vol 3. No1) and this issue will provide details on the program at the University of Ottawa. While this information is an excellent overview of what is happening in our university programs, we indirectly wish that you read these profiles throughout the year and hope that you develop a sense of nostalgia and increase your level of involvement with these programs. Contrary to other disciplines, the ivory towers of the audiology programs typically have large gates with neon welcome signs, realizing that the relationship with clinical audiologists is an important component which needs to be encouraged and nurtured.

As well, we invite you to keep reading *CHR* as we have another profile in "Founders of our Profession." We have received many compliments on this segment and intend to ensure our professional legacy by profiling some of the greatest minds in both Canadian and international audiological research.

Our original research article this issue, from Erin Schafer and Jace Wolfe, provides an interesting perspective on acceptable noise levels in adults with cochlear implants. Speaking of noise, we also include Alberto Behar's contribution on the topic of noise protection devices.

We sincerely hope you will enjoy this latest issue of *CHR*. Happy reading!

Sincerely,
André Marcoux, Ph.D.
Editor-in-Chief

Engagement, nostalgie et autres appartenances.

L'éventail des intervenants dans le domaine des soins auditifs, et certainement dans le domaine de l'audiologie, constitue une force sur laquelle il faut compter. Compte tenu de l'existence d'autorités de réglementation, d'associations, de groupes d'intérêt, de parties intéressées, de ministères et des partis politiques, rien de moins qu'un « martyr professionnel » serait exigé pour gérer tous ces intervenants.

Heureusement, nombre d'audiologistes ont décidé de rendre service à une profession qui les a bien traités et qui a été classée par la suite parmi les professions les plus enrichissantes du domaine de la santé qui sont recherchées par les étudiants. J'en arrive à un point important; qui est mieux placé pour promouvoir et défendre une profession que les professionnels qui la pratiquent. Toutefois, tout comme les enfants ne naissent pas avec un sens de l'engagement à l'égard de quoique ce soit, les audiologistes n'entre pas dans le domaine avec un sens de l'engagement et des responsabilités à moins que ne leur soient fournis les connaissances et les outils adéquats pour le faire. Au cours d'une rencontre récente avec plusieurs collègues d'universités canadiennes, il a été agréable d'apprendre que les programmes d'audiologie participaient déjà au processus de création de composantes de pratique professionnelle obligatoires et importantes dans leur curriculum afin de mettre l'accent sur le rôle des audiologistes dans les contextes professionnels, sociaux et politiques. L'avenir est prometteur puisque que les ajustements nécessaires seront apportés à notre profession et qu'en plus, nous pouvons être certains que de jeunes audiologistes participeront activement à leur domaine de profession.

Depuis le début de 2008, la *RCA* examine les programmes universitaires offerts au Canada. Notre dernier numéro (vol. 3, n°1) comptait un article sur le programme d'audiologie de l'Université de la Colombie-Britannique et présentait des détails sur le programme de l'Université d'Ottawa. Cette information constitue une excellente mise à jour sur nos programmes universitaires, et nous espérons que lorsque vous lirez ces articles tout au long de l'année, que vous développerez un sentiment de nostalgie et que vous augmenterez votre niveau d'engagement à l'égard de ces programmes. Contrairement à d'autres disciplines, les tours d'ivoires des programmes d'audiologie ont généralement de grandes portes avec des enseignes de bienvenue au néon puisque les universités reconnaissent que la relation avec les audiologistes cliniciens est une composante importante qui doit être encouragée et entretenue.

Pour en savoir plus sur les fondateurs de notre profession, nous vous invitons à continuer à lire la *RCA*. Nous avons reçu de nombreux compliments relatifs à ces chroniques et nous avons l'intention d'assurer notre héritage professionnel en dressant le profil de certains des plus grands acteurs canadiens et internationaux dans le domaine de la recherche en audiologie.

Notre article de recherche spécial du mois, préparé par Erin Shafer et Jace Wolfe, offre une perspective intéressante sur les niveaux de bruit acceptables chez les adultes dotés d'implants cochléaires. Parlant de bruit, nous présentons également un article d'Alberto Behar sur les dispositifs de protection contre le bruit.

Nous espérons sincèrement que vous apprécierez ce plus récent numéro de la RCA. Bonne lecture!

Je vous prie de recevoir, chers collègues, mes salutations distinguées.

André Marcoux, Ph.D.
Éditeur en chef

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RESEARCH AND DEVELOPMENT FOCUS

SPOTLIGHT ON SCIENCE

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The notion of an association that is the voice of the profession of audiology in Canada was the seed that began the Canadian Academy of Audiology It grew from a strong interest in seeing an association that was by audiologists and for audiologists. The profession has grown over the past decade, both in terms of numbers and in terms of recognition. Where once we needed the support of the greater numbers of our speech-language pathology colleagues, we now garner enough recognition to begin to stand on our own and to speak with our own voice. Without the history of collaboration and cooperation of the profession of speech-language pathology however, we would have been unable to reach this point. Although our roots are tied to that integration of professions, we are growing out of that need.

The Canadian Academy of Audiology began as a conference-driven association, providing an excellent forum for audiologists to gain access to continuing education and to cutting edge research in our own country. While we continue to develop our conference, the CAA now has many tangible and intangible benefits to membership beyond the conference. We are slowly becoming THE voice for audiology in Canada, and in reaching that goal we are offering value to our members. However, there is a long way to go in order to have the structure necessary to reach that goal. That is what this year holds for us. That is, a change in administration and infrastructure that will allow us to support the growth of the association in a responsible manner.

In reflection of the history and growth of the CAA, a movement in Ontario may see the birth of a provincial association of audiologists, for audiologists. Some time ago, the CAA was approached by a group of audiologists in Ontario, expressing a need in the province for such an association. Audiologists in the province of Ontario had long been well represented by the Ontario Association of Speech Language Pathologists and Audiologists (OSLA). However, interest by OSLA members in an audiology organization for Ontario, one that is not tied to speech-language pathologists, created the impetus for OSLA and CAA to work collaboratively to investigate a model that would work. A survey of Ontario audiologists indicated an interest in a distinct provincial audiology association. OSLA and the CAA then began initial discussions to evaluate this concept.

The board of directors of the CAA have long recognized the potential disconnect of a national association to the needs of members in each province. Discussion around formal linkages to provincial associations has long been on the agenda. It is in the interest of the profession for a national association to have structured communication channels to provincial associations so that both parties can respond appropriately to the needs of members. This structure would lead to improved advocacy and the avoidance of duplication of efforts. The potential for a provincial "Academy of Audiology" with ties to the national academy exists with the Ontario situation.

However, the development of such a body must be entered into with great care. A professional association carries with it responsibility to members, both financial and legally. In order for any association to survive and to serve all members effectively there needs to be an administrative infrastructure in place capable of supporting the endeavour. If all of the necessary pieces are not in place prior to the formation of an association and the enlisting of members, the proba-

la naissance de l'académie canadienne d'audiologie. Elle s'est développée grâce à l'intérêt pour plusieurs de voir la réalisation d'une association formée PAR des audiologistes et POUR des audiologistes. Cette profession s'est considérablement développée pendant les dix dernières années, autant en chiffre qu'en reconnaissance. Autrefois, le soutient de nos collègues les orthophonistes nous était nécessaire, car ceux-ci étaient supérieurs en nombre, mais aujourd'hui nous possédons la reconnaissance dont nous avons besoin pour faire entendre notre propre voix. Toutefois, sans la collaboration et la coopération de la profession de l'orthophonie, nous n'aurions pu atteindre ce point. Bien que nos racines soient liées à l'intégration de ces professions, nous sommes en train de grandir séparément.

L'Académie Canadienne d'Audiologie (ACA) a connu ses débuts en offrant uniquement une conférence à la hauteur des attentes des audiologistes canadiens, fournissant d'excellents forums aux audiologistes en leur donnant accès à une éducation continue et à la recherche effectuée dans notre propre pays. Aujourd'hui, l'ACA dispose de nombreux efectifs et bénéfices tangibles et non tangibles pour ses membres. Peu à peu, nous sommes en train de devenir la voix de l'audiologie au Canada et, en atteignant cet objectif, nous offrons une valeur sure à nos membres. Toutefois, nous avons du chemin à faire avant d'obtenir la structure nécessaire à l'atteinte de cet objectif. C'est justement sur cela que nous allons travaillés pendant cette année. Une modification dans l'administration et l'infrastructure qui nous permettra de supporter la croissance de l'association de manière responsable.

En reflétant sur l'histoire et la croissance de l'ACA, nous percevons la possibilité qu'un mouvement en Ontario voie l'apparition d'une association provinciale d'audiologistes, pour les audiologistes. Dans le passé, l'ACA fut approché par un groupe d'audiologistes de l'Ontario exprimant un besoin pour une telle association dans notre province. Les audiologistes de la province de l'Ontario ont longtemps été représentés par le Ontario Association of Speech Language Pathologists and Audiologists (OSLA). Toutefois, un intérêt des membres audiologistes d'OSLA de fonctionner sans l'influence des membres orthophonistes a mené cette association, en coopération avec l'ACA, à trouver un modèle de collaboration qui pourrait mieux répondre aux besoins des audiologistes. Un sondage fait auprès d'audiologistes ontariens démontre un intérêt pour une association provinciale d'audiologie distincte. L'OSLA et l'ACA ont alors commencés à discuter et à faire l'évaluation d'un tel concept.

Depuis longtemps, le conseil d'administration de l'ACA reconnait le risque potentiel de voir une déconnection d'une association nationale vis-à-vis le besoin des membres au niveau des effectifs provinciaux en santé. Des discussions au sujet des liens formels avec des associations provinciales ont été prévues à l'agenda depuis longtemps. C'est dans l'intérêt de la profession d'avoir une association nationale ayant des chemins de communication structurés avec les associations provinciales afin que les deux parties puissent répondre aux besoins de leurs membres de façon appropriée. Cette structure mènerait à une meilleure promotion de notre profession et à minimiser les la redondance de projets. Le potentiel de voir la création d'une académie d'audiologie provinciale avec des liens à l'académie nationale existe en Ontario.

Toutefois, le développement d'un tel projet doit être fait avec grand soin. Une association professionnelle est responsable, de façon légale bility of failure is high. The CAA is not prepared to have such an opportunity come to failure and we wish to carefully consider all aspects of this trust and partnership prior to its inception. The trust and reputation that the CAA has with its members cannot be placed in jeopardy at this or any juncture.

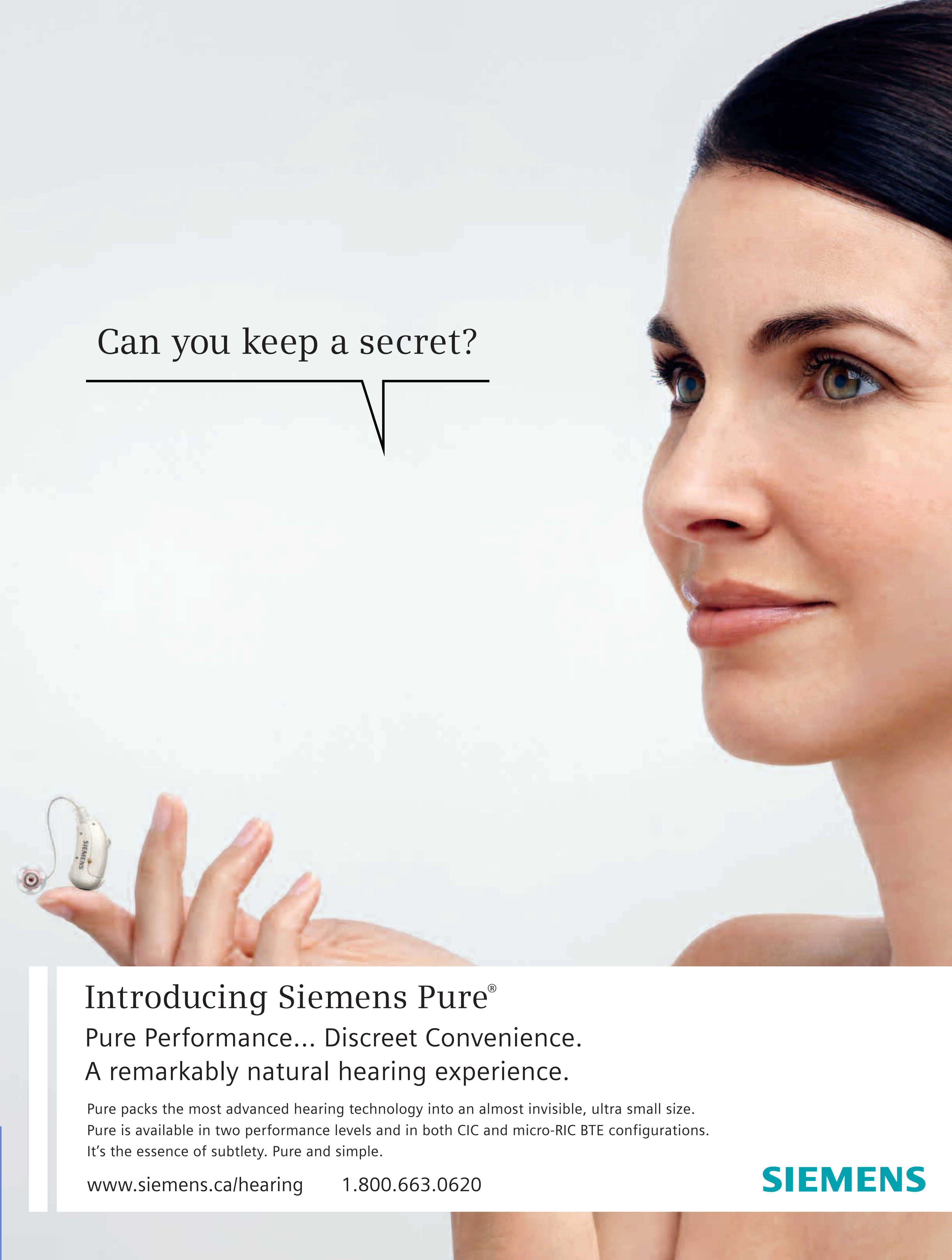
The board of directors of the CAA is wholly supportive of the formation of an Ontario Academy of Audiology, indeed of any and all provincial audiology associations with ties to the national academy. We intend to continue discussions with the OSLA executive and the committee that they have established to initiate this move. It is the strong hope of both parties that the end result will be a model for audiologists in all provinces and a movement towards further growth of the profession. Rest assured, however, that we are taking careful steps toward this goal, with every effort to ensure that the trust of our members is not harmed in any way. I ask that members continue to watch with interest and continue to send us questions and comments regarding the CAA. And, as always, I welcome those who wish to help nurture a worthy cause, to volunteer time to serve the profession as we grow.

William Campbell, MClSc,
Audiologist
President

La notion d'une association pouvant être la voix de la profession d'audiologie au Canada est responsable de et financière, de ses membres. Il est important qu'une association puisse servir tous ses membres de façon efficace et, pour faire ainsi, il est nécessaire d'avoir une infrastructure administrative en mesure de supporter un tel projet. Si nous n'avons pas tous les éléments nécessaires en place avant la formation d'une association et l'enrôlement des membres, les probabilités de faillites sont élevées. L'ACA n'est pas préparée pour voir une telle opportunité faire faillite et nous désirons considérer très prudemment tous les aspects du projet avant d'en faire la création. La réputation et la confiance en l'ACA par ses membres ne peut être placée en danger.

Le conseil d'administration de l'ACA supporte entièrement la formation d'une académie d'audiologie en Ontario, et de toutes et n'importe quelle association d'audiologie provinciale en liens avec l'académie nationale. Nous avons l'intention de continuer nos discussions avec l'exécutif d'OSLA et le comité qui a été établi afin d'initié ce mouvement. Nous espérons que le résultat final pourra servir de modèle pour les audiologistes de toutes les provinces et que cela contribuera à faire croître notre profession encore plus. Soyez assurés que nous demeurons prudents dans nos démarches vers l'atteinte de cet objectif et que nous veillons à ce que la confiance de nos membres ne soit blessée en aucune façon. Je vous prie de continuer à nous envoyer des questions au sujet de l'ACA. Et, comme d'habitude, j'encourage ceux qui le désirent de contribuer leur temps afin de servir cette profession en pleine croissance.

William Campbell, MClSc,
Audiologiste
Président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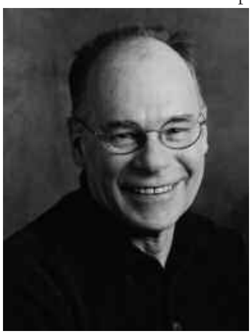
Richard Seewald receives Distinguished University Professor Award

We know that you will all join us in congratulating our colleague and friend Dr. Richard Seewald (University of Western Ontario Department of Communication Sciences and Disorders) who is being honoured with a **2008 Distinguished University Professor Award**. The Distinguished University Professor Award is UWO's highest recognition for a faculty member. This award is presented in honour of sustained excellence in teaching, research and service during an outstanding scholarly career at The University of Western Ontario.



Richard joined the University of Western Ontario in 1986. Since that time he has received numerous international awards including: Honours of the Association Distinction (CASLPA; 1996); Career Award Distinction (CAA; 2001); Tier 1 Chair in Childhood Hearing Loss (Canada Research Chairs Program; 2002); Fellow Distinction (ASHA; 2003); The International Award in Hearing Distinction (AAA; 2007). He has also recently been recognized with an award named in his honour by the *Hear the World* Foundation (The Richard Seewald Annual Award for Childhood Hearing; www.hear-the-world.com). Well done Richard!

The National Centre for Audiology
University of Western Ontario

Bill Cole of Audioscan presented with Lifetime Achievement Award.

On April 2nd during the Audiology NOW! conference in Charlotte, North Carolina, Bill Cole, (above left), was presented with the **Lifetime Achievement Award** by NASED for his work in hearing aid circuit development, hearing aid testing standards, test box and real ear measurement systems, and as one of the founding partners of Audioscan/Etymonic Design.

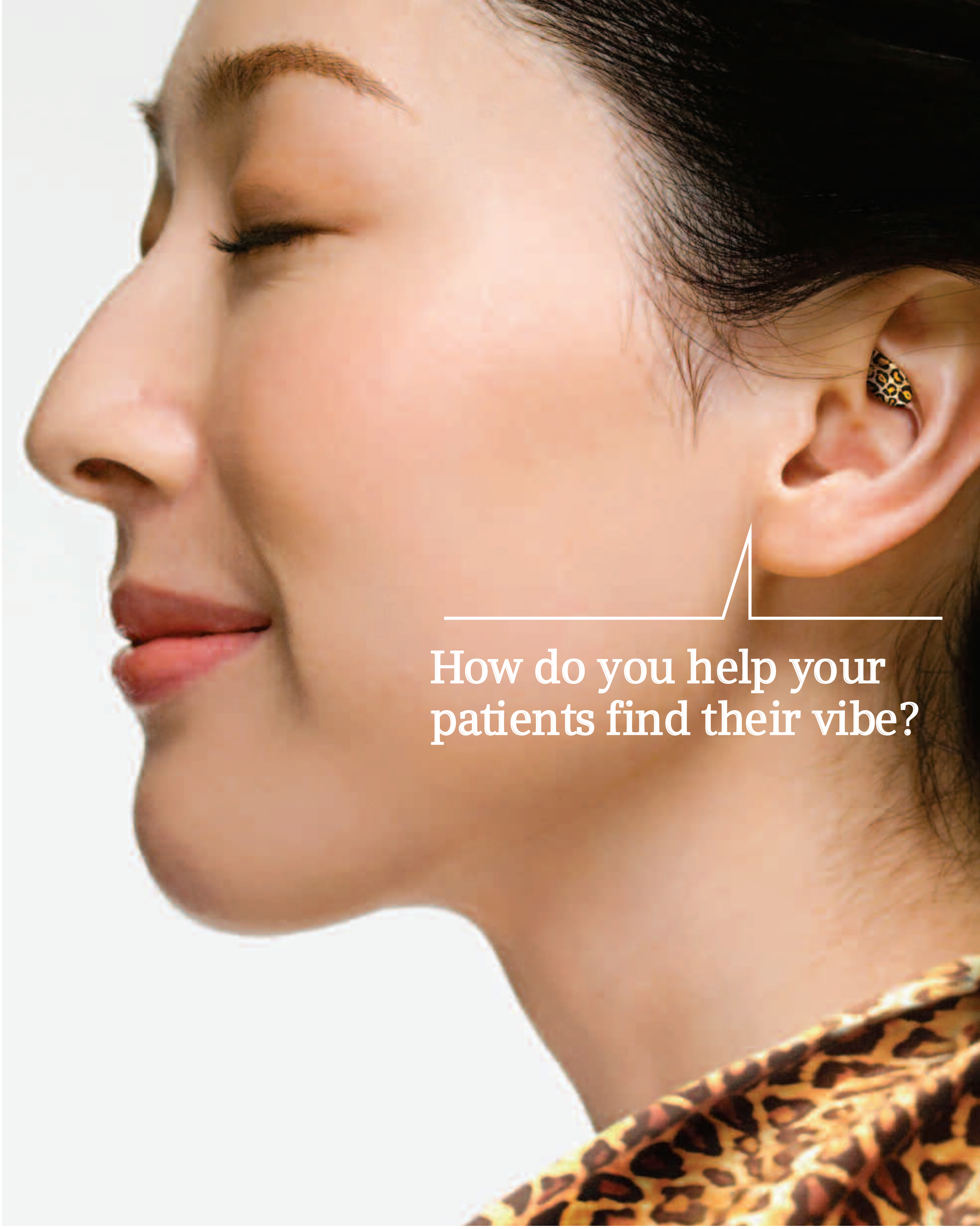
Inter-organizational Collaboration

On April 20, 2008, the Canadian Academy of Audiology (CAA) along with representatives of the provincial/territorial associations for audiologists and speech-language pathologists, the Canadian Alliance of Regulators (CAR), the Canadian Council of University Programs in Communicative Sciences and Disorders (CCUP-CSD), and the Canadian Association of Speech-Language Pathologists and Audiologists (CASLPA) met for the second time as part of an inter-organizational group to discuss issues surrounding audiology and speech-language pathology in Canada. This year's meeting, like last year's, resulted in a great deal of mutually beneficial information being exchanged and many concrete action items were established. Some of the topics discussed included the following.

- **Human Resources:** What positions are needed to service the public? What are the areas that need improvement (geographical areas, areas of specialty, multi-cultural considerations)? What can we do to improve the state of audiology and speech-language pathology in Canada?
- **Mandates, Roles and Terminology:** Defining roles of educators, regulators and associations to eliminate redundancy and confusion.
- **Clinical Education:** What changes are happening in our universities to help prepare graduates for a career in audiology or speech-language pathology (program changes and funding changes)?
- **Establishing essential competencies models** for audiology and speech-language pathology.
- **Identifying opportunities for collaboration.**
- **Public relations and education activities** across the country.

Perhaps the biggest outcome of this meeting was the establishment of a steering committee to determine the roles, responsibilities and common initiatives of the various groups involved. This yet to be named committee will be composed of representatives from the three key stakeholder groups; the educators (represented by CCUP-CSD), the regulators (represented by CAR) and the associations (represented by CASLPA and CAA). The goal of this group is to determine the most appropriate course of action to promote and support the professions of audiology and speech-language pathology in Canada. This steering committee is the first step in developing an efficient Canadian system with clearly segmented units for audiology and speech-language pathology.

The CAA's role on this committee will be to advocate for audiology at this table and ensure that the profession is served in the most efficient means possible. The CAA has a few items to bring to this committee, and as the work of committee progresses we will be looking to you, our membership, for input and we hope that you will lend your voice to these important initiatives.


How do you help your
patients find their vibe?

Celebrate Our Profession – Nominate a Colleague for a CAA Award

Last year at the CAA's 10th Anniversary Conference, Rex Banks, on behalf of the Canadian Hearing Society (CHS) and the CAA announced the introduction of the MONECA PRICE HUMANITARIAN AWARD. Established in 2007 by the CHS and CAA, the **Moneca Price Humanitarian Award** will be presented to an audiologist in recognition of extraordinary humanitarian and community service, above and beyond the requirements of employment. In a particularly poignant moment at the 10th Anniversary Celebration Gala, Moneca's husband, Dave, addressed the guests, speaking about Moneca and thanking the CAA and CHS for dedicating this award on her behalf.

As you may or may not be aware, CAA has an awards committee which oversees the distribution of all CAA awards annually. This program supports the recognition of those people who have made significant contributions to our profession. The introduction of Moneca Price Humanitarian Award brings the CAA's total number of awards to seven.

Following is a list of the Awards that are offered annually along with the Moneca Price Humanitarian Award:

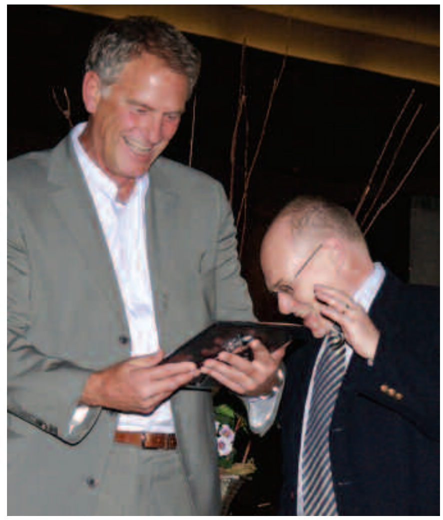
HONOURS OF THE ACADEMY

Given in recognition of outstanding contribution to audiology or a related field; such as the development of a significant clinical program, test procedure or protocol, an outstanding research project, teaching or mentoring, excellence in management of an audiology or related program, contribution to the field through advocacy, or outstanding public relations efforts.

Laurie Usher from British Columbia was awarded Honours of the Academy at the 2006 Conference by Past President Anne Caulfield, who had been awarded the prize before her.

At the 2007 CAA conference, Richard Seewald presented Honours of the Academy to Krista Riko and Martyn Hyde for their outstanding contribution to audiology and related fields over the past 30 years.

Krista Riko



Martyn Hyde (*left*)

PRESIDENT'S AWARD

Given in recognition of outstanding contribution to the development of the academy, the recipient is nominated by the president of the CAA, with the unanimous consent of the board of directors.

Past winners of this award include Glen Sutherland (2006) and Kathy Pichora-Fuller (2007).

PAUL KUTTNER PIONEER AWARD

Paul Kuttner was the "Paul Bunyon" of the profession and one of Canada's first audiologists. The Paul Kuttner Award is presented to a pioneer in audiology in Canada, who has "boldly gone where no one has gone before" and been the "first" to embark on a new program or procedure which has impacted audiology service delivery in Canada.

Glen Sutherland, Kathy Pichora-Fuller

STUDENT AWARD

The Student Award is presented to an outstanding audiology graduate student in Canada for academic or clinical excellence, outstanding research, or community service. Each Canadian program may nominate one student to be considered. The student award winner will be provided a plaque or certificate, transportation costs to a maximum of $500, and complimentary conference registration to the CAA conference in order to receive their award.

JEAN KIENAPPLE AWARD FOR CLINICAL EXCELLENCE

Jean Kienapple, who lived and worked in Nova Scotia, was one of Canada's more noteworthy audiologists. The Jean Kienapple Award is given in recognition of clinicians who deliver outstanding clinical services on an ongoing basis, as recognized by peers and clients.

RICHARD SEEWALD CAREER AWARD

Richard Seewald, whose name is synonymous with the word "audiology" is a professor at the University of Western Ontario. His contributions to our field are legendary. The Richard Seewald Career Award is given in recognition of an outstanding career in clinical practice and/or teaching and mentoring young people. The candidate must have made significant contributions to the practice and/or teaching of audiology or a related field and have had a long-term professional career.

CELEBRATE OUR PROFESSION AND NOMINATE A COLLEAGUE FOR AN AWARD!

We have awards to give! What we don't have are that many nominees for these awards. Surely, you can think of some deserving recipient who meets the criteria for one of these awards? In anticipation of this year's CAA conference in Halifax, Nova Scotia, please give consideration to nominating a deserving person for one of these awards.

Nomination Procedure

Nominations may be submitted by any member of the association and must be seconded also by a member (with the exception of the Student Award which must be submitted by the head of the training program and the President's Award which is submitted by the president). Nominees must be CAA members to be considered for the President's Award or the Jean Kienapple Clinical Award. You do not have to be a CAA member to be considered for other categories.

Nominations must include the nominees name, organization, and contact information and the names and signatures of two nominators. Nominations must include a letter indicating the reason for nomination with sufficient detail on the nominee's training, background, experience, and outstanding aspects of their professional career to allow the Awards Committee to evaluate the nomination. For the Jean Kienapple Award, nominations should include testimonials from clients or other individuals impacted by the nominee.

All submissions are due by August 1st and will be forwarded to the Awards Committee for consideration.

Granting Procedure

Awards deemed appropriate will be presented at the CAA Annual Conference.

Publicity Ideas for National Audiology Week

October 20 to 26, 2008

Effective publicity for National Audiology Week events is essential in order to gain community awareness and participation. The following is a list of ideas that may be used to increase the reach and impact of important messages.

Media

- Appearing on local radio programs
- Appearing on local access television programs
- Getting the local television station to do a story on National Audiology Week
- Inviting media to shadow an audiologist for a day
- Publishing newspaper articles, Letter to the Editor, and advertisements
- Placing special inserts in local newspapers
- Running radio public service announcements
- Organize a television or radio interview with an adult in your community living with a hearing problem
- Set-up a call-in radio show with an audiologist to let the public "talk to the experts."

Partnering with Organizations

- Events cosponsored with organizations and companies to promote good hearing health, etc.
- Mall events, such as displays
- University events (schools of audiology), education and communication can help plan campus-wide events; students may be able to get university credit for volunteering to help with hearing health promotion activities; faculty may give generously of their time; (plan this early)
- Hold a career presentation at a local high school, college, or university to introduce our professions to students
- Display National Audiology Week posters on bulletin boards throughout your community – at work, local schools, shopping centres, community centres, or churches, etc.
- Offer an information session to members of the community who wish to find out more about audiology and hearing
- Provide National Audiology Week colouring/activity sheets to be put in your waiting room, doctors' offices, etc.
- Supply your local pharmacies/grocery stores with audiology and hearing literature and ask them to include it in the bag with each customer's purchase
- Hold an open house or health fair where co-workers, clients, community members, and the general public are invited to visit your facilities
- Offer hearing screenings and demonstrate equipment such as FM amplification systems, assistive listening devices, etc.
- Participation of local legislators; for example, health screenings of legislators at municipal, provincial, and federal levels
- Church bulletin inserts
- Create a speakers bureau consisting of audiologist (offer to give workshops to local businesses, schools)
- Display a National Audiology Week poster in the lobby of your hospital
- Do a presentation about audiology and hearing at the Chamber of Commerce Luncheon, social clubs, etc.

Other Ideas

- Restaurant table tents
- Banner
- Fridge magnets
- Luncheon and breakfast placemats
- Proclamation
- Create sticker or stamp announcing the National Audiology week to put on outgoing mail

National Audiology Week Promotional Materials May Be Distributed to:

Local businesses, Local malls, Local restaurants, Health clubs, Schools, Libraries, Local grocery stores, Laundromats, Movie theaters, Daycare, centers, Youth centers, Banks, Hair salons, Hospitals, Medical, optometrist, and dental offices, Senior citizen homes, Public health departments, and health organizations and clubs (Red Cross, Lions Clubs, etc.).

Idées publicitaires pour la Semaine nationale de l'audiologie

20 au 26 octobre 2008

Pour sensibiliser la communauté et obtenir sa participation, il faut une publicité efficace des activités prévues au cours de la Semaine nationale de l'audiologie. La liste suivante comprend des options pouvant être utilisées pour augmenter la portée et l'impact des messages importants.

Médias

- Passer à la radio locale
- Passer à la télévision locale
- Demander à la chaîne de télévision locale de faire un reportage sur la Semaine nationale de l'audiologie
- Inviter les médias à observer le travail d'un audiologiste pendant une journée
- Faire paraître des articles dans les journaux, une lettre au rédacteur en chef et des annonces publicitaires
- Insérer des encarts spéciaux dans les journaux locaux
- Faire diffuser des messages d'intérêt public à la radio
- Organiser une entrevue à la télévision ou à la radio avec un adulte de votre communauté aux prises avec un problème auditif
- Organiser une émission de radio téléphonique avec un audiologiste pour que le public puisse parler aux « experts »

Partenariat avec des organismes

- Activités de promotion de la santé auditive, etc. coparrainées avec des organismes et entreprises
- Activités dans les centres commerciaux, telles expositions
- Activités dans les universités (écoles d'audiologie) – les services d'éducation et de communications peuvent aider à planifier des activités sur le campus; les étudiants peuvent obtenir des crédits universitaires en participant volontairement aux activités faisant la promotion de l'audition; les membres de la faculté peuvent donner généreusement de leur temps (commencer tôt la planification)
- Faire un exposé d'initiation aux carrières à une école secondaire, au collège ou à l'université de votre région pour faire connaître la profession aux élèves et étudiants
- Mettre des affiches de la Semaine nationale de l'audiologie sur les tableaux d'affichage dans votre communauté – au travail, dans les écoles, centres commerciaux, centres communautaires, églises, etc.
- Offrir une séance d'information aux membres de la communauté qui désirent en savoir davantage sur l'audiologie et l'audition
- Placer des feuilles à colorier et des feuilles d'activités sur la Semaine nationale de l'audiologie dans votre salle d'attente, les cabinets de médecin, etc.
- Donner de la documentation sur l'audiologie et l'audition aux pharmacies et épiceries de votre région et leur demander de la mettre dans le sac d'épicerie de chaque client
- Tenir une journée portes ouvertes ou une foire sur la santé et inviter vos collègues de travail, membres de la communauté et le grand public à visiter vos installations, etc.
- Organiser une activité de dépistage auditif et faire une démonstration de l'équipement comme système de diffusion MF, dispositifs techniques pour malentendants, etc.
- Faire appel à la participation des élus municipaux, provinciaux et fédéraux, en leur faisant subir un dépistage auditif par exemple
- Mettre des encarts dans les bulletins paroissiaux
- Créer un service de conférenciers formé d'audiologistes (offrir de donner des ateliers aux entreprises, écoles locales)
- Mettre une affiche de la Semaine nationale de l'audiologie dans le hall d'entrée de votre hôpital
- Faire un exposé sur l'audiologie à un dîner de la chambre de commerce locale, aux clubs sociaux, etc.

Autres idées

- Cartes-chevalets dans les restaurants
- Bannière
- Aimants de réfrigérateur
- Napperons pour dîner et déjeuner
- Proclamation
- Création d'auto-collants ou d'un timbre annonçant la Semaine nationale de l'audiologie pour le courrier à expédier

Le matériel promotionnel de la Semaine nationale de l'audiologie peut être distribué comme suit :

Entreprises locales, Centres commerciaux locaux, Restaurants locaux, Clubs de santé, Écoles, Bibliothèques, Épiceries locales, Buanderies, Cinémas, Garderies, Centres de jeunes, Banques, Salon de coiffure, Hôpitaux, Cabinets de médecin, d'optométriste et de dentiste, Foyers pour personnes âgées, Services de santé publique, Organismes de santé et clubs sociaux (Croix-Rouge, clubs des Lions, etc.)


bernafon
Innovative Hearing Solutions
Who said hearing aids
had to be big, beige and boring?
brite,
naturally different

Industry Insider

BERNAFON INTRODUCES MOVE

At AudiologyNOW! in Charlotte, N.C. (April 3–5, 2008), the Swiss hearing system manufacturer Bernafon proudly presents the most complete and comprehensive product portfolio ever. MOVE, a new upper mid-range hearing system family is introduced as a world premiere. Bernafon's receiver-in-the-ear technology, brite, is made even more flexible with additional micromold styles.

At this year's convention, Bernafon introduced MOVE, an upper mid-range hearing system family that offers advanced adaptive functionality based on the patient's individual lifestyle. The automatic program offers the choice of nine different signal processing modes based on adaptivity to changing environments with emphasis on speech or comfort. A new copy program function as well as freely configurable programs makes MOVE flexible, easy and fast to fit. The large range of BTEs includes a micro BTE with a T-coil and an optional standard earhook. All BTEs are suitable for open fittings with the modular thin tube system SPIRA flex. The micro BTEs are available in 10 attractive housing colors which will MOVE patients to take the first step to better hearing.

www.bernafon.com

WIDEX SUPPORTS DEAF SPORTS

Widex is sponsoring two annual awards for the best male and the best female athlete in deaf sports respectively. The awards – "Widex Sportsman of the Year" and "Widex Sportswoman of the Year" – are part of Widex' support for the International Committee of Sports for the Deaf (ICSD), which also stages the Deaflympics.

2007 Winners

The 2007 Widex Sportsman of the Year award was won by the 40-year-old badminton player Rajeev Bagga from India, who has not lost a singles match since 1989.

The 2007 Widex Sportswoman of the Year was the swimmer Natalia Deeva from Belarus, who at the latest world deaf championship broke three world records on the same day.

Many Years of Support

Widex has been supporting deaf sports for many years. In addition to the above-mentioned awards, they also grant a special "Widex Fair Play Prize" in connection with the Summer Deaflympics, which will take place in Taipei in 2009.

www.widex.com

SIEMENS HEARING INSTRUMENTS TURNS UP THE VOLUME WITH NEW NATIONAL ADVERTISING CAMPAIGN

Campaign Touts CENTRA's SoundSmoothing Technology, Shown in Laboratory Tests to Reduce Non-Speech Transient Sounds

Piscataway, N.J., February 25, 2008 – Siemens Hearing Instruments, Inc. a leading manufacturer of hearing instruments in the United States, today announced the launch of a new national advertising campaign for its CENTRA™ line.

Central to the campaign is the promotion of CENTRA's SoundSmoothing™, the world?s first transient noise suppression technology, which is available on every CENTRA instrument. In a recent study conducted at the National Acoustic Laboratories, the noise-reduction algorithm used in SoundSmoothing to reduce non-speech transient sounds was shown to offer benefits to the hearing aid wearer in terms of comfort, with no noticeable effect on localization or intelligibility.

"Siemens CENTRA line with SoundSmoothing is one of the most comprehensive product portfolios on the market - addressing wearers' audiological and lifestyle needs – and this national campaign allows us to show off those attributes," said Dr. Thomas Powers, vice president of Audiology and Professional Relations at Siemens Hearing Instruments, Inc.

www.siemens-hearing.ca

EXÉLIA MICRO OFFERS THE FULL LIFE EXPERIENCE –MORE THAN YOU WOULD EVER EXPECT FROM A MICRO!

Stäfa, Switzerland, 2nd April 2008 – Phonak expands the new paradigm in hearing excellence with the introduction of the Exélia micro. Exélia, a unique combination of cutting-edge technology, audiological expertise and wireless connectivity, delivers unprecedented hearing performance and user interaction together with easy access to modern communication and entertainment systems.

The Exélia micro is the most advanced, highly featured microStyle hearing instrument. At the heart of the Exélia system is CORE (Communication Optimized Real-audio Engine) technology which allows Exélia micro to address communication challenges in three principal areas:

Best Hearing Performance

The Exélia micro superior hearing performance is based on SoundFlow, a revolutionary automatic system that seamlessly creates an infinite number of situation-specific programs.

Full Control over System Functionality

Although seamless automatic hearing performance is paramount; users occasionally require manual control. The optional myPilot command center provides intuitive control of hearing instrument functions and sophisticated network status information.

Easy and Complete Connectivity to the Digital World

Technology surrounds us, and modern lifestyles require access to a multitude of devices and gadgets. iCom is a highly innovative wireless communication interface through which any Bluetooth enabled device is accessible with stereo audio quality.

www.phonak.com

VIVOSONIC INC. APPOINTS MR. SERGE AMAR AS VICE PRESIDENT, WORLDWIDE SALES

Toronto, Ontario, Canada, April 8, 2008 – Vivosonic Inc., the Toronto-based developer and manufacturer of the world's only non-sedated ABR technology, is pleased to announce the appointment of Mr. Serge Amar as vice president, Worldwide Sales.

Mr. Amar is responsible for the further development of the Vivosonic Integrity™ sales platform throughout the globe, working closely with specialty equipment distributors, institutions, and private practices. Serge brings nearly 20 years of international experience in the medical device industry, heading worldwide sales and market development teams for several technology-based companies.

"Serge has a wealth of industry experience and demonstrated success in managing and growing a global sales organization" said Dr. Yuri Sokolov, president and CEO of Vivosonic.

"Vivosonic is an innovator with a superior solution portfolio and a strong track record." said Mr. Amar. "I am excited to join the company and look forward to working with Vivosonic's exceptional team to deliver outstanding results."

NEXT• REDEFINES THE ADVANCED THROUGH ESSENTIAL CATEGORIES

Everything You Need to Succeed

April 2, 2008 – Kitchener, Ontario, Canada – Unitron Hearing announced today the introduction of its new Next• series comprised of four outstanding product lines: Next 16, Next 8, Next 4, and Next E, each with a unique set of purpose-driven features for client needs. Next is developed on the world's most advanced digital sound processing platform resulting in a better sounding hearing instrument. Each Next product line raises the bar for performance and features in the advanced through essential categories, with flagship technologies included across the series.

World's Leading Breakthrough Feedback Management

Next features the world's most advanced feedback management technology across all four product lines which detects and suppresses multiple feedback peaks faster, while maintaining superior sound. The breakthrough feedback technology provides more useable gain, an expanded fitting range, more open styles, and larger venting for more natural sound. The advanced feedback technology means more custom product styles than ever before, including a new Power CIC and full shell power directional, along with client-pleasing innovations.

"Unitron Hearing has a long-standing commitment of developing industry-leading technologies across all product categories," explains Cameron Hay, president and CEO, Unitron Hearing. "Unitron Hearing's Element• series continues to set the benchmark for features and performance in the advanced to essential categories. Now, we have raised the bar to the Next• level in terms of breadth of offering, features and performance expectations across all form factors and price points. Quite simply, Unitron Hearing now has the most advanced, comprehensive hearing instrument portfolio in the industry."

The Next series of products will be available in May 2008. Please contact your localrepresentative for availability in your market.

www.unitronhearing.ca

Hearing Protection Devices: A Double Noise Reduction Rating?

Alberto Behar, PEng, CIH

Alberto Behar is with the Institute of Biomaterials and Biomedical Engineering, University of Toronto

Question: Why do we measure the attenuation of a hearing protector device (HPD)? Answer: To calculate the noise level of the protected ear (i.e., the effective level the ear is exposed to once the HPD is in place). For all practical purposes, if we know the noise level a person is exposed to and if this level exceeds a certain jurisdiction's limit of best practice, we would like to protect that person by providing him with a HPD that will reduce the level to below the limit.

That is what the Noise Reduction Rating or NRR was supposed to do and, for a long time, we were satisfied using it. The NRR was obtained by calculations, using results from attenuation measurements performed in a laboratory setting, using trained subjects and following the procedures in the ANSI S.19-1974 Standard.[1] It did offer a very easy method for the calculation: measure the noise level in dBC, subtract the NRR of the HPD and you get the sound level of the protected ear in dBA. If you couldn't measure the noise in dBC, but in dBA, you had simply to add 7 dB to the above mentioned difference.

For example, if the ambient noise level was 100 dBC, and if the acceptable limit was 85dBA, then you would have to look for a HPD with an NRR of 100 – 85 = 15 dB or greater. And if you measured your noise in dBA and it was 98, then the NRR will be 98 – 85+7 = 20 dB.

Unfortunately, numerous studies had shown that the results were overly optimistic and did not match the real-life situations at all. That was the reason for the Occupational Safety and Health Administration (OSHA) to recommend a de-rating of 50% of the NRR. The National Institute for Occupational Safety and Health (NIOSH) recommended a selective de-rating of 25% for muffs, 50% for formable earplugs and 70% from all other plugs. Further studies have shown that there is no firm ground for recommending any de-rating schemes.[2]

The problem was not really the NRR measurement per se, but the way measurements of the attenuation were performed. This is the reason why, as a result of multiple studies, a new method ("B") was developed and included in the current ANSI standard.[3] It requires "naïve" subjects that have no previous experience in using HPDs. Also, they do not get assistance from the technician in charge of the test. The subjects have to fit the HPDs following the instructions on the package. This situation is much more in line with the way users behave and so, the results of the measurements are closer to those obtained in real-life situations.

However, even having a reliable method for the measurement, there was still the need for guidance on how to use the results of the measurement.

Here is what is new in that respect:

ANSI has just issued a new standard, the ANSI S12.68-2007.[4] Produced by the Working Group 11 of the Accredited Standard Committee S12 (Noise), this is the first ANSI Standard that provides a method for the calculation of the noise level of the protected ear.

The really revolutionary concept in this standard is the introduction of a double rating for the same HPD indicating two levels of attenuation that can be obtained by different groups of users.

It is a well-known fact that different individuals obtain different attenuation using the same HPD. This is due mainly to the quality of the fit they can achieve: better fit results in an improved seal between the HPD and the ear of the user and consequently in a higher attenuation. The fit is a combined effect of several causes such as an easier donning process and the training and motivation of the user: it has been proven that real-life attenuation is higher in workplaces with an effective hearing conservation program. On the other hand, in places where HPDs are just handed out without proper training and motivation the observed attenuations are significantly lower.

One draw-back of the today's NRR (obtained either using Method "A" or "B") is that it does not show explicitly the variation of the attenuation among the individual users.*

That is when the idea of using a dual rating came into place. According to the ANSI S12.68-2007 standard, the attenuation and standard deviation data from measurements performed using either Method "A" or "B" are used to calculate the so called Noise Level Reduction Statistics (NRS) – a measurement that is similar to the NRR.

There are two NRSs: NRS_A and NRS_G. They are obtained using two different calculation procedures (analytical and graphical) one more complex than the other, but they yield similar results. The user does not have to calculate them: this is done by the manufacturer who will have them written on the package (in the same way as the NRR is written now).

Each of the NRSs can be calculated for a different percentage of the protected population, and this percentage appears as a subscript of the NRS. As an example, the NRS calculated for the 20th percentile of the population** using the analytical method is indicated as $NRS_{A,20}$. This is the attenuation that will be achieved or exceeded by

*This is not exactly true: the standard deviation among the results is used for the calculation of the NRR. The larger the variation, smaller is the NRR. However, by only knowing the NRR one does not know separately the attenuation and the standard deviation.

**Indicates that 20% of the population will achieve or exceed the NRS_A,20 value. NRS_A,80, will be met or exceeded by 80% of the protected population.

highly motivated and trained individuals.

On the other hand, the NRS calculated for the 80th percentile of the population using the graphic method is indicated as $NRS_{G,80}$. This will be the protection achieved or exceeded by most users. The 20th percentile value will always be higher than the 80th percentile one.

Other advantages of the "two-numbers approach" are that:

a. It indicates the range of attenuation to be obtained by different users.

b. It diverts the attention of the buyer from the tendency to purchase the HPD with the highest NRS value.

c. It uses the ambient noise level measured in dBA for the calculation of the noise level of the protected ear.

d. It draws attention to the possibility of over protection (the danger of too much protection that may them uncomfortable and hampers the ability to hear danger or warning signal).

Use of the Noise Level Reduction Statistics

The effective A-weighted sound pressure level L'_{Ax} of the protected ear (for protection performance x percent) is computed as:

$$L'_{Ax} = L_A - NRS_{Ax},$$

Where L_A is the time-weighted average noise level (in dBA) the person is exposed to.

As an example, if L_A at a given location is 95dBA and the values of the HPD are NRS_{A80} = 19 dB and NRS_{A20} = 27, then L'_{A80} = 95 – 19 = 76 dBA – the effective A-weighted level most users will not exceed and L'_{A20} = 95 – 27 = 68 dBA – the effective A-weighted level a few motivated proficient users will not exceed.

The EPA plans to reconsider its hearing protector device-labeling rule probably this year. So, starting in 2009, there may already be HPDs with two values of NRS on their packaging.

Impact of the Double Rating in Canada

The Canadian standard that deals with hearing protectors is the CSA Z94.2-02.[5] The standard specifies that the measurement of the attenuation should be done following the ANSI standard S12.6-1997 (R2002) referred to above. It also specifies three different ways for the selection of the HPDs, using the results of the attenuation measurements. They are:

a. **Classes A, B, and C.** Its use is recommended for $L_{EX, 8\ hr}$ of < 105 dBA, = <95 dBA and = <90 dBA respectively. Basically, the user has to measure the $L_{EX, 8\ hr}$ in the workplace and then choose the HPD on the basis of its Class, that is indicated by the manufacturer.

b. **SNR(SF_{84}) Grades 1 through 4**. The name stands for Single Number Rating, Subject Fit 84th Percentile. Its use is recommended for L $L_{EX, 8\ hr}$ of <105 dBA, = <100 dBA, = <95 dBA and = <90 dBA for the Grades 1. 2, 3, and 4 respectively.

c. **Octave Band Computation.** This is a straightforward calculation, subtracting the attenuation values from the octave band values of the ambient noise level.

The above classifications methods didn't gain much popularity for two reasons:

1. Because the only information available to users remained the NRR, since its use is compulsory in the USA – the country with the largest market, and
2. Because potential users are more familiar with the NRR.

If and when EPA institutes the dual rating NRS system, manufacturers will have to label their products accordingly. Canadian users will have to be informed about the meaning and the usage of this system, since only the NRS values will be available to them.

At that time (or even before) it will be advisable that the Canadian standard CSA Z94.2 be revised accordingly and the new classification be included in the text. Another avenue will be the adoption of the ANSI S12.68-2007, something that may simplify the entire process. In any event, parts of CSA Z94.2 should be updated and kept, since it contains important information regarding the care and use of the protectors.

References

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3. ANSI. 1997-2002. Methods for Measuring the Real-Ear Attenuation of Hearing Protectors. American National Standards Institute S12.6-1997(R2002): New York, NY.
4. ANSI. 2007. Methods of Estimating Effective A-weighted Sound Pressure Levels when Hearing Protectors are Worn. American National Standards Institute S12.68-2007: New York, NY.
5. CSA. 2007. Hearing Protection Devices – Performance, Selection, Care and Use. Canadian Standards Association Z94.2-02 (R2007): Toronto, ON.


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Department of Audiology and Speech Language Pathology, University of Ottawa

The University of Ottawa (U of O) houses the only French language audiology program in the world based on the two-year master's degree structure. Furthermore, unlike many other programs in Canada, U of O has a national mandate of training audiologists which can deliver services to francophones residing outside of the province of Quebec. While the language of instruction is French, clinical placements and externships will require students to be knowledgeable in both languages given the important francophone clusters in the predominantly English-speaking city of Ottawa. The unique cultural and geographical aspects related to this program have naturally created a fascinating learning environment for both students and professors. Graduates from the program are highly sought due to their ability to communicate and apply their knowledge in both official languages.

The Faculty

Andrée Durieux-Smith (Full Professor) was the founder of the graduate program in audiology and speech-language pathology in 1993. She obtained her PhD from McGill University and at that time became the founding director of the audiology department at the newly opened Children's Hospital of Eastern Ontario in Ottawa. From 1997 to 1999, she was the first director of the newly formed School of Rehabilitation Sciences. From 1999 to 2002, she was vice-dean (research) and is presently vice-dean, professorial affairs. Since 1981, she has been carrying out externally funded research in the area of early identification of hearing loss in children and on the factors which influence the development of children with a permanent hearing loss. For her research she has received awards from the American Auditory Society and the Canadian Association of Speech Language Pathologists and Audiologists (CASLPA). She has chaired task forces and working groups for Health Canada on Childhood Hearing. In 2005, she was elected fellow of the Canadian Academy of Health Sciences.

Elizabeth Fitzpatrick (Assistant Professor) joined the university in 2007 after completing doctoral studies in population health at the University of Ottawa. She is currently working on developing a graduate certificate program in Auditory-Verbal Studies at the University of Ottawa. She has been working in auditory (re)habilitation and audiology for the past 25 years. Before joining the university, she held various positions as audiologist, therapist, and manager at the Children's Hospital of Eastern Ontario (CHEO) in Ottawa and the Central Speech and Hearing Clinic in Winnipeg. Working in collaboration with colleagues at CHEO and the Ottawa Hospital, her research and publications cover the spectrum from infants to adults. Her doctoral studies were focused on newborn hearing screening and she is currently involved in examining the clinical management of children with mild and unilateral hearing loss. She is also involved in clinical projects examining outcomes in children and adults with cochlear implants. She has been involved in professional associations as a member of the Canadian Association of Speech-Language Pathologists and Audiologists working group on cochlear implants in children and internationally as a member of the Board of Directors of Auditory-Verbal International, Inc. She is currently a member of the Auditory-Verbal Certification Committee (Alexander Graham Bell Academy for Listening and Spoken Language).

Christian Giguère (Associate Professor) was trained as an engineer and has worked in the fields of acoustics, biomedical engineering and audiology for the past 20+ years. Dr. Giguère joined the faculty in 1995, and is also cross-appointed at the School of Information Technology and Engineering (SITE). His main research and professional contributions include the development of an anthropomorphic acoustic test fixture (ATF) to measure the attenuation of hearing protectors, a software tool for the analysis and control of HVAC noise in buildings, the development of a hospital-based psychoacoustic laboratory, a mathematical model of sound transmission through the peripheral auditory system (AIM), the development of a System for Evaluating sound Localization Acuity (SELA), software tools to analyze the efficacy of acoustic warning signals in noisy workplaces (Detectsound and AlarmLocator), and the development of hearing standards for the Department of

Fisheries and Oceans Canada (DFO) and the Royal Canadian Mounted Police (RCMP). He is also currently involved in a collaborative research project on intelligent signal processing with a major hearing aid manufacturer. Dr. Giguère is president of the Canadian Acoustical Association and co-chair of Team II (Noise and Communication) for the International Commission on the Biological Effects of Noise.

Chantal Laroche (Full Professor) obtained a PhD in the field of biomedical sciences (Audiology) from the University of Montreal in 1989. After completion of her studies, she became president of her own consulting firm, Sonométric Inc., from 1990 to 1993. She was a recipient of one of the Premier's Research Excellence Award (2000–2005) and has been awarded grants from major agencies (e.g. SSHRC, NSERC, IRSST, NCE, CFI), in collaboration with colleagues in audiology, speech-language pathology, engineering, and psychology. She has also received contracts from clients such as the Canadian Coast Guard, the National Research Council, Health Canada, RCMP, and the Municipality of Ottawa-Carleton. She has published more than 80 scientific papers in national and international peer-reviewed journals and proceedings. As principal investigator or co-applicant, she has been granted more than 1.5 million dollars in the past 10 years. Her research has focused on noise and communication, noise and safety in the workplace, the development of hearing ability assessment tools (e.g. French HINT, localization test), the localization and perception of warning sounds (e.g., Detectsound, AlarmLocator), the effects of recreational noises on health and quality of life, and hearing loss prevention programs

André Marcoux (Interim-director and Assistant Professor) is an audiologist by training who has worked as a clinician and as the director of a private clinic in the Ottawa region. After completing his Doctorate in Experimental Psychology at Carleton University, he moved to Copenhagen, Denmark where he was hired as a pediatric specialist by Widex, a company involved in hearing aid research and development. His research work yielded innovations in instrumentation design and in the acquisition of knowledge on deaf newborns and young children. He has presented his research findings and given lectures on various theoretical, academic, and political aspects of audiology in more than 30 different countries. He is also a former president of the Canadian Academy of Audiology and is the ongoing chair of the world-renowned Widex Congress of Pediatric Audiology. Professor Marcoux has been a member of faculty since 2004 and is a researcher affiliated with the Children's Hospital of Eastern Ontario Research Institute. His research interests focus on pediatric hearing assessments and the development of hearing instruments and testing equipment for infants and children.

The University of Ottawa is currently examining its curriculum of the past 10 years to answer to the evolving needs for expanded services in audiology and hearing healthcare. A PhD program in Rehabilitation Sciences should see the day in 2009, where audiology students will have a natural path to third-cycle studies. Courses for the PhD will be offered in English to attract international applicants coveting the U of O for its state-of-the-art laboratory, built in 2006 through an award from the Canadian Foundation for Innovation to Drs. André Marcoux, Chantal Laroche, and Christian Giguère. Unique funding is also provided to the University of Ottawa via the *Consortium National de Formation en Santé* (CNFS), a national entity which promotes training of francophone health professionals outside of the province of Quebec.

The department of audiology is a founding partner in a multi-disciplinary clinic at the University of Ottawa and works in tandem with other disciplines such as medicine, physiotherapy, occupational therapy, and speech-language pathology to provide quality services as well as unique multi-dimensional training opportunities for the students enrolled in our program. This success story has been widely referred to as a cornerstone of health care training in the area.

The University of Ottawa, with its faculty members, support staff, and excellent teaching, training, and research facilities is poised to answer the hearing health care challenge for years to come. A solid core of teachers and researchers, excellent training and research facilities combined with a unique student population are spelling interesting times ahead for our program.

Seminars on Audition

Seminars on Audition is a one day non-profit conference relevant to audiologists, hearing instrument practitioners, researchers, and engineers interested in hearing loss, its prevention, assessment, and remediation. The following brief articles are from the participants at the latest conference – the 23rd annual – entitled "The front end is for music, and the back end is for speech."

All proceeds from Seminars on Audition go to sponsor the Seminars on Audition Scholarship which enables a University of Western Ontario audiology student in their final year of study to visit an extra-ordinary facility anywhere in North America. Support is also provided to the Poul B. Madsen Award through the University of Toronto Institute of Biomaterials and Biomedical Engineering. This is for a graduate student who demonstrates excellence in applied biomedical engineering.

Seminars on Audition: Listening to the Forest and the Trees

Steve J. Aiken, Assistant Professor, School of Human Communication Disorders, Dalhousie University, Halifax, Nova Scotia

Msot audiolgisots nkow taht sepech cna be udnsterood ealisy evne wehn ti is srevely ditsotretd. Well-known examples of distorted-but-intelligible speech include sine-wave speech[1] (where formant peaks are replaced with sine-waves), "Talkbox" speech (where vocal tract resonances are used to shape electric guitar sounds – famously used by Peter Frampton in the 1970s), and noise-vocoded speech[2] (where the temporal envelope is used to shape band-limited noise). In all of these cases, the detailed "fine-structure" of the speech differs widely, but the speech is nonetheless intelligible.

These amazing feats of comprehension belie the notion that speech details are important for understanding. They simply don't appear to matter, at least for adult listeners. But how is it possible to understand speech when its fine-structure has been replaced with noise, sine-waves, or an electric guitar?

What matters for speech understanding are not the fine details of the human voice, but the sound patterns that reflect the movement of the primary articulators – the tongue, jaw, and lips. The brain is a magnificent pattern analyzer, and it's capable of recognizing well-learned patterns, even when those patterns are presented in an unfamiliar way. It can even find meaningful patterns where none likely exist – in clouds, tea leaves, and toasted cheese sandwiches (A toasted cheese sandwich with the face of the Virgin Mary was sold on eBay for $28,000). As long as the pattern is intact, distorted details can be overlooked. Similarly, experienced readers have little difficulty reading text presented in unfamiliar fonts, or text with letters randomly rearranged. In other words, it's not the trees that matter, but the forest.

This suggests that speech should be intelligible as long as its general pattern is audible. However, many people with hearing loss continue to have difficulty even after being fitted with hearing aids. If a hearing aid has made speech audible, and distorted details can be overlooked, why do speech understanding problems persist?

This question can be answered by taking a closer look at fine-structure. In voiced speech, the glottis opens and closes in a sawtooth-like pattern, creating energy at the fundamental frequency (i.e., the rate that it opens and closes), as well as at even and odd harmonics (multiples) of this frequency. For instance, if the glottis opens and closes 100 times per second, energy is created at 100 Hz, 200 Hz, 300 Hz, and so on. This harmonic energy – called the "voice" – is the fine-structure of speech.

Although this voice-related information is unnecessary for speech understanding, it is crucially important for listening to speech in noise. Before the brain can analyze the sound patterns emitted by a particular speaker, it needs to tease those sounds apart from other sounds in the environment – a process called "auditory scene analysis.[3]" The fine-structure of the voice likely simplifies this process, since it carries the speech pattern of each speaker in a unique set of correlated harmonics. If a speaker has a glottal source frequency of 115 Hz, the speaker's vocal energy (and much of the speech sound pattern) will occur at 115 Hz, 230 Hz, 345 Hz, etc. A second speaker is unlikely to speak at the same pitch (and speakers tend to vary their pitch as they speak), so that speaker's sound pattern will be easy to distinguish. Sound localization, another component of auditory scene analysis, also depends on the fine-structure of speech.[4]

Sensorineural hearing loss usually involves a loss of spectral resolution in addition to a loss of audibility. Hearing aids can correct the audibility problem, but they cannot compensate for the peripheral distortions that impair the perception of the fine-structure of speech – details that aren't important for speech understanding, but are important for auditory scene analysis, and thus for listening in noise.

There are two lessons that we can take from this. First, since sensorineural hearing loss can make it difficult to separate sounds in noise, we should liberally employ technologies to help attenuate competing sounds, such as directional microphones and FM systems. Second, for all but the most severe hearing losses, hearing aids should provide near-perfect speech intelligibility in quiet (i.e., in the absence of concomitant neural or cognitive deficits). Are we meeting this goal? Many clinicians rely on manufacturer "first-fit" algorithms to program hearing aids, but these algorithms do not reliably provide sufficient audibility,[5] so there are likely many people who are receiving less than optimal benefit. Real-ear verification needs to become a standard part of the fitting process.

The human brain is a remarkable pattern analyzer. It is our job to make the patterns audible.

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The Experience of Relative Pitch

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In order to understand and appreciate most types of music, a basic sensitivity to the relations between pitches is required. One of the most basic aspects of relative pitch is the perception of interval size. Interval size becomes larger as the distance between two pitches increases. An assumption implicit in theories of music perception and cognition has been that the perception of interval size is not influenced by contextual factors. Thus, a semitone is treated as having a perceived size that is no larger or smaller than a semitone regardless of the particular context in which it was produced. In this brief report I will review some recent evidence suggesting that the *experience* of interval *size*, is strongly influenced by contextual factors. Contextual factors considered include pitch register, pitch direction, timbre, and visual information. The approach throughout much of this work has been to adopt the psychophysical method of magnitude estimation, asking listeners to scale the perceived size of a range of musical intervals under different presentation conditions. Although the contextual effects are most clearly demonstrated in untrained listeners, they may also be observed in trained listeners.

Effects of Transposition and Direction

In Russo and Thompson,[1] a large range of intervals (from 0.5 semitones to 2 octaves) was presented to listeners in low and high transpositions and in ascending and descending pitch directions. Interval size estimates were remarkably consistent across levels of training. However, perception of interval size was not veridical. Overall, intervals were perceived as larger when presented in the higher pitch range than in the lower pitch range and in the descending pitch direction than in the ascending pitch direction. Moreover, ascending intervals were perceived as larger than descending intervals when presented in a high pitch register, but descending intervals were perceived as larger than ascending intervals when presented in a low pitch register.

Effects of Timbre

Timbre is a non-pitch variable that is based on an amalgam of physical characteristics including phase spectrum, frequency spectrum, and transient characteristics of sound. In Russo and Thompson,[2] we investigated whether the timbral brightness of component tones in a pitch interval influenced the experience of size. Regardless of training, ascending intervals were experienced as larger when the timbre shifted from dull to bright. Similarly, descending intervals were experienced as larger when the timbre shifted from bright to dull. These timbral effects on interval size were not explainable by pitch distortions and were large enough to yield perceptual illusions. Recent work in my lab has shown that similar timbral effects may be obtained by manipulating the phonemic brightness (e.g., /da/ vs. /di/) of component syllables in sung music. These findings raise important questions about the independence of pitch and lyrics in the perception and representation of vocal music.

Multimodal Influences

A growing body of work is revealing that visual information is an important aspect of musical experience. For instance, a performer's body movements can have effects on perception of musical tension,[3] duration,[4] and emotion.[5] On the subject of relative pitch, research has shown that observers can "read" fundamental aspects of interval size from the facial expressions and head movements of singers. For example, participants are able to scale the size of pitch intervals using only visual information from the head and face.[5] Scaling data from audio alone and video alone presentations exhibit a robust linear correlation, suggesting that visual information could in this limited context be substituted for audio information.

Given this remarkable sensitivity to visual aspects of interval size, it's reasonable to expect that there may be important effects on interval size invoked by the visual context. Consistent with this expectation, we have found that an audio recording of a small sung interval presented in temporal synchrony with a video recording of a large sung interval is experienced as larger than the same audio recording presented with a visual recording of a small sung interval. This visual context effect appears to be automatic because it is resistant to instructions to attend exclusively to the audio. The visual context effect also appears to be pre-attentive in that it is resistant to attentional demands posed by a secondary task.

This report suggests that our everyday experience of relative pitch is essentially multidimensional and multimodal. Although it is possible to attend in an analytic manner to the isolated dimensions of music, our experience tends to be more holistic, involving the integration of auditory (and sometimes non-auditory) dimensions.

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Dr. EAG Shaw

In conversation with Marshall Chasin

Dr. E.A.G. Shaw's work, performed in the 1970s on free field to eardrum transfer functions and the acoustic characterstics of the outer and middle ear, is still relevant today. With the advent of real-ear measurement in the 1980s and its subsequent proliferation, Dr. Shaw's work is even more important today – both from a clinical and an academic perspective. In 1979, Dr. Shaw won the very prestigeous Rayleigh Medal awarded by the British Institute of Acoustics. The Canadian Acoustical Association has honoured him with the annual Edgar and Millicent Shaw Postdoctoral Prize in Acoustics, which is given to a young acoustic scientist in Canada.

MC: To start off, you were not born and raised in Canada. What encouraged you to come from England to the "colonies"?

EAG Shaw: Before I got my degree in England I was involved in war work, specifically with vacuum tubes which were the staple of radar at that time, and high-frequency cables which were being made of polyethelene at that time. After the war I decided to go back to school to get a degree and I went to Imperial College in London (where previously Boyle, of Boyle's Law fame [pressure is inversely proportional to volume] had done his work). This was roughly the MIT of England. After my PhD I went on to do postgraduate work under Dr. Stephens and then I needed a job. I came to the National Research Council (NRC) in Ottawa. The NRC had a very good reputation around the world at that time and still has.

MC: The understanding of many Canadian audiologists is that the NRC and name, EAG Shaw, are synonymous.

EAG Shaw: It was there long before me, but the acoustics section did develop while I was there and that was headed up by George Theissen. The way I got into studying about the ear is that there was a serious problem in the paper mills in Canada from excessive noise levels and subsequent noise induced hearing loss. This was before they had good hearing protectors. We were approached by the head of the engineering section of the NRC to see if we could provide them with better hearing protectors. After looking at the problem, we were so disgusted with what was on the market at that time that we started to do our own reseach on it. One of the problems at that time was that hearing measurement wasn't as accurate as it could be because of the interaction between the earphone and the ear. We started to study this problem and wondered whether it would be possible to do something better, and this is how I got in to studying the acoustics of the external ear. I soon found out that the information that was available was quite contradictory, so I tried to put it all together and to make some inferences of my own. I made quite a few measurements of my own in free field and with earphones. This led to the papers published in *JASA* (for example, 1974, vol. 56, 1848–61). The landmark publication was the chapter that I wrote for the Springer-Verlag publication on the external ear ("The External Ear," in *Handbook of Sensory Physiology*, vol.V, no. 1, W.D. Keidel and W.D. Neff, Eds., 1974).

MC: My next question was suggested by Bill Cole (president of Audioscan). Most clinicians are still using the old TDH-series of earphones for audiometry and its known (from your work) that there is a lot of individual variation in eardrum SPL for the same audiometer dial setting. Do you have comments on the acoustic characteristics of our ears that would limit the reliability and any comments on how it could be improved.

EAG Shaw: One of the ideas I had is that if you knew more about the acoustics of the outer ear we could design a better earphone and I had had the hope that I would be the one to design it, but that never came off. I found that designing an earphone that had a better interaction with the ear wasn't easy. The one that has some kind of attraction is the circumaural type (Shaw and Theissen, 1962 "Acosutics of Circumaural Earphones," *JASA*, 34, 1233–43) because it keeps out the environmental noise but the interactions with that type were even less well-controlled than conventional TDH-39 earphones.

MC: What is your opinion of the insert earphones that go directly into the ear canal that essentially destroys the concha-related resonance and ear canal contributions?

EAG Shaw: It depends on what you want to measure. I think that the method of measuring hearing is probably pretty good but you have to have the right transfer functions to compare it with the required information. I don't know how well developed that is – it wasn't developed back in the 1970s and 1980s when I was more active in the field.

MC: Your own work showed the effect of the concha-related resonance that is highly variable from person to person and its argued that this is one factor that is responsible for vertical sound localization. Would you agree with the statement that with insert earphones, at least we can get rid of the highly variable concha-related resonance, thereby improving test validity?

EAG Shaw: I think that you would indeed have better high-frequency reliability for that reason. However you can have a technique that is good but unless you have a lot of data to back it up, its use will be questionable.

MC: I am looking at the 1975 Seventh Danavox Symposium that you participated in entitled "Earmoulds and Associated Problems" organized by Stig Dalsgaard, (Scandinavian Audiology Supplementum 5) and during the question and answer portion you had stated that you didn't think it would be easy to generate and measure reliable stimuli above 10 kHz because the mass of the eardrum becomes significant.

EAG Shaw: Well, we know a lot more about the ear and the earcanal and more importantly the shape and orientation of the eardrum, than we did at that time. One of the things that is rather interesting is that the eardrum is at quite an acute angle relative to the main axis of the earcanal. And because of this, the high frequencies are transmitted better than I would have expected. I think that you get better transfer if the wave travels across the eardrum. However, the fact still remains that if you go above 10 kHz the transmission becomes very inefficient.

MC: We know that there is a lot of difficulty in transducing calibrated high frequency stimuli (for example, from your colleague at the NRC, Dr. Michael Stinson's work) and this leads me to a second question from Bill Cole – do you have any opinion about high-frequency audiometry and also about high-frequency transduction in hearing aids?

EAG Shaw: I suspect that all of the useful information, except vertical localization, is contained below 4 kHz. It used to be thought that high frequency audiometry could give some special information about the state of the ear but I don't know whether that has been realized. As far as the concha resonance (just above 4 kHz) in the free field we do know that some sound sources are better transferred to the ear if they are coming from above the plane and that's because of the fact that the diameter of the ear canal entrance is finite in diameter and when you bring sound in horizontally you are trying to excite the modes of the ear on a node, so sounds above the ear come in better than sounds on the horizontal plane.

MC: With a typical occluding hearing aid physically occupying the meatal entrance you would destroy this cue?

EAG Shaw: That is true and I would presume that would be a benefit of any non-occluding aid, but I don't know that much about the newer aids. The BTE hearing aids that I am wearing are about 15 years old but I have an open mold configuration. The actual hearing aids are Ensoniq – a manufacturer of musical instruments. They used multiband compression and WDRC, and were fit by Chuck Berlin at the Kresge Research Lab in New Orleans. I went down to give a seminar at Lousianna State University and they gave me these Ensoniq aids and I was very impressed with them.

MC: Currently we all pretty much use, or have access to, real ear measurement systems. That wasn't the case in the early 1970s. How did you do your work back then?

EAG Shaw: When I wanted to do some measurements on the free field response of the ear I found that the probe microphones that were available at that time worked well up to about 1,000 Hz and then they trailed off very badly. Now-a-days we have wonderful methods of equalizing and by using a computer, incorporting calibration corrections. We didn't have that in those days, so that what you got out of your little recorder was what you got – the raw SPL. If I could have a flat probe microphone that would simplify life significantly because I could read the graphs directly. I set out to make a probe microphone with a flat response and it came out pretty well. I think its flat out to about 10 kHz. It was a horn-coupled probe microphone and it was made by Bruel and Kjaer. It involved a probe tube, a horn, an acoustic network, and a microphone.

MC: Finally, a very important question in the minds of audiology students who read your publications. What does EAG stand for in E.A.G. Shaw?

EAG Shaw: Edgar, Albert, George Shaw. My parents chose the name Edgar because they liked it. Albert is my father's name, and George is after an uncle who was killed in WWI so it was in memory of him.

MC: Thank you Edgar for sharing your time with us.

Dr. EAG Shaw

En conversation avec Marshall Chasin

Le travail du Dr. E. A. G. Shaw sur le free field eardrum transfer et les charactéristiques de l'oreille externe et moyenne dans les années 1970 demeure toujours pertinent aujourd'hui. Avec l'avènement du real-ear measurement dans les années 1980, le travail du Dr. Shaw est encore plus important aujourd'hui, autant d'une perspective clinique qu'une perspective académique. En 1979, il gagna la prestigieuse médaille Rayleign qui fut accordée par le British Institute of Acoustics. The Acoustical Canadian Association lui accorda l'annuel Edgar and Millicent Shaw Postdoctoral Prize in Acoustics, un prix qui est présenté à un jeune chercheur en acoustique au Canada.

MC: Pour commencer, vous n'êtes pas originaire du Canada. Qu'est-ce qui vous as motivé de partir de l'Angleterre pour venir « aux colonies »?

EAG Shaw: Avant d'avoir obtenu mon baccalauréat en Angleterre, j'étais impliqué dans le travail d'armée, plus spécifiquement avec les tubes à vide qui étaient à la base du radar à cette époque, et avec les cables de haute fréquence qui étaient faites de polyéthylène à cette époque. Après la guerre, je me suis décidé de retourner aux études afin d'obtenir un baccalauréat et, ains, je suis allé au Imperial College en Londres (où Boyle, de Boyle's Law fame, avait fait son travail). Ce collège était considéré comme le « MIT » de l'Angleterre. Après avoir obtenu mon doctorat, j'ai continué mes études postuniversitaires sous la supervision du Dr. Stephens et j'avais besoin d'un emploi. C'est ainsi que je suis venu à Ottawa pour travailler au Conseil National de Recherche (CNR). Le CNR avait une très bonne réputation partout dans le monde à cette époque et encore aujourd'hui.

MC: Pour plusieurs audiologistes Canadiens, le CNR et le nom EAG Shaw sont synonymes.

EAG Shaw: Il était là bien avant mon arrivé, mais la section acoustique s'est développée pendant que j'y étais et cela était fut dirigé par George Theissen. J'ai commencé à étudier l'oreille car, à cette époque, il y existait un sérieux problème avec les moulins à papier au Canada dues aux niveaux de bruits excessifs qui causaient la perte auditive. Ceci fut bien avant le développement de bons protecteurs de l'audition. Nous avons été approchés par le chef de la section d'ingénierie du CNR et il nous demanda de leur fournir de meilleurs protecteurs de l'audition. Après avoir investigué le problème en question, nous étions très découragés de voir les produits disponibles sur le marché. Ainsi, nous avons commencé à faire notre propre recherche sur le sujet. Un des problèmes de cette époque était que les mesures d'audition n'étaient pas précises à cause de l'interaction entre le l'écouteur et l'oreille. Nous avons commencés à étudier ce problème en se demandant si nous pourrions améliorer le problème, et c'est ainsi que j'ai commencé à étudier l'acoustique de l'oreille externe. J'ai rapidement découvert que l'information disponible était considérablement contradictoire. Ainsi, j'ai essayé de tout mettre l'info ensemble afin de pouvoir arriver à faire mes propres inférences. J'ai fait plusieurs tests moi-même dans le champ libre et avec des écouteurs. Ceci a mené à la publication d'ouvrages dans le JASA (par exemple, 1974, vol. 56, 1848-61). La publication qui a fait date fut le chapitre que j'ai écris pour la publication Springer-Verlag au sujet de l'oreille externe ("The External Ear," in Handbook of Sensory Physiology, vol.V, no. 1, W.D. Keidel and W.D. Neff, Eds., 1974).

MC: Ma prochaine question à été suggérée par Bill Coles (le président d'Audioscan). La majorité des cliniciens se servent de la vielle série d'écouteurs TDH pour l'audiométrie et nous savons aujourd'hui (grâce à votre travail) qu'il existe de grandes variations individuelles du tympan SPL pour le même réglage audiométrique. Avez-vous des commentaires par rapport au sujet des charactéristiques acoustiques de nos oreilles qui pourraient limiter la fiabilité, ou des commentaires par rapport à comment ceci pourrait être amélioré?

EAG Shaw: J'ai eu l'idée selon laquelle si nous savions plus au sujet de l'acoustique de l'oreille externe nous serions en mesure de construire un meilleur écouteur et j'avais espéré être celui qui allait le construire, mais je n'y suis jamais parvenu. J'ai découvers qu'il était difficile de construire un écouteur ayant une meilleure interaction avec l'oreille. Le seul qui a eu du quelque peu de succès fut le type circumaural (Shaw and Theissen, 1962 "Acoustics of Circumaural Earphones," JASA, 34, 1233–43) car il ne prend pas compte du bruit dans l'environnement, mais les interactions avec ce type sont encore moins controllées que les écouteurs TDH-39 conventionnels.

MC: Quel est votre opinion des insert earphones qui sont placées directement dans le canal auditif, ce qui détruit essentiellement la résonance associé au pavillon et au conduit auditif?

EAG Shaw: Cela dépend de ce que tu désires mesurer. Je pense que cette méthode pour mesurer l'audition est très, mais tu dois avoir les bonnes fonctions de transfert afin de pouvoir les comparer avec l'information requise. Je ne connais pas la qualité de cette méthode puisqu'elle n'était pas encore développée dans les années 1970 et 1980 à l'époque où j'étais plus actif dans ce domaine.

MC: Votre travail a démontré que l'effet de la résonance associé à la conque varie grandement d'une personne à l'autre et il est soutenu que ceci est un facteur responsable pour la localisation sur le plan vertical. tes-vous d'accord avec l'énoncé suivant : avec des écouteur intra-auriculaires nous sommes au moins capable d'ignorer la grande variation du concha-related resonance et ainsi nous améliorons la validité de la mesure?

EAG Shaw: Je pense tout à fait que la fiabilité de la haute fréquence serait améliorée. Toutefois, il est possible de posséder une bonne technique, mais en autant que nous n'avons pas de données pour supporter son efficacité, son utilisation demeurera questionnée.

MC: Je suis en train de regarder le septième Danavox Symposium intitulé "Earmoulds and Associated Problems" en 1979 qui fut organisé par Stig Dalsgaard (Scandinavian Audiology Supplementum 5) et dont tu as participé. Pendant la période de question et réponses, vous avez annoncé que vous ne pensiez pas qu'il serait facile de générer et de mesurer de façon fiable des stimulis au-dessus de 10 kHz car la masse du tympan devient importante.

EAG Shaw: Nous savons beaucoup plus au sujet de l'oreille et du canal auditif, et encore plus important, nous savons plus au sujet de la forme et de l'orientation du canal auditif aujourd'hui qu'à cette époque. Il est intéressant de savoir que le tympan est à un angle très aigu par rapport à l'axe principale du canal auditif. Toutefois, il en demeure toujours que si tu dépasse 10 kHz, la transmission devient très innefficace.

MC: Nous savons qu'il est très difficile de faire la transduction de stimuli calibrés à haute fréquence (par exemple, du travail de votre collègue du CNR, Dr. Michael Stinson) et ceci me mène à une question posée par Bill Cole : Avez-vous une opinion au sujet de l'audiométrie à haute fréquence, et au sujet de la transduction de haute fréquence avec des appareils auditifs?

EAG Shaw: Je pense que toute l'information utile, à l'exception de la localisation sur le plan vertical, se retrouve au-dessous de 4 kHz. Autrefois, le gens pensaient que l'audiométrie de haute fréquence pouvait donner une sorte d'information spéciale au sujet de l'état de l'oreille, mais je ne sais pas si cela à encore été réalisé. En ce qui concerne la résonance de la conque (juste au-dessu de 4 kHz) dans le champ libre, nous savons que certains sons sont mieux transférés à l'oreille s'ils proviennent d'au-dessus du plan. Nous savons ceci dû au fait que le diamètre de l'entrée du canal auditif est limité en diamètre et lorsqu'on apporte un son de façon horizontale on essaye d'exciter les modes de l'oreille sur un noeud, aucun son ne provient mieux à l'orielle que des sons sur un le plan horizontal.

MC: Avec un appareil auditif causant de l'occlusion et occupant l'entrée du meatus, est-ce que l'on détruit cet indice?

EAG Shaw: Cela est vrai et je présume que ce serait un avantage de n'importe quel appareil « open », mais je ne sais pas grand-chose au sujet de nouveaux appareils. Les appparareils auditifs BTE dont je me sert ont à peu près 15 ans, mais j'ai une configuration « open ». Les appareils auditifs actuels sont des Ensoniq – une manifacturier d'instruments musicaux. Ils utilisent une compression WDRC sur plusieurs bandes, et ont été placés par Chuck Berlin au Kresge Research Lab en Nouvelle-Orléans. Je suis allé présenté un séminaire au Louisiana State University et ils m'ont donnés les appareils Ensoniq. J'étais très impressionné par ces appareils.

MC: En ce moment, nous utilisons pas mal tous, ou nous avons accès aux chaînes de mesure étymotique (real-ear). Ceci n'était pas le cas au début des années 1970. Comment accomplissiez-vous votre travail à cette époque?

EAG Shaw: Lorsque je voulais prendre des mesures sur la réponse de l'oreille dans le champ libre, j'ai découvert que les micro-sonde qui étaient disponibles à cette époque fonctionnaient bien jusqu'à 1000 Hz et ensuite diminuaient en efficacité. De nos jours, nous avons de très bonnes méthodes pour égaliser et en utilisant un ordinateur nous arrivons très bien à incorporer des corrections de calibration. Ceci était impossible à cette époque, donc ce que l'enregistreur te fournissait était tout ce que tu avais – les niveaux sonores bruts. Si j'avais une mesure micro-sonde égalisée cela simplifierait bien des choses car je pourrais lire les graphiques directement. Je me suis décidé d'en construire un et cela à fonctionné pas mal bien. Je pense que c'est plat jusqu'à à peu près 10 kHz. C'était un micro-sonde couplé à une corne et il a été fait par Bruel and Kjaer. Cela impliquait un micro-sonde, une corne, un réseau acoustique et un microphone.

MC: Finalement, une question dans la tête de tous les étudiants en audiologie qui font la lecture de vos publication: Qu'est-ce que le EAG représente dans E.A.G. Shaw?

EAG Shaw: Edgar, Albert, George Shaw. Mes parents ont choisis le prénom Edgar car ils aimaient bien ce prénom. Le prénom de mon père est Albert, et George est le prénom d'un oncle qui est décédé pendant la première guerre mondial donc c'est en sa mémoire que je porte son prénom.

MC: Je vous remercie, Edgar, d'avoir pris le temps de nous parlez.

Acceptable Noise Levels in Adults with Cochlear Implants

Erin C. Schafer, PhD and Jace Wolfe, PhD

About the Authors

Erin Schafer *is an assistant professor in the Department of Speech and Hearing Sciences at the University of North Texas, where she has held an academic appointment since August 2005. She received her BS degree in Communication Sciences from Texas Woman's University, and her MS and PhD degrees in audiology from The University of Texas at Dallas. Dr. Schafer has authored and co-authored papers in the* American Journal of Audiology, Journal of the American Academy of Audiology, Language, Speech, *and* Hearing Services in the Schools, *and* Journal of Educational Audiology. *Her research interests include the areas of speech perception in noise, cochlear implants, hearing aids, and assistive devices.*

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Abstract

According to results of speech recognition testing in noise and subjective questionnaires, adults who use cochlear implants experience significant difficulty in background noise. Another relatively new measure, Acceptable Noise Level (ANL), may also be beneficial for quantifying a patient's difficulty level in noise. To date, no publications have examined the viability of ANL for determining perceptual preferences of adults with cochlear implants. Therefore, the goals of this pilot study were to examine the variability of ANL in adults with cochlear implants and to determine how ANL relates to speech perception in noise and subjective hearing handicap. Results of the study suggest that ANL may be an important addition to clinical-testing protocols, as it cannot be predicted from hearing handicap or speech-in-noise thresholds. Determining that a patient has higher ANL scores may support the need for modifications to current cochlear implant programming and recommendations for assistive devices and aural rehabilitation programs.

Similar to users of hearing aids,[1,2] adults who use cochlear implants report significant difficulty hearing speech in noisy environments.[3] In cochlear implant research, a patient's level of difficulty in noise is often determined through speech-recognition testing and subjective questionnaires; however, there may be a clinical measure available to quantify perceptual effects of noise and preferences of adults using cochlear implants. Measurement of a patient's acceptable noise level (ANL) quantifies the level of noise that a person is willing to accept when listening to speech stimuli.[4] The measurement of ANL is a simple and efficient clinical procedure that is calculated by subtracting the patient's maximum background noise level (BNL) tolerance from his or her most comfortable listening level (MCL).

For adults with hearing loss, ANL may be used as a predictive measure to determine success with hearing aids. According to recent research, users with poorer (higher) ANLs are less likely to be long-term, consistent users of hearing aids.[4] According to this research, ANL is a better predictor for success with hearing aids than many other factors including speech recognition in noise, severity of hearing loss, age, gender, and subjective findings from outcome-assessment questionnaires (i.e., Profile of Hearing Aid Benefit). These findings suggest that, for people with hearing loss, willingness to tolerate more background noise (i.e., lower ANL) may predict success with amplification.

To date, there are no publications reporting ANL results of adults using cochlear implants. While ANL may not be used as a predictive measure for cochlear-implanted individuals, it could offer more valuable information about user success after cochlear implantation than traditional measures of hearing handicap and speech recognition in noise. Measurement of ANL may be helpful, because despite similar devices and equipment, speech-recognition performance and perceptual sound-quality judgments of people with cochlear implants vary because of numerous factors including age of implantation, age onset of hearing loss, duration of hearing loss, electrode insertion depth, duration of implant use, and speech-processor programming. Furthermore, even in adults with similar characteristics, large inconsistencies in ANL may exist. These findings support the idea that central regions of the auditory system may partially mediate ANL.[5] Difficulties in noise are of concern to professionals working with cochlear implants because of subjective reports and significantly degraded speech recognition in noise, spectral resolution, and auditory fusion across temporal gaps.[6–8]

The measurement of ANL for adults who use cochlear implants may be beneficial for determining individual preferences and needs from a subjective, but quantitative standpoint. Knowledge that an individual has a higher ANL than average may result in alterations to overall patient management in terms of counselling, implant programming, and recommendations for assistive devices. Furthermore, poor ANLs may indicate the patient's need for assistive listening devices as well as an auditory rehabilitation program and auditory training to better acclimate to challenging real-world environments.

Given the valuable information that may be obtained from conducting ANL measurements with users of cochlear implants, we conducted a pilot study with eight adults to examine the (1) variability of ANL in adults with cochlear implants and (2) how ANL relates to hearing handicap and speech-recognition performance in noise.

Method and Procedures

Eight adults, ages 43 to 75 (mean 60.6), with unilateral cochlear implants were included in the pilot study. Participants used Advanced Bionics Corporation Auria speech processors with HiResolution 90K (*N* = 5) or HiFocus CII (*N* = 3) internal devices for a minimum of two years. All adults used the HiRes S speech processing strategy, were post-lingually deafened, and used English as their first language.

Participants were tested in a double-walled sound booth, and stimuli were presented using an audiometer, compact disc player, and two loudspeakers. The signal and noise loudspeakers were located three meters from the participant's head at 0 and 180 degrees azimuth, respectively.

Prior to testing, the participants completed the Hearing Handicap Inventory for Adults

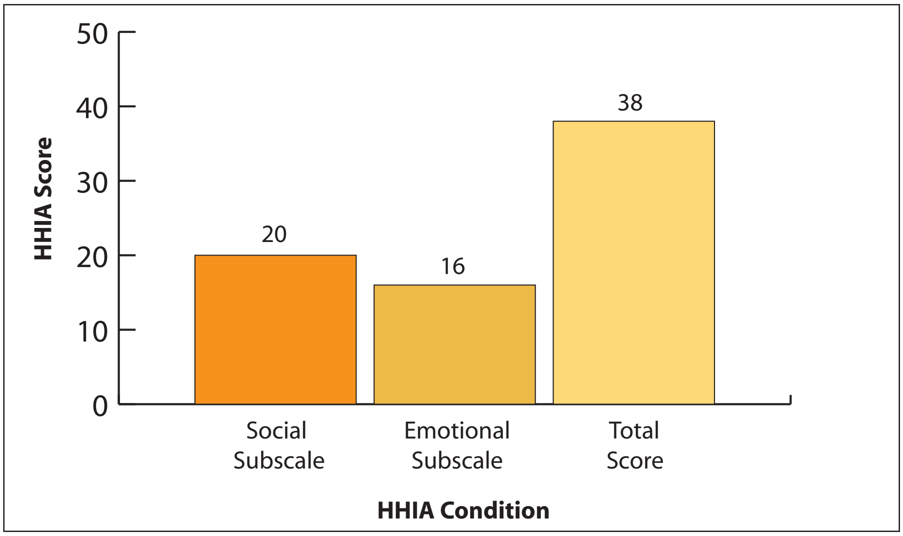

Figure 1. Average scores for the Hearing Handicap for Adults (HHIA). Questionnaire
Note: The line represents one standard deviation.

(HHIA).[9] The HHIA was selected because it is expected that a person's willingness to tolerate background noise could be related to overall hearing handicap, especially in social domains. Then, the adults completed the ANL and speech-recognition measures, which were counter balanced among the eight participants. The ANL and speech-recognition stimuli included sentences and multi-talker babble from the BKB-SIN test.[10] For speech-recognition testing, the BKB-SIN was used to measure a 50% correct speech-in-noise threshold based on the number of key words repeated correctly. For this type of testing, a lower signal-to-noise ratio score indicates a better outcome. The split-track recording of the BKB-SIN was used to present speech and multi-talker babble noise through the two separate loudspeakers. During testing, the speech signal was fixed at 60 dBA (41 dB HL) and the multi-talker babble automatically adapted from a +12 to +15 dB signal-to-noise ratio (step size 3 dB). Each patient was tested with two BKB-SIN list pairs to determine an average speech-in-noise threshold.

The procedure for ANL included measurement of MCL and BNL. For this testing, speech and noise signals were also presented from the two separate loudspeakers. For MCL, patients were asked to indicate their most comfortable listening level by having the examiner increase or decrease the intensity of the sentences according to a hand signal of thumbs up or thumb down, respectively. When the sentences were at a comfortable level, the patients were asked to signal with a flat hand. For BNL, patients were asked to indicate the background noise level that they would be willing to accept without becoming tense or tired while listening to the sentences at MCL. The same hand signals were used to increase or decrease the intensity of the noise until the patient indicated the BNL with a flat hand. The specific directions for the patients were similar to those used in the Nabelek et al.[4] study. The MCL and BNL procedures were repeated three times and averaged for each patient.

Results

As shown in Figure 1, the average HHIA score for the eight adults was 38 (SD = 17.8). According to previous research, this average score is similar to those of adults with mild (mean = 42; SD= 26) and moderate (mean = 49; SD = 20) sensorineural hearing losses.[9] The average scores on the social and emotional subtests were 20 (SD = 10.1) and 18 (SD = 8.5), respectively, which are also similar to those scored by individuals with mild and moderate sensorineural hearing losses.

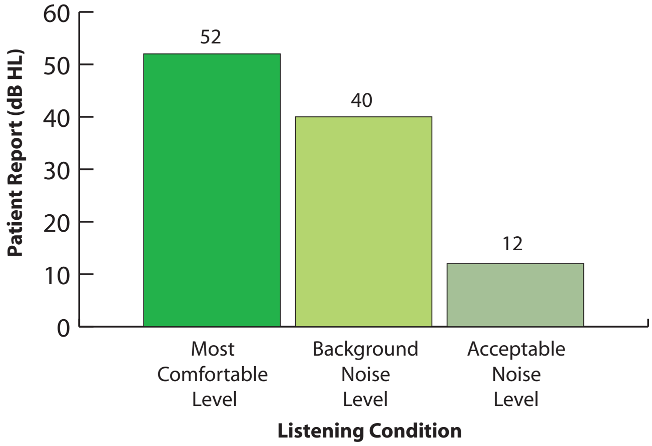

Figure 2. Average acceptable noise level measurements.
Note. The line represents one standard deviation.

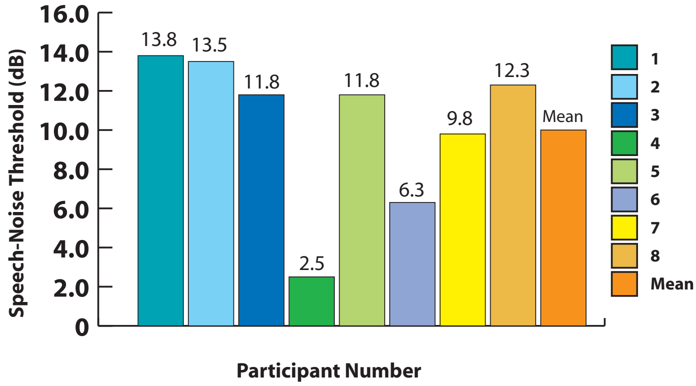

Figure 3. Individual and average speech-in-noise thresholds.
Note. The line represents one standard deviation.

The average ANL was 12 dB (SD = 5.1) with a range from 7 to 20 dB (Figure 2). According to these results, the adults with cochlear implants prefer listening at very favourable signal-to-noise ratios. The ANL was calculated from the average MCL of 52 dB (SD = 4.1) and the average BNL of 40 dB (SD = 5.6). The variability in ANL among the eight participants is similar to the spread of scores for adults with hearing loss who are non-users (mean = 14; SD = 14), part-time users (mean = 14; SD = 4), or full-time users (mean = 8; SD = 3) of hearing aids.[4]

The individual and average speech-in-noise thresholds on the BKB-SIN are shown in Figure 3. Average performance was 10.2 dB (SD = 3.9), which is substantially poorer than the average threshold of –2.5 dB (SD = 0.8) reported for adults with normal hearing.[10] Interestingly, the patient's speech-in-noise thresholds were close to his or her ANL score. All but one participant had a speech-in-noise threshold within 5.3 dB of his or her ANL score.

As shown in Table 1, relationships among ANL, speech-in-noise thresholds, and HHIA were examined by computing correlation coefficients. Significance tests were conducted for all moderate (>.30) and strong (>.50) relationships,[11] and a Bonferroni correction was used to correct for the multiple comparisons. The ANL scores did not significantly correlate with speech-in-noise thresholds or HHIA; however, thresholds did significantly correlate with the HHIA total score. In addition, BNL, HHIA social score, and HHIA emotional score significantly correlate with the MCL. The limited number of significant correlations with ANL suggests that it may be measuring a different aspect of listening than speech-in-noise thresholds or HHIA scores. Therefore, these traditional measures may not identify his or her true difficulties in noise.

Discussion

The goal of this pilot study was to examine the variability of ANL in adults with cochlear implants and to determine how this measurement relates to subjective hearing handicap and speech recognition in noise. ANL was easily measured in the adults with cochlear implants, and the variability of ANL scores was similar to those from adults with mild or moderate sensorineural hearing

Table 1. Correlation Matrix for Speech-in-Noise Thresholds, ANL, and HHIA.

	Threshold in Noise	MCL	BNL	ANL	HHIA Social	HHIA Emotional	HHIA Total
Threshold in Noise	1.00						
MCL	0.13	1.00					
BNL	0.02	0.47*	1.00				
ANL	0.08	0.28	-0.71*	1.00			
HHIA Social	0.54	0.38*	0.12	0.17	1.00		
HHIA Emotional	0.31	0.33*	0.11	0.14	0.83	1.00	
HHIA Total	0.46*	0.37	0.37	0.16	0.96*	0.95*	1.00

* = significant correlation at the .0045 level (Bonferroni correction), MCL=most comfortable level, BNL=background noise level, ANL = acceptable noise level, HHIA=Hearing Handicap Inventory for Adults.

loss.[4] The average ANL score suggests that the adults with cochlear implants preferred listening to speech in a positive signal-to-noise ratio of 12 dB.

Correlation analyses suggest no relationship of ANL to HHIA scores or speech-in-noise thresholds. The lack of correlation between ANL and speech recognition in noise was somewhat expected given the similar results for adults with sensorineural hearing loss and hearing aids in the Nabelek et al. study.[4] However, it is surprising that neither HHIA scores nor HHIA subtest scores are related to ANL scores. These results suggest that hearing handicap does not necessarily relate to a person's willingness to tolerate or listen to higher levels of noise. It is possible that another self-assessment questionnaire, more specifically focused on listening in noise (i.e., Abbreviated Profile of Hearing Aid Benefit), could relate to ANL. Overall, the findings of this pilot study highlight the utility of ANL for identifying patients who may perceive more difficulty in noise. Poorer ANLs may guide an audiologist to make changes to implant programming or provide recommendations for assistive devices or aural rehabilitation programs.

One possible alteration of implant programming is to adjust input dynamic range (IDR). The IDR describes the range or window of input levels that are coded in the speech processor within a person's electrical dynamic range. The IDR is often fixed in the speech-processor programming, but it can be changed in the programming of many speech processors. Some research suggests that a narrower IDR may improve speech recognition in noise, which could also address the issue of higher ANL.[12] A narrower IDR may improve a patient's ANL because it limits the range of inputs that the patient is internally processing.

Several assistive devices exist for improving listening in noise for individuals with cochlear implants including lapel microphones that are hard-wired to the speech processor and frequency-modulated (FM) systems. Personal FM systems for cochlear implants consist of a transmitter worn by the primary talker and a receiver, which is connected to the cochlear implant speech processor through a specialized cord, earhook, or adaptor. FM systems significantly improve speech recognition in noise of adults with cochlear implants.[13] and receiver and speech processor settings can positively alter the signal-to-noise ratio received by the listener. Many newer FM receivers have adjustable gain to allow for higher or lower levels of input from the FM system relative to the signals processed by the speech processor, thus controlling the signal-to-noise ratio. Also, several processors (e.g. Harmony and Freedom) allow for programmability of audio-mixing ratios between the signal from the FM transmitter and the signal from the processor microphone. For example, in the Harmony processor, a 50/50 ratio provides equal inputs from the FM system and processor microphones. However, a 30/70 ratio results in an attenuation of the processor microphone by 10 dB resulting in greater emphasis for the FM signal. We are in the process of determining the effects of these programmable options in the speech processor and FM receiver, and our data suggests that some adults will prefer 30/70 ratios or higher receiver-gain settings when listening in noisy situations.

One final recommendation that audiologist may consider for patients with higher ANLs is aural rehabilitation programs with an auditory-training component. Group rehabilitation programs may be helpful, or there are several home-based computer programs aimed at improving patient's listening in noise. Examples of computerized auditory-training programs include Seeing and Hearing Speech[14] and LACE – Listening and Communication Enhancement.[15] Both of these programs offer the patient extensive practice in listening to various speakers in background noise. It is possible that given more practice, a patient with a poor ANL could acclimate to higher levels of noise.

Summary

The primary findings of this pilot study were:

- ANL is an efficient and valuable clinical tool for identifying listeners with cochlear implants who cannot tolerate background noise.
- The variability of ANL scores for adults with cochlear implants is similar to adults with mild and moderate sensorineural hearing losses.
- ANL does not relate to a patient's speech recognition in noise or perceived hearing handicap.
- Measuring ANL for patients with cochlear implants will guide the audiologist in clinical decisions regarding the need for changes to implant programming or recommendations for assistive devices or aural rehabilitation programs.

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Age-Related Hearing Loss and Speech Recognition

Lorienne Jenstad, PhD
Associate Editor

Dubno JR, Lee F-S, Matthews LJ, et al. Longitudinal Changes in Speech Recognition in Older Persons. Journal of the Acoustical Society of America 2008;123(1):462?75.

What's really going on with our older clients? Does speech recognition really get worse with age, or is "hearing loss simply hearing loss" no matter what age of the client? These are important questions for both theoretical and clinical reasons. Theoretically, we are interested in knowing whether the entity we call presbycusis actually exists as its own type and cause of hearing loss, and what the different types of presbycusis are. Clinically, we need to know what to expect for our patients beyond the information we see on the audiogram. If age-related differences play a large role, the treatment and rehabilitation may need to be altered.

It's been difficult to separate the effects of aging from hearing loss for a simple and practical reason: generally, the two go hand-in-hand. In most studies, cross-sectional data are collected; that is, different groups of subjects (younger and older adults) are recruited and tested. If the two groups then differ significantly on speech recognition tests, we can't conclude that age "causes" differences in speech perception/ word recognition. We also have to look at any other potential differences between the two groups that might be associated with the difference in outcome. With age comes greater prevalence of hearing loss. If the two age groups have not been carefully matched for hearing loss, it is extremely likely that the groups will have different hearing status. Thus, the differences we see between the younger and older groups of listeners may be due to age, or they may be due to hearing loss. Because these two variables (age and hearing loss) are often *confounded*; that is, the effects of one cannot be separated from the other, it's been difficult to know whether the oft-heard complaints about speech understanding are due to a client's age or hearing loss, or some combination of the two factors.

Even if both groups of listeners have technically normal hearing, the range of hearing levels that can be labeled as normal hearing is quite wide, ranging from 25 dB HL down to –10 dB HL. If all the young adults have thresholds within the 0 to –10 dB HL range, and all the old adults have thresholds within the 20 to 25 dB HL range, *hearing* is still a confound between these two groups.

So, it is challenging to distinguish between hearing and aging. However, Judy Dubno and colleagues, at the Medical University of South Carolina, have recently published an article with an innovative approach to separating aging factors from hearing loss.

Using individual patients as their own controls, they measured speech recognition in adults age 55 and over at regular intervals; approximately every two to three years. Several measures and tests were done at each visit, including hearing thresholds, speech recognition thresholds, and speech recognition in quiet and noise for different materials (words and sentences).

This design doesn't directly solve the problem of separating aging from hearing loss. That is, as these subjects get older, their speech recognition might decrease, but their thresholds are also likely decreasing. Judy Dubno and her colleagues dealt with this problem by calculating audibility for *each* subject at each test time. Then it was possible to calculate how much speech recognition scores changed over the test intervals for each subject, and determine how much of that change was explainable simply by changes in audibility, and how much change was left over and therefore, likely attributable to age.

A large strength of their study is the relatively large number of participants: repeated tests of word recognition were available from 256 participants, and repeated tests of key word recognition in sentences were available from 85 participants.

The Upside of This Approach

Testing subjects over time in this longitudinal approach has at least a couple of advantages. First, it gives a larger number of data points, making the statistical estimate of the effect more *robust*. Second, with subjects serving as their own controls, it is possible to eliminate several potential confounds in interpreting age differences.

The Downside of This Approach

With longitudinal studies, there is always the danger of subject attrition (subjects who drop out or are unable to complete the next visits for various reasons). With an older subject population, this possibility in increased, as subjects drop out for health or mortality reasons. This may have the effect of an overly positive outcome, if the subjects who stay in the study are those who are healthier than those who drop out.

Their Key Findings

There are a lot of interesting results in this study, so I'd encourage you to read the article for yourself if you want to find out more. (Articles in the Journal of the Acoustical Society of America are available on-line; check your university library to see whether you qualify for access). However, here are the main points of interest:

First, word recognition in quiet did decrease significantly over time, more than would be expected simply due to audibility changes related to decreasing hearing thresholds. The change was small (a decrease of 0.74% per year), but cumulative over the span of many years, this becomes a noticeable effect within an individual. Remember, too, that this change is in addition to any changes in recognition due to hearing loss.

Second, females showed a greater rate of decline in word recognition than males. Again, this effect couldn't be accounted for by differences in initial thresholds. The differences were related to serum progesterone levels in the females (blood draws taken as part of the study showed that there was a correlation between high serum progesterone and declining speech recognition).

Third, recognition of key words in sentences, presented in a background of babble noise, did not decrease with age. This is an interesting finding, because it is different from many other studies that do not show an age effect for speech in quiet but do show an age effect for speech in noise (e.g., Dubno et al.,1 Gordon-Salant and Fitzgibbons,2,3 Helfer and Huntley4). The Dubno et al. finding may be more accurate than the cross-sectional studies that did show an age difference in noise, but their differences may also be due to some methodological issues such as practice effects on the materials. The authors have a good discussion of some factors that may have contributed to the lack of an age effect for recognition of key words in noise. This is a question that still needs to be investigated further.

What to Keep Watching For in the Literature

Researchers are working to find the mechanism behind age-related changes in hearing and speech recognition. The data in this study help to show that the mechanism of age-related auditory changes is different from changes due only to hearing loss. There is great interest in defining what, exactly, presbycusis is and whether hearing loss in older adults needs to be treated differently from hearing loss in younger adults. The gender difference in recognition provides some clues about the different causes of hearing loss between older males and females. I'm sure there will be exciting updates related to the role of progesterone in hearing.

Also, I'm sure we can keep looking for more findings from this group of researchers on this data set. They have recruited over 800 subjects, so the data reported in the article reviewed here are just a subset of what we can eventually hope to see.

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