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Acoustique canadienne est publié quantre fois par an, en mars, juin, septembre et décembre. Cette revue trimestrielle est envoyée gratuitement aux membres individuels de l'Association canadienne d'acoustique (ACA) et aux abonnés institutionnels. L'**Acoustique canadienne** publie des articles arbitrés et des rubriques sur tous les aspects de l'acoustique et des vibrations. Ceci comprend la recherche, les recensions des travaux, les nouvelles, les offres d'emploi, les nouveaux produits, les activités, etc. Les articles concernant les résultats inédits ou les applications de l'acoustique ainsi que les articles de synthèse, les tutoriels et les exposées techniques, en français ou en anglais, sont les bienvenus. L'Association canadienne d'acoustique a sélectionné **Paypal** comme solution pratique pour le paiement en ligne de vos frais d'abonnement. Paypal prend en charge un large éventail de méthodes de paiement (Visa, Mastercard, Amex, compte bancaire, etc) et ne nécessite pas que vous ayez déjà un compte avec eux. Si vous désirez procéder à un paiement par chèque de votre abonnement, merci de remplir le formulaire d'inscription et de l'envoyer au secrétaire exécutif de l'association (voir adresse ci-dessus). - - Dr. Roberto Racca - Canadian Acoustical Association/Association Canadienne d'Acoustique c/o JASCO Applied Sciences 2305–4464 Markham Street Victoria, BC V8Z 7X8 - - secretary@caa-aca.ca

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President's Message
Message du Président

Rejuvenation in sight!

In my previous post at this time last year, I told you about the many difficulties with our various computer servers (journal, conference, website, etc.). The situation is now back under control and our journal is professionally hosted by Public Knowledge Project (PKP), the very creators of the Open Journal System platform we use. I am very grateful to all CAA members for their patience, especially when we lost our Google Scholar! indexing, and in particular to Cécile Le Cocq, our system administrator and journal manager, for her help in fixing the many SQL scripts and routines.

For the first time since the COVID-19 pandemic, our annual Acoustics Week in Canada 2022 conference was held entirely in person in the memorable city of Saint John's (NL). On page 32, you will find a summary of the conference written by the AWC2022 organizing team, led by Professors Len Zedel and Benjamin Zendel of Memorial University. I would like to take this opportunity to warmly thank them and their colleagues for their excellent work and for a conference that I believe was particularly appreciated by all participants.

You will find on page 47 the minutes of our general membership meeting and on page 42 the minutes of the last Board of Directors meeting, as prepared by our Executive Secretary, Roberto Racca. In these minutes, you will find, among other things, the progress of the initiatives to which your Board of Directors is committed, and I am pleased to announce that the project to update our procedures to reflect the evolution of key roles over time (editor, media officer, etc.) will very soon be made available to all members via a wiki (https://wiki.caa-aca.ca/).

The fact that all the details of our association will be documented in this way and will soon be accessible should greatly facilitate the participation of new members in the administrative functions of the Canadian Acoustical Association. My hope is that this will allow more new - and young - members to get involved while quickly understanding their possible roles and responsibilities. I would even like to push with the Board of Directors a little further and see if we could make it possible for the terms of the elected directing members to be limited in time again, as it was before the revision of our statutes in 2014 under the presidency of Professor Frank Russo. This would, I think, allow for a quicker turnover of people, encouraging the involvement of more younger members, while limiting their time commitment and clarifying expectations. In short, this is

Rajeunissement en vue !

Lors de mon précédent message à pareille date l'année dernière, je vous parlais des nombreuses difficultés rencontrées avec nos différents serveurs informatiques (journal, conférence, site web, etc.). La situation est maintenant à nouveau sous contrôle et notre journal est hébergé professionnellement par Public Knowledge Project (PKP), les créateurs même de la plateforme Open Journal System que nous utilisons. Je suis très reconnaissant à tous les membres de la CAA pour leur patience, notamment lorsque nous avions perdu notre indexation sur Google Scholar!, et en particulier à Cécile Le Cocq, notre administratrice système et responsable du journal, pour son aide dans la correction des nombreux scripts et routines SQL.

Pour la première fois depuis la pandémie de COVID-19, notre conférence annuelle 2022 de la Semaine canadienne d'acoustique s'est tenue entièrement en présence dans la mémorable ville de Saint-Jean de Terre-Neuve. Vous trouverez à la page 32, un résumé de la conférence écrit par l'équipe organisatrice de AWC2022, dirigée par les professeurs Len Zedel et Benjamin Zendel de l'université Memorial. J'aimerais profiter de cette occasion pour les remercier chaleureusement, ainsi que leurs collègues, pour leur excellent travail et pour une conférence qui me semble avoir été particulièrement appréciée de tous les participants.

Vous trouverez à la page 47 le procès-verbal de notre assemblée générale des membres et à la page 42 le procès-verbal du dernier conseil d'administration, tel que préparé par notre secrétaire exécutif, Roberto Racca. Dans ces procès-verbaux, vous trouverez, entre autres, l'avancement des initiatives auxquelles votre conseil d'administration s'est engagées et je suis heureux de vous annoncer que le projet de mise à jour de nos procédures, afin de refléter l'évolution des rôles clés au fil du temps (rédacteur en chef, responsable des médias, etc.) va très bientôt être mis à la disposition de tous les membres via un wiki (https://wiki.caa-aca.ca/).

D'ailleurs le fait que tous les détails de notre association se retrouvent ainsi documentés et bientôt accessibles devrait grandement faciliter la participation de nouveaux membres aux fonctions administratives de l'Association canadienne d'acoustique. Mon souhait est que cela permette ainsi à plus de nouveaux -et jeunes- membres de s'impliquer tout en comprenant rapidement leurs possibles rôles et les responsabilités qui s'y attachent. Je souhaiterais même pousser avec le Comité de direction la réflexion un peu plus obviously an initiative that you will hear about again, and that will be discussed at our next Annual General Membership Meeting in October 2023 at AWC2023 in Montreal...

Peer review is the driving force of journal development, and reviewers are gatekeepers who ensure that our Canadian Acoustics journal maintains its standards for the high quality of its published papers. Thanks to the cooperation of our reviewers, in 2022, the average time to first decision was 13 days and the average time to acceptance was 62 days. In my name and in the name of the journal editorial board, we would like to express our sincere gratitude to all reviewers, listed on page 31 for their precious time and dedication, regardless of whether the papers were finally published.

Before you start reading this issue, please make sure your contact information, which is listed in the 249 Member Directory, starting on page 52, is up to date. Again this year, we have marked the missing fields with a "N/A" so that the missing information is clearly visible. Not having the divinatory abilities of Santa Claus, when we don't have your mailing address, we can't send you your newspaper!

With this usual call to action, I wish you a happy holiday season and a well-deserved rest.

Jérémie Voix
Président

loin et voir si nous pourrions faire en sorte que les mandats des membres directeurs élus puissent être à nouveau limités dans le temps, comme ce l'était avant la révision de nos statuts en 2014 sous la présidence du professeur Frank Russo. Cela permettait, je pense, un plus rapide roulement des personnes, favorisant l'implication de plus de jeunes membres, tout en limitant leur engagement dans le temps et en clarifiant les attentes. Bref, il s'agit évidemment d'une initiative dont vous entendrez à nouveau parler, et qui sera débattue lors de notre prochaine Assemblée générale des membres en octobre 2023 lors de l'AWC2023 à Montréal...

La révision par les pairs est la force motrice du développement d'une revue, et les réviseurs sont des gardiens qui veillent à ce que notre revue Acoustique canadienne maintienne ses standards de qualité élevés pour les articles publiés. Grâce à la coopération de nos évaluateurs, en 2022, le délai moyen de première décision était de 13 jours et le délai moyen d'acceptation était de 62 jours. En mon nom et au nom du comité de rédaction de la revue, je tiens à exprimer ma sincère gratitude à tous les évaluateurs, énumérés à la page 31, pour leur temps précieux et leur dévouement, que les articles aient été ou non publiés.

Avant de commencer à lire ce numéro, veuillez-vous assurer que vos coordonnées, qui figurent dans le répertoire des 249 membres, à partir de la page 52, sont à jour. Cette année encore, nous avons marqué les champs manquants par un "N/A" afin que les informations manquantes soient clairement visibles. N'ayant pas les capacités divinatoires du Père Noël, quand nous n'avons pas votre adresse postale, nous ne pouvons pas vous envoyer votre journal !

Sur cet appel à l'action habituel, je vous souhaite un joyeux temps des fêtes et un bon repos mérité.

Jérémie Voix
Président

METHODE HYBRIDE POUR LA CONCEPTION ET L'OPTIMISATION D'UN ÉCHAPPEMENT SILENCIEUX DE VOITURES DE COURSE FORMULA

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Résumé

Dans ce travail, une analyse CFD à plusieurs niveaux a été appliquée pour la conception d'un Système d'échappement silencieux de voiture de course Formula présentant de meilleures caractéristiques de niveau de pression acoustique (SPL) et de réponse dynamique des fluides. Les approches développées et appliquées pour le processus d'optimisation vont de la simulation 1D à la simulation CFD entièrement 3D, en explorant des approches hybrides basées sur l'intégration d'un modèle 1D avec des outils 3D. Les silencieux modernes ont généralement un système complexe de chambres et de voies d'écoulement. Il existe toute une gamme de mécanismes d'amortissement et d'absorption du son qui atténuent le son transmis par le silencieux et les tuyaux. Deux méthodes de calcul ont été sélectionnées pour cette étude. Le silencieux a une structure interne complexe contenant un tuyau perforé et un matériau fibreux. Le fichier CAO du silencieux a été créé pour développer le modèle FEA dans (AVL BOOST v2017) et un autre logiciel de conception avancée commercial (SolidWorks 2017). Le modèle FEA a été conçu pour surveiller les propriétés d'écoulement, la pression et la vitesse. Une fois le modèle vérifié, des études de sensibilité des paramètres de conception ont été effectuées pour optimiser le niveau de pression acoustique du silencieux. Les résultats de l'analyse par logiciels sont inclus dans l'article. Des recommandations sont formulées pour obtenir des courbes de niveau de pression acoustique (SPL) plus lisses pour diverses méthodes de mesure.

Mots clefs : Système d'échappement, silencieux, niveau de pression acoustique, analyse par éléments finis, simulation 1D et 3D

Abstract

In this work, a multilevel CFD analysis was applied for the design of a Formula race car muffler system with improved sound pressure level (SPL) and fluid dynamic response characteristics. The approaches developed and applied for the optimization process range from 1D simulation to full 3D CFD simulation, exploring hybrid approaches based on the integration of a 1D model with 3D tools. Modern silencers typically have a complex system of chambers and flow paths. There are a variety of sound damping and absorption mechanisms that attenuate the sound transmitted through the muffler and pipes. Two calculation methods were selected for this study. The silencer has a complex internal structure containing a perforated pipe and a fibrous material. The CAD file of the silencer was created to develop the FEA model in (AVL BOOST v2017) and another commercial advanced design software (SolidWorks 2017). The FEA model was designed to monitor flow properties, pressure, and velocity. Once the model was verified, sensitivity studies of the design parameters were performed to optimize the sound pressure level of the silencer. The results of the software analysis are included in the paper. Recommendations are made for smoother sound pressure level (SPL) curves for various measurement methods.

Keywords: Exhaust system, muffler, sound pressure level, finite element analysis, 1D and 3D simulation

1 Introduction

La conception d'un silencieux joue un rôle important dans les performances globales en BVC (Bruit, Vibration et choc) d'une voiture de course Formula. En règle générale, le contrôle du niveau et de la qualité du bruit des pièces de moteur des voitures de course est un aspect essentiel du processus de conception d'un nouveau système de transmission du moteur, afin de respecter les limites réglementaires et de fournir un son extérieur caractéristique [1]. En particulier, le bruit dynamique des gaz est émis par les systèmes de conduits d'admission et d'échappement du moteur en raison des écoulements très instables dans les canalisations, générés par le processus d'échange périodique de gaz dans les cylindres. La perte d'insertion et la perte de transmission du silencieux permettent d'évaluer ses performances. De nombreuses publications sont disponibles sur la conception acoustique et les méthodes de mesure des silencieux d'échappement. L'atténuation du bruit dynamique des gaz repose sur l'utilisation de silencieux hybrides, réactifs et dissipatifs, conçus et optimisés pour amortir ou accentuer certaines composantes spectrales du bruit du moteur. Par conséquent, la conception de systèmes d'amortissement complexes est une opération longue qui doit être réalisée au moyen de simulations numériques. L'objectif de cet article est de réaliser une analyse de sensibilité du silencieux de voiture de course Formula Student sur trois para-

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mètres de conception clés, à savoir l'emplacement de la cloison (tuyau perforé), la variation du volume de la chambre et l'insertion d'un matériau absorbant dans un silencieux réactif. Mohamad, 2019 [2] a présenté dans son article technique un processus efficace d'optimisation de la perte de transmission du silencieux réactif Audi A6 C6 2.0 TDi en utilisant l'analogie acoustique de Ffowcs Williams et Hawkings (FW-H). Ce dernier, a mis en œuvre la répartition de la vitesse, de la pression et du niveau de puissance le long des conduites du silencieux.

L'article révèle que le solveur acoustique non linéaire peut être utilisé pour modéliser la génération et la transmission du bruit à partir d'un écoulement turbulent initial statistiquement stable, ainsi que l'analogie acoustique FW-H. Mohamad et al., 2019 [3] ont utilisé une analyse CFD pour la conception d'un collecteur d'admission avec des caractéristiques améliorées de réduction du bruit et de réponse dynamique des fluides. Les approches développées et appliquées pour le processus d'optimisation vont de la simulation CFD 1D à la simulation entièrement 3D en utilisant la technique de couplage. Mohamad et Amroune, 2019 [4] ont exploré des approches hybrides basées sur l'intégration d'un modèle 1D et d'outils 3D pour décrire les effets de l'écoulement sur le niveau acoustique de la chambre d'échappement du moteur. Elles montrent la perte de transmission du silencieux à une fréquence différente de celle du solveur. Mohamad et al., 2019 [5] Dans leur étude de caractérisation acoustique basée sur la technique de la matrice de transfert (TMM), le résultat de leur étude d'un silencieux existant a été comparé aux données expérimentales d'essais au niveau du véhicule. La perte de transmission a été optimisée pour la nouvelle conception du silencieux; d'autres littératures ont joué un rôle important dans la validation de leurs résultats. Mohamad 2019 [6] a étudié plusieurs nouvelles techniques dans le cadre de cette revue de la littérature. Les derniers développements en matière de performances acoustiques ont été réalisés. La théorie de base derrière les deux approches est expliquée ainsi qu'une technique de caractérisation de source qui peut être utilisée pour relier les deux méthodes. Certains outils logiciels acoustiques ont été appliqués à divers systèmes d'échappement.

2 Méthodologie

Modèle CAO

La géométrie a été mise en œuvre sur la base du prototype actuel de silencieux réactif FS à l'aide du logiciel de conception avancée SolidWorks 2017, comprenant une entrée, une sortie, un tuyau perforé et une chambre. Le tuyau perforé était placé au milieu de la chambre de forme cylindrique du silencieux. La section transversale et les dimensions du silencieux sont expliquées à la figure 1.

3 Contexte analytique

3.1 Configuration du logiciel

Plusieurs procédures ont été réalisées pour effectuer la modélisation à l'aide d'outils de calcul dynamique des fluides et créer le design optimal pour une étude de cas utilisant l'optimisation AVL BOOST v2017 (logiciel commercial). Le silencieux étant en alliage de titane, les propriétés du gaz ont été sélectionnées directement dans les deux bases de données logicielles. Les conditions aux limites considérées pour l'analyse acoustique du débit sont représentatives du système d'échappement à plusieurs vitesses de moteur. Les détails sont montrés dans le schéma ci-dessous (Fig. 2).

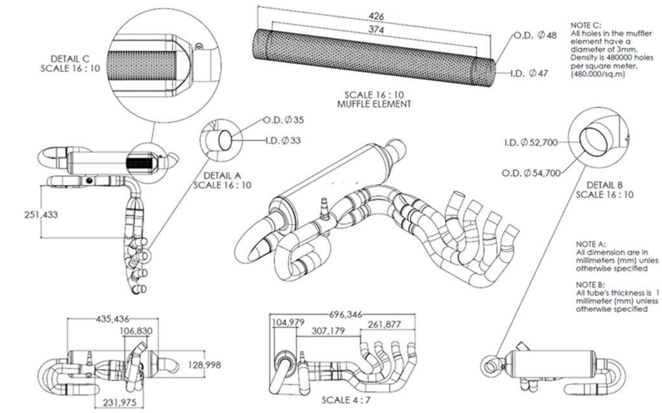


Figure 1 : La section et les dimensions du FS silencieux

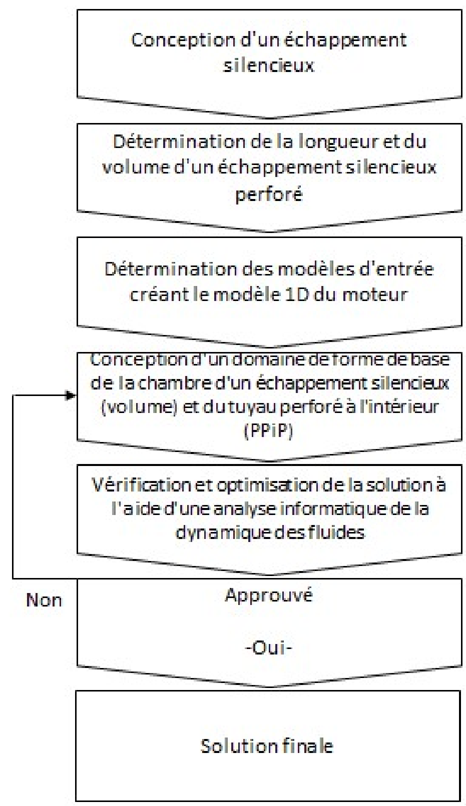


Figure 2 : Organigramme de la conception et un processus d'optimisation

Le modèle 1D créé dans AVL Boost implique une approche unidimensionnelle de la description des processus dans les systèmes d'admission et d'échappement du moteur à piston. L'énoncé unidimensionnel du problème permet d'estimer l'influence des dimensions des conduites et des canaux (diamètres, longueurs, rayons de congé) sur le débit de gaz.

L'ensemble du cylindre (section) est considéré comme un seul volume dans lequel se produisent les processus d'admission, de compression, de combustion, de détente et de sortie. Ce volume, contrairement à l'approche tridimensionnelle, n'est pas divisé en sous-domaines (volumes de contrôle ou finis). Le système d'équations (énergie, continuité, état des gaz) n'est écrit que pour un volume qui change avec le temps (dans l'approche tridimensionnelle - le système d'équations est résolu pour chaque volume de contrôle) (Tableaux 1 et 2).

Les conditions aux limites (BC) d'entrée - étaient les valeurs de débit massique et de température des points de mesure MP 19, 9, 21, 10 (Fig. 3). BC de sortie - pression en MP 10. En outre, la température de paroi d'une chambre externe d'un échappement silencieux a été définie: Tw = 573 K et le coefficient de transfert de chaleur (hc) = 50 W/m^2/K.

Les conditions initiales sont la température et la pression à l'intérieur du volume (les données ont été extraites des résultats du calcul dans Boost).

La chute de pression était définie comme la différence entre la pression dans le collecteur d'échappement à la sortie du cylindre et la section transversale à la sortie du silencieux (volume de calcul).

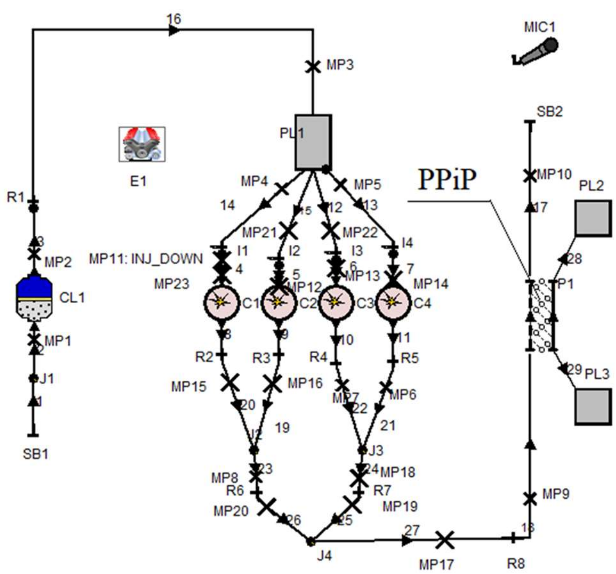


Figure 3: Schéma du moteur de la voiture de course Honda CBR 600RR (PC 37) avec tuyau perforé dans le (PPiP) faisant partie du silencieux.

Tableau 1 : Paramètres du tuyau perforé

Porosité	0.047 mm
Coefficient de décharge de porosité intérieure	0.6 mm
Coefficient de décharge de porosité extérieure	0.6 mm
Diamètre du trou de perforation	3 mm
Perforation-Épaisseur de parois	0.5 mm

Tableau 2 : Propriétés des cellules modèles

Propriétés	Cellules
Dimensions de base du maillage	0Nx = 82 Ny = 16 Nz = 20
Cellules liquides	565554
Cellules solides	259408
Cellules coupées	0
Nombre total de cellules	824962

Ce document a adopté une analyse par éléments finis à l'aide de la simulation de flux 3D SolidWorks 2017 pour calculer les performances du produit et les capacités du modèle géométrique du silencieux. La valeur de la rugosité est de 0,5 µm.

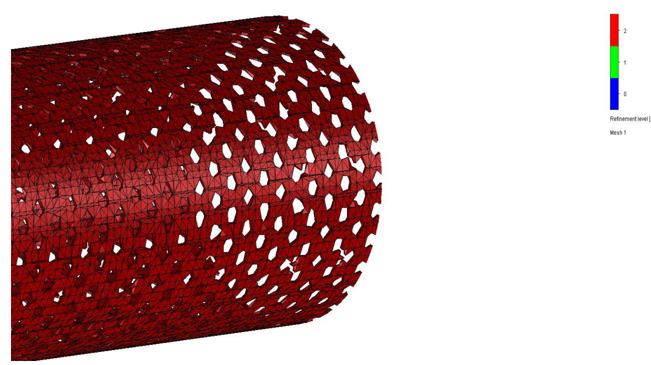


Figure 4: Raffinement du maillage de tube perforé.

3.2 Analyse mathématique

Le modèle mathématique repose sur les équations fondamentales du transport tridimensionnel instationnaires: les équations de quantité de mouvement (Navier-Stokes), d'énergie (Fourier-Kirchhoff) et de conservation de la masse (continuité), qui prennent la forme de Reynolds après le calcul de la moyenne. Procédure par la méthode Favre :

$$\bar{\rho}\frac{d\bar{W}_i}{dt} = \bar{G}_i - \frac{\partial \bar{P}}{\partial x_i} + \frac{\partial}{\partial x_j}\left[\mu\left(\frac{\partial \bar{W}_i}{\partial x_j} + \frac{\partial \bar{W}_j}{\partial x_i} - \frac{2}{3}\delta_{ij}\frac{\partial \bar{W}_k}{\partial x_k}\right) - \bar{\rho}\overline{W'_i W'_j}\right],$$

$$\bar{\rho}\frac{d\bar{H}}{dt} = \bar{G}_j\bar{W}_j + \frac{\partial \bar{P}}{\partial t} + \frac{\partial}{\partial x_i}\left(\bar{\tau}_{ij}\bar{W}_j\right) + \frac{\partial}{\partial x_j}\left(\lambda\frac{\partial \bar{T}}{\partial x_j} - c_p\bar{\rho}\overline{T'W'_j}\right), \quad (1)$$

$$\frac{\partial \bar{\rho}}{\partial t} + \frac{\partial}{\partial x_j}\left(\bar{\rho}\bar{W}_j\right) = 0;$$

où W_i, W_j, W_k sont les projections du vecteur vitesse, m/s; P est la pression, N/m^2; G_i est la projection du vecteur de densité des forces volumiques (N/m^3) sur la Ox$_i$ axe d'un système de coordonnées cartésien rectangulaire; H est l'énergie spécifique totale, J/kg; T est la température, K; μ est la viscosité dynamique, kg/(m·s), $\bar{\tau}_{ij}$ est la contrainte de Reynolds moyenne pour les composants, c_p est la capacité thermique à pression constante, J/(kg·K), λ est la conductivité thermique, W/(m·K); δ_{ij} est le symbole de Kronecker; t est la valeur de temps, s; et d/dt est le dérivé substantiel. Les équations utilisent la représentation de n'importe quel paramètre Φ (il peut s'agir de la vitesse W, de la pression P, de l'enthalpie H, etc.) comme la somme de sa moyenne $\overline{\Phi}$ et pulsation Φ' valeurs.

Le système d'équations de transport sous la forme de Reynolds (Eq. 1) est fermé par le modèle de turbulence *k-ζ-f* Ce modèle a été spécialement développé et vérifié pour les processus de flux, de combustion et de transfert de chaleur dans les moteurs à pistons [7, 8]. Le modèle *k-ζ-f* a trois équations : pour k l'énergie cinétique de la turbulence, pour ε le taux de dissipation de cette énergie connue du modèle de turbulence k-ε et les équations pour l'échelle de vitesse normalisée $\zeta = \overline{W}^2/k$ [9].

Des fonctions de paroi hybride ont été utilisées pour déterminer les paramètres de flux de gaz et de transfert de chaleur dans la couche limite [10].

Merkeret al., 2019 [11], Basshuysen et Schäfer, 2007 [12] et Kavtaradze et al., 2009 [13] ont souligné que ce modèle mathématique est typique des calculs CFD des processus dans les moteurs à pistons.

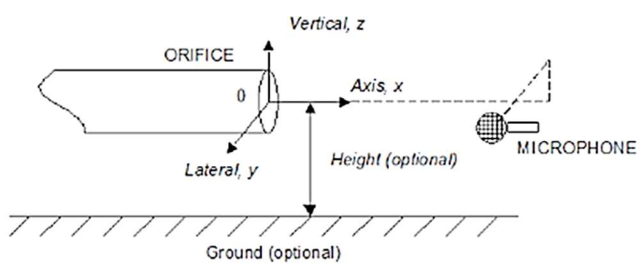


Figure 5 : Position de la limite du système par rapport au microphone

Les effets du bruit d'écoulement généré par la turbulence ont été déclarés par [14] :

$$L_w = \eta_w + 10\log(P_{amb}0.0075) - 17.5\log T + 20\log D + 45\log u - 26.9; \quad (2)$$

où L_w est le niveau de puissance de bruit généré par le flux global rayonné (dB); η_w est le facteur d'efficacité (dB); P_{amb} est la pression atmosphérique (Pa); D est le diamètre du tuyau (m) et u la vitesse d'écoulement du gaz (m / s).

La formule prédit le niveau de puissance du bruit une fois que la valeur du facteur d'efficacité est connue à partir de mesures expérimentales effectuées pour le silencieux spécifique. Cela inclut les effets de toutes les parties du système, y compris les changements de zone d'écoulement et les perforations. Le bruit d'écoulement prévu s'étend à toute la gamme de fréquences et non à des fréquences spécifiques.

Pour l'échappement silencieux des moteurs, différentes structures et paramètres du silencieux ont évidemment eu différentes influences sur la réduction du bruit. En raison du processus de travail complexe du silencieux, la manière de calculer et de concevoir théoriquement la structure interne du silencieux a toujours été un sujet de discussion.

Afin de déterminer l'effet du matériau absorbant (MA) et de la porosité du tuyau sur le niveau de pression acoustique, nous allons appliquer la formule suivante :

$$\text{Porosité du matériau} = 1 - (\text{Densité d'emballage}) / (\text{Densité matérielle}) \quad (3)$$

Les ressources de propriétés matérielles incluant la valeur de densité peuvent être trouvées dans la base de données du logiciel.

4 Résultats

4.1 Trajectoire d'écoulement

La figure 6 présente le contour de la répartition du champ d'écoulement du système de silencieux. Comme on peut le constater, la plus grande vitesse d'écoulement (52,799 m / s) se situe dans la conduite de raccordement de PPiP à la sortie du silencieux et la plus grande pression du silencieux corporel (102325,35 Pa) se trouve à l'entrée, comme le montre la figure 7.

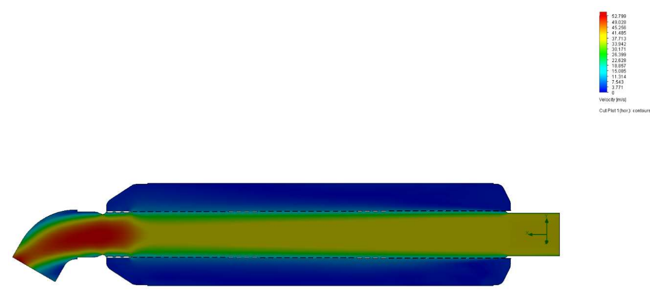


Figure 6 : La distribution de vélocité commence à droite (entrée) et sort à gauche (sortie) dans le silencieux PPiP.

La majeure partie du fluide à l'intérieur du silencieux PPiP est entrée directement dans le volume du silencieux à partir du tuyau perforé. De plus, les tubes perforés situés dans le silencieux avaient des trous dont le diamètre était très petit (3 mm) permettant d'augmenter la résistance de l'écoulement. A cause de la résistance élevée dans les trous, l'écoulement du fluide a été considérablement réduit (voir figure 7)

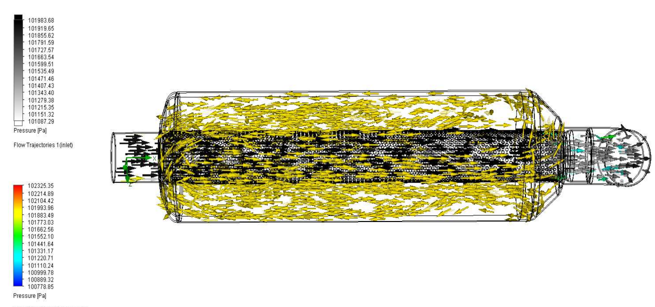


Figure 7 : Contour de pression (trajectoires de flux) dans le tube perforé et la partie volume du silencieux (entrée à gauche et sortie à droite).

Sur la base de calculs tridimensionnels, les valeurs de la perte de charge dans le silencieux simulé ont été obtenues en tenant compte de la présence d'un tuyau perforé interne. En outre, des modèles tridimensionnels ont permis de clarifier la valeur de la porosité du matériau. De plus, ces valeurs ont été utilisées pour étalonner le modèle 1D de système d'échappement dans AVL Boost.

4.2 Puissance de sortie

L'influence du diamètre (Dm_int), du diamètre du trou du tuyau intérieur perforé (Dm_hole), du diamètre de la coque du silencieux (Dm_ext) et de la longueur de la variation du silencieux sur les performances du moteur Honda, ont été contrôlées et optimisées sur la base du solveur AVL BOOST.

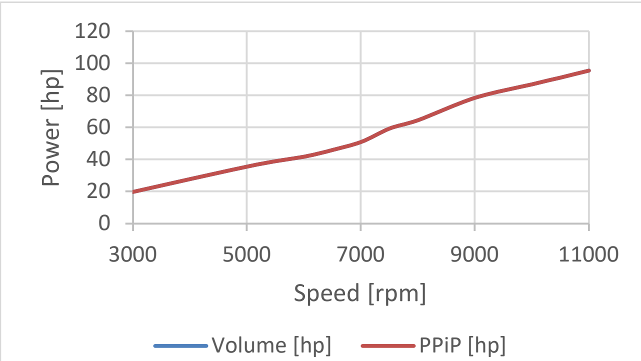


Figure 8 : Comparaison de la puissance du moteur de voiture de course Honda CBR 600RR (PC 37) avec volume et PPiP (Figure 3)

L'utilisation de types de silencieux d'échappement différents par rapport au moteur FS actuel n'a aucun effet sur la puissance, car aucun convertisseur de catalyseur ou refroidisseur intermédiaire ne permet de créer une contre-pression élevée (comme illustré à la Fig. 8).

4.3 Niveau de bruit

Comme on peut le voir à la figure 9, le silencieux modifié permet de réduire les niveaux de bruit, mais pour n> 3 000 tr / min, le niveau de bruit est toujours plus élevé que dans le cas d'une construction de silencieux à volume unique.

Cet article visait à optimiser le SPL moyen du silencieux au lieu de le prendre à toutes les fréquences. Il en résulte une augmentation de SPL avec une augmentation de la vitesse du moteur qui peut agir dans le domaine de fréquence.

4.4 Effet du paramètre de conception du silencieux sur le niveau de bruit

L'effet des paramètres géométriques du silencieux sur les performances de réduction du bruit est étudié et rapporté. La figure 10 montre une comparaison des niveaux de bruit émis par le moteur à une distance d'un mètre de la coupure du silencieux lorsqu'il utilise un silencieux de base et modifié. La simulation du bruit d'écoulement se propage pour le silencieux de base et la discussion de leurs facteurs d'influence, l'efficacité de cette théorie de la combinaison dans le domaine du flux insuffisant dans la gaine d'échappement reflète les conditions pratiques Le silencieux était relié au moteur de l'automobile.

Une dépendance significative des paramètres de fonctionnement du moteur, y compris le niveau de bruit, de la longueur de la conduite de sortie est déterminé par la propagation des ondes arrière à partir de l'extrémité ouverte de la conduite. En conséquence, le niveau de bruit le plus faible tout

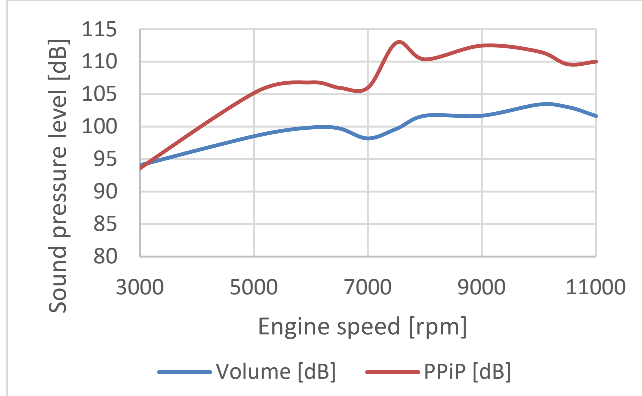


Figure 9 : Comparaison du niveau de pression acoustique du silencieux moteur pour voiture de course Honda CBR 600RR (PC 37) avec volume et PEeP (Figure 3)

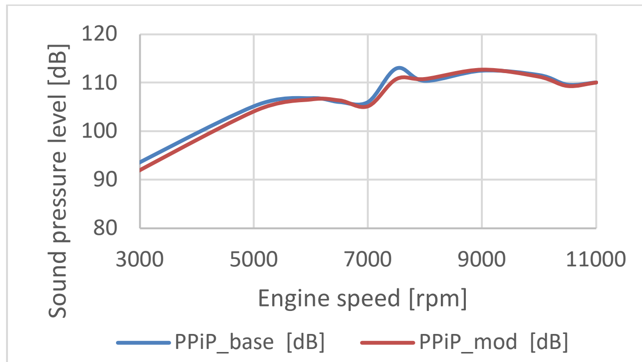


Figure 10 : Performances acoustiques du moteur Honda en cas d'embase (Dm_hole = 3 mm, Dm_int = 47 mm, Dm_ext = 116 mm, Lm = 426 mm) et modifiée (Dm_hole = 3 mm, Dm_int = 47 mm, Dm_ext = 126 mm, Lm = 436 mm) géométrie du silencieux avec tuyau perforé dans le tuyau.

en maintenant la puissance du moteur a été atteint lorsque Dm_out = 126 mm et Lm = 436 mm (Figure 11).

La figure 12 montre que l'utilisation d'un matériau insonorisant a permis de réduire le niveau de pression acoustique de 15 à 20% dans toute la plage de régime du moteur. En même temps, la résistance au débit de sortie augmente, ce qui réduit les performances effectives du moteur. En outre, pendant le fonctionnement du moteur, le matériau insonorisant peut être obstrué par des particules de suie présentes dans les gaz d'échappement, ce qui entraîne une augmentation de la résistance en sortie et une détérioration des conditions de fonctionnement du moteur. La combustion processus a été simulée dans les cylindres du moteur. Dans le modèle appliqué, il est également possible de simuler la formation de suie, mais pour un moteur SI avec mélange externe, les émissions de suie peuvent être négligées. Les processus de postcombustion ne sont pas simulés dans le système d'échappement et la modification de la température des gaz d'échappement résulte d'un échange de chaleur avec l'environnement. Un silencieux principal avait non seulement une masse plus légère, mais devait également garantir un SPL minimal à la sortie, problème d'optimisation à objectifs multiples. Tous les processus d'optimisation ont été effectués par le logiciel commercial.

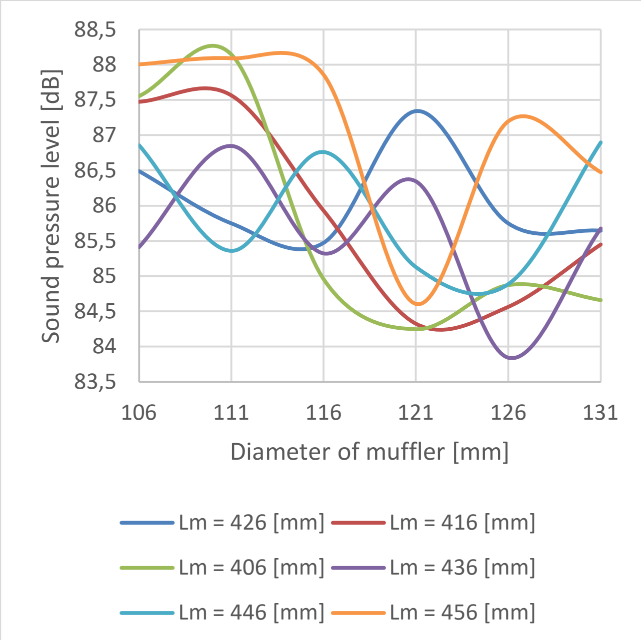


Figure 11 : Résultats de la variation de la longueur de la conduite (Lm) et du diamètre (Dm_ext) de la conduite externe non perforée (diamètre de la conduite interne perforée Dm_int = 47 mm, n = 2000 tr / min)

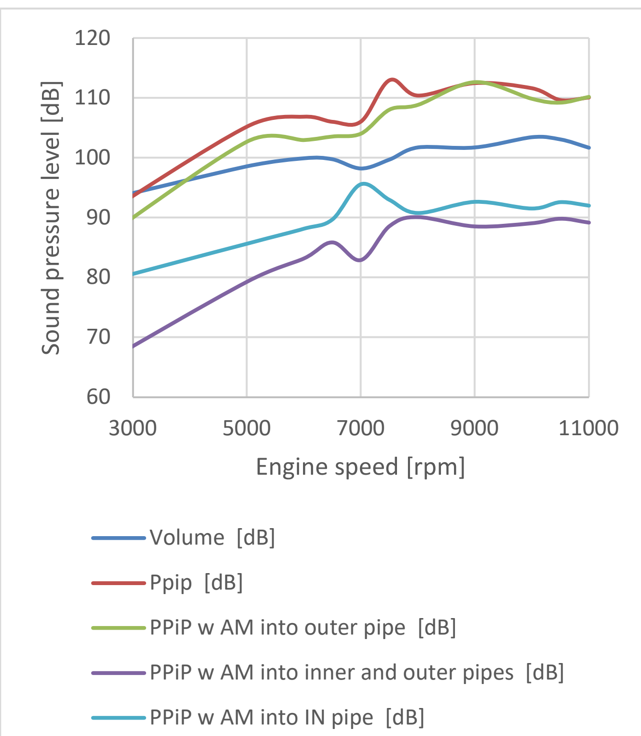


Figure 12 : Niveau de pression acoustique du moteur FS avec différents types de matériaux de silencieux

L'utilisation d'un matériau insonorisant permet de réduire considérablement le niveau de bruit du moteur à une taille comparable du silencieux.

Les paramètres du matériau absorbant (AM): porosité = 0.9 et résistivité à l'écoulement = 10000 N·s/m^4. La porosité du matériau représente la fraction de l'air dans le matériau (0 à 1). Dans notre cas, une porosité du matériau de 0,9 définit 10% du volume rempli de matériau et 90% d'espace pour les gaz.

5 Conclusion

Le problème acoustique est résolu en utilisant un matériau absorbant, ce qui est une étape possible dans la réduction supplémentaire du niveau de bruit. Les résultats de l'utilisation de AM dans le tuyau intérieur en premier, puis dans le tuyau extérieur et dans le silencieux en même temps sont présentés à la figure 12. L'échappement silencieux pourrait répondre aux exigences en matière de bruits d'échappement. La région plus large du tuyau perforé (PPiP) était principalement par régénération du flux d'air. Le silencieux a principalement réduit le bruit grâce à la transformation du flux d'air en énergie thermique dans un espace clos. L'utilisation de la simulation 1D et 3D des processus dans le système d'échappement peut réduire considérablement le temps et le coût de sélection de la taille optimale du silencieux et des tuyaux d'échappement. Dans notre cas, les résultats ont montré de grandes chances pour l'équipe Formula Racing Miskolc de sélectionner les dimensions, la géométrie et le matériau absorbant corrects du silencieux pour voiture de course formule.

References

[1] J. Cherng, W. Wu, P. Ding, M. Hebbes, and H. Zhang Design Optimization of Vehicle Muffler Transmission Loss using Hybrid Method. *SAE Technical Paper* 2015-01-2306,doi:10.4271/2015-01-2306, 2015.

[2] B. Mohamad. Design and optimization of vehicle muffler using the Ffowcs Williams and Hawkings model.*Machine Design*,11, (3),pp. 101-106, 2019.

[3] B. Mohamad, and A. Zelentsov 1D and 3D Modeling of Modern Automotive Exhaust Manifold. *Journal of the Serbian Society for Computational Mechanics*, 13,(1), pp. 80-91, 2019.

[4] B. Mohamad, and S. Amroune The analysis and effects of flow acoustic in a commercial automotive exhaust system. *Advances and Trends in Engineering Sciences and Technologies III, Proceedings of the 3rd International Conference on Engineering Sciences and Technologies* (ESaT 2018), September 12-14, 2018, High Tatras Mountains, TatranskéMatliare, Slovak Republic, pp. 197-202, 2019.

[5] B. Mohamad, and J. Karoly, and M. Kermani Exhaust system muffler volume optimization of light commercial passenger car using transfer matrix method. *International Journal of Engineering and Management Sciences (IJEMS)*, 4, 132-139, 2019.

[6] B. Mohamad. A review of flow acoustic effects on a commercial automotive exhaust system. *Mobility and Vehicle Mechanics,* 45, (2), pp.1-4, 2019.

[7] R. Tatschl, J. Schneider, D. Basara, A. Brohmer, A. Mehring, and K. Hanjalic Progress in the 3D-CFD calculation of the gas and water side heat transfer in engines, in 10. Tagung der Arbeitsprozess des Verbrennungsmotors (Proc. 10th Meeting on the Working Process of the Internal Combustion Engine), Graz, Austria, 2005.

[8] R. Tatschl, B. Basara, J. Schneider, K. Hanjalic, M. Popovac, A. Brohmer, and J. Mehring, Advanced Turbulent Heat Transfer Modeling for IC-Engine Applications Using AVL FIRE. Proceedings of International Multidimensional Engine Modeling User's Group Meeting. Detroit, USA, 2006.

[9] K. Hanjalić, M. Popovać, and M. Hadziabdić, A Robust Near-Wall Elliptic-Relaxation Eddy-Viscosity Turbulence Model for CFD. *Int. J. Heat Fluid Flow*, 25. 897-901, 2004.

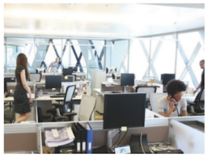
[10] M. Popovać, K. Hanjalić Compound Wall Treatment for RANS Computation of Complex Turbulent Flow. Proc. 3rd M.I.T. Conference, Boston, USA, 2005.

[11] G. Merker, Ch. Schwarz, and R. Teichmann Grundlagen Verbrennungsmotoren: Funktionsweise, Simulation, Messtechnik (Fundamentals of Internal Combustion Engines: Mode of Operation, Simulation, Measurement Technology), 9th ed.; Springer: Wiesbaden,1117 p., 2019.

[12] R. Basshuysen, and F. Schäfer (Hrsg.) Handbuch Verbrennungsmotor. 4. Auflage. Vieweg und Sohn Verlag. Wiesbaden, 1032 p., 2007.

[13] R. Z. Kavtaradze, D. O. Onishchenko, A. A. Zelentsov, and S. S. Sergeev The influence of rotational charge motion intensity on nitric oxide formation in gas-engine cylinder. *Int. J. Heat Mass Tran.,* 52, 4308–4316. DOI: 10.1016/j.ijheatmasstransfer.2009.03.060., 2009.

[14] A. J. Green, and P. N. Smith Gas flow noise and pressure loss in heavy vehicle exhaust systems. Part 1: Experimental programme. Part 2: Design data. Institution of Mechanical Engineers, 112, ISBN: 0266-7045, 1988.

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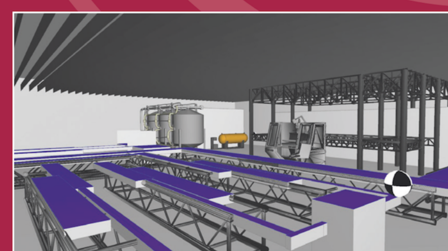

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HEARING LOSS: ETIOLOGY, IDENTIFICATION AND INTERVENTIONS

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Abstract

Hearing loss is characterized by increasing difficulty in hearing, interpreting and understanding the sounds. Although many acousticians are familiar with hearing trauma caused by loud sounds, a significant part of the acoustics community has limited knowledge on how hearing loss is identified, its consequences in everyday life, or the latest innovations in terms of management. This article summarizes the types and degrees of hearing loss, and its impact on quality of life. The main methods of evaluation (audiometry, tympanometry, acoustic reflex threshold, auditory evoked potentials) and treatments (hearing aids, cochlear implants, auditory brainstem implants) are also discussed to raise awareness of the day-to-day clinical audiology reality to the Canadian acoustic community.

Keywords: audiology, hearing loss, evaluation, hearing aids, bone conduction implants, cochlear implants, auditory brainstem implants

Résumé

La perte d'audition se caractérise par des difficultés croissantes à entendre, interpréter et comprendre les sons. Bien que de nombreux acousticiens soient conscients des traumatismes auditifs causés par les sons forts, une partie importante de la communauté acoustique a des connaissances limitées sur l'identification de la perte auditive, ses conséquences dans la vie quotidienne ou les dernières innovations en termes de prise en charge. Cet article résume les types et degrés de perte auditive, ainsi que leurs impacts sur la qualité de vie. Les principales méthodes d'évaluation (audiométrie, tympanométrie, réflexe stapédien, potentiels évoqués auditifs) et de traitement (prothèse auditive, implant cochléaire, implant du tronc cérébral) sont également abordées afin de sensibiliser la communauté de l'Acoustique Canadienne aux réalités de l'audiologie clinique quotidiennes.

Mots clefs: audiologie, surdité, évaluation, prothèses auditives, implants auditif en conduction osseuse, implants cochléaires, implants auditifs du tronc cérébral

1 Introduction

Hearing loss is an invisible disability that affects 1.5 billion people worldwide [1]. According to the WHO, this number could rise to 2.5 billion people by 2030. In addition to depriving a person's main sense used for communication, hearing loss is associated with depression [2], and social withdrawal [3]. More drastically, hearing loss is predictive of dementia [4]. For children, hearing loss is a major barrier to normal speech and language development [5]. This can lead to learning problems that ultimately hinders academic achievements. Annually, the cost of the global burden imposed by hearing loss is estimated to be US$ 960 billion [1].

This paper aims to report the most methods employed to identify hearing loss as well as the existing treatments and interventions. Section 2 reports what is hearing loss. The types, degrees and impact of hearing loss are presented in Sections 2.2, 2.3, and 2.4 respectively. Most common methods employed to evaluate the degree and type of hearing problems are described in Section 3. Sections 4 address the possible treatments and interventions. Conclusions are reported in Section 5.

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2 What is Hearing Loss ?

Hearing involves the transduction of mechanical energy coming from sound waves to electrical signals that are interpreted by the brain. The peripheral auditory system can roughly be divided into three parts : the external, middle, and inner ear. Hearing loss arises when one or more of these components are disrupted resulting in lowered sensitivity to sounds when compared to normal hearing, or reduced speech intelligibility.

The hearing sensitivity, or degree of hearing, is evaluated by measuring the hearing threshold for pure tones of different frequency, typically from 250 to 8000 Hz. The degree of hearing loss is based on these thresholds measured with earphones, which are also referred to as air conduction (AC) thresholds. Classification of hearing loss is based on a continuum from mild (thresholds between 25 and 40 dB(HL)) to profound (95 dB(HL) or more). It is common for the degree of hearing loss to be different from one frequency region (low, mid or high frequencies) to the other.

Another type of transducers used in audiometry is the bone conduction (BC) vibrator. The BC vibrator is placed against the skull, usually the mastoid bone, to obtain BC thresholds, which essentially represent the response of the inner ear. Bone conduction testing bypasses the conductive portions of the auditory pathways (outer and middle ear) [6]. Hearing loss is characterized by the nature (type) of hearing loss, and the degree of hearing loss at different frequencies in each ear. This information allows clinicians to approximate expected functional difficulties, to recommend personalized treatment plans, and to establish baselines for future auditory surveillance. Hearing loss is often visually represented on an audiogram where the tested frequencies are on the x-axis and the hearing threshold is on the y-axis (see Fig. 1).

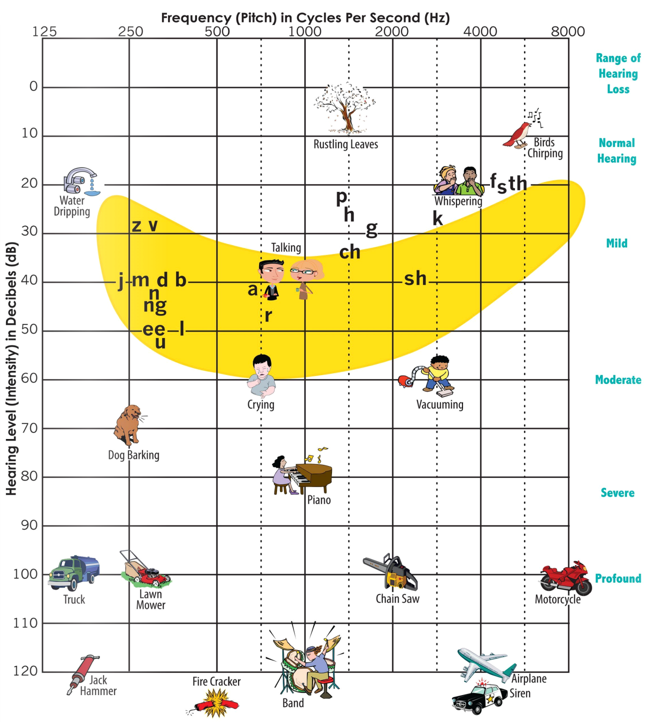

FIGURE 1 – Audiogram of familiar sounds. Image courtesy of John Tracy Center (https ://www.jetv.org).

2.1 How is hearing loss measured ?

Audiometry is performed in a soundproof booth where hearing acuity is assessed for different tones and/or different speech stimuli. Pure tone audiometry is a fast and simple way to assess a patient's hearing. Sensitivity to sounds is generally assessed at different frequencies (usually between 0.25 – 8 kHz) for each ear, but more and more clinics also evaluate the hearing thresholds in the extended high-frequency range (10 to 20 kHz) to monitor the effect of chemotherapy on the hearing system for example, or other ototoxic medication [7]. The threshold is defined as the lowest intensity at which the patient hears the tone at least 50% of the time [8]. The thresholds are used to determine the degree of hearing loss.

Pure tone audiometry can be performed via air conduction (AC) or bone-conduction (BC). Air-conduction thresholds are determined as the sounds travel through all the structures of the ear. They are evaluated using headphones. Bone-conduction thresholds are obtained by using a bone vibrator which transmits the sound through the skull directly to the inner ear, bypassing the external and middle ear [9]. By comparing the results obtained by these methods, clinicians can determine the nature of the hearing loss.

The results for each ear are represented on an audiogram where the x-axis represents the tested frequencies, and the y-axis represents sound intensity. The symbols on the audiogram will usually represent the thresholds. This graphical representation allows clinicians to quickly identify hearing loss configurations. A hearing impairment that is progressively worse in the high frequencies (commonly called "ski slope" due to its particular shape) is often associated with the age-related hearing loss. Hearing loss centered around 4kHz can be observed in cases of noise-induced hearing loss. A hearing loss in the middle frequencies with normal thresholds in the lows and the highs (cookie-bite) can be associated to congenital hearing loss [10].

Validity of the test can be compromised if the patient does not fully understand the instructions (e.g. language barrier or young children), the patient is not attentive (e.g. fatigue), or if the patient is a malingerer. It is always important to crosscheck the results of pure tone audiometry with other tests.

2.2 Types of Hearing Loss

Sensorineural Hearing Loss

A sensorineural hearing loss is identified when the hearing thresholds are at the same level in air and bone conduction (see Fig. 2a). It occurs when there is damage to the inner ear and/or damage to the nerve that relays information from the ear to the brain. Noise exposure, ototoxic medication, and aging are, among others, causes of this type of hearing loss. The hair cells of the inner ear (the cochlea) are not only responsible for the detection of sounds, but also for providing the ability to discriminate between different sounds [11]. Thus, degradation of these hair cells will not only result in a reduction of perceived loudness but also a reduction in the clarity of sounds. In some rare cases, the information transmitted from the cochlea to the brain can become desynchronized. This condition called Auditory Neuropathy Spectrum Disorder (ANSD) results in compromised speech understanding accompanied by variable hearing loss [12]. For most cases, sensorineural hearing loss is permanent.

Conductive Hearing Loss

A conductive hearing loss is identified when the hearing thresholds obtained with bone conduction are significantly bet-

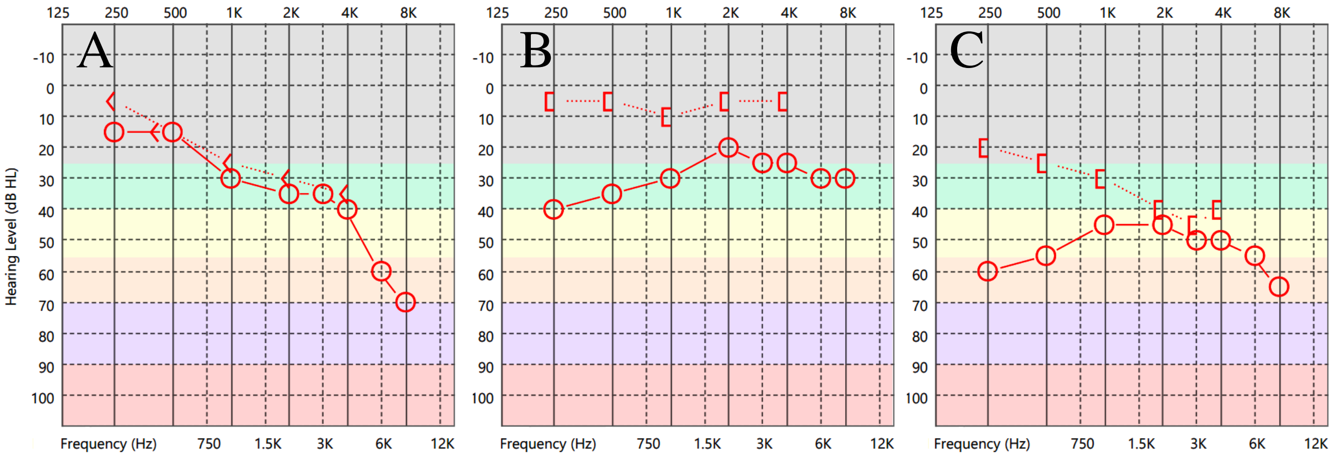

FIGURE 2 – Example of audiograms. A : sensorineural hearing loss in high frequency assessed on the right ear. Both air-conducted (◯ symbols) and bone-conducted (< symbols) thresholds show normal hearing from 250 to 500 Hz followed by a mild sloping to moderately severe sensorineural hearing loss from 1 to 8 kHz. B : conductive hearing loss assessed on the right ear. The masked bone-conducted thresholds are within normal range but the air-conducted thresholds are in the mild range. C : mixed hearing loss assessed on the right ear. Both air-conducted and masked bone-conducted ([symbols) thresholds are in the abnormal range, with a significant air–bone gap, also called AB gap, greater $\geq$ 15 dB in the low frequency range. Normal hearing is indicated by the grey area. Green, yellow, orange, purple and red areas respectively denote mild, moderate, moderately severe, severe, and profound hearing loss.

ter (difference greater than 10 dB) than those obtained with air conduction (see Fig. 2b). It occurs when sound waves are not transmitted efficiently through the outer and/or the middle ear. These first two parts of the peripheral auditory system mainly serve as conductive parts of the ear, as well as amplifiers for the sound waves before reaching the inner ear. Examples of outer ear complications include excessive accumulation of cerumen and auditory canal malformations, such as exostosis which are common in cold water divers. Ear infections (otitis media), tympanic membrane perforation, and damage to the ossicles are potential contributors to conductive hearing loss involving the middle ear [11]. When a sound is loud enough, it can overcome the loss of natural amplification. Most cases of conductive hearing loss s are reversible and can be treated. However, when no intervention is possible, the hearing impairment will persist.

Mixed Hearing Loss

A hearing loss that occurs in both the conductive and sensorineural arts of the ear is called a mixed hearing loss. The hearing thresholds obtained with bone conduction are significantly better (difference greater than 10 dB) than those obtained with air conduction (see Fig. 2c), but in both cases that are showing a hearing loss. Mixed hearing loss (see Fig. 1c) is the combination of conductive and sensorineural hearing loss. While the conductive component can possibly be treated, the sensorineural component is considered a permanent hearing loss. An example of mixed hearing loss is an older individual with age-related hearing loss that presents with a perforated ear drum. The sensorineural component of the hearing loss is associated to presbycusis whereas the conductive component of the hearing loss is associated to the perforated ear drum.

Central Hearing Loss

Auditory information is relayed from the peripheral auditory system to the central auditory system via the auditory nerve. The signal passes through several structures before reaching the auditory cortex. These structures include cochlear nucleus, superior olivary nuclei, lateral lemniscus, inferior colliculus, and medial geniculate nuclei. More complex processing of the auditory information is carried out as it ascends towards the central auditory system. Additionally, auditory information is also influenced by top-down control via the medical olivocochlear (MOC) efferent system. It is believed that this efferent system contributes to protect the cochlea from intense sounds as well as facilitate speech-in-noise recognition [13].

Central hearing loss occurs when there are alterations or damage to these higher order structures. In a typical audiology clinic, it is not possible to directly access the integrity of these structures. However, central hearing loss often manifests itself as behavioral difficulties that include, but that are not limited to worse-than-expected difficulties with hearing in noise, difficulties with sound localization, difficulties following rapid speech, academic difficulties related to reading or spelling, difficulties paying attention, and frequent requests for repetition. These symptoms are observed despite normal results for the peripheral auditory system evaluation [11]. Speech in noise tests can be used to document these difficulties. Additionally, evaluation of the auditory processing abilities can be performed to attempt to identify specific weaknesses relating to higher order sound processing.

2.3 Degree of Hearing Loss

In addition to its nature, hearing loss is also characterized by a degree or severity. The degree of hearing loss ranges from mild to profound. It is determined as how loud a sound needs

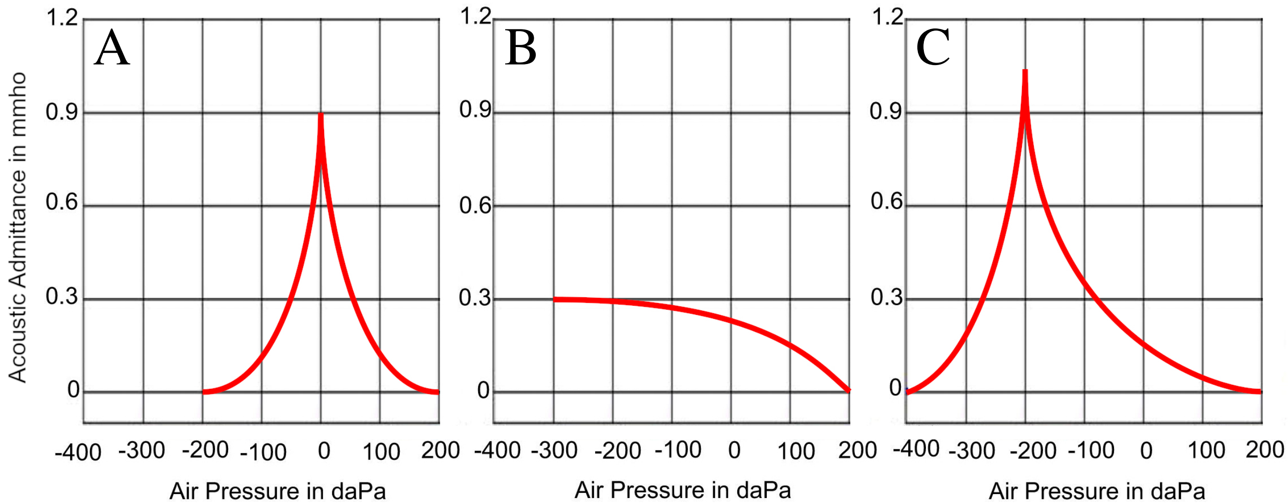

FIGURE 3 – Common types of tympanographs. Example A illustrates a tympanogram showing normal middle ear pressure. Example B is typical in case of otitis media with effusion, space-occupying lesions of the tympanic cavity, and tympanic membrane perforations. Example C present a tympanogram showing negative middle ear pressure as reflected by the negative pressure peak, which is associated with eustachian tube disfunction.

to be for an individual to hear it (in dB HL). The cut-offs for the various degrees of hearing loss can be found in Table 2 from [14]. The severity of hearing loss allows clinicians to describe a hearing loss and obtain a general idea of the expected difficulties.

2.4 Impact of Hearing Loss

The first listening difficulties experienced by individuals suffering from hearing loss may include : muffled speech sounds, difficulty understanding speech in noise, confusing certain words, asking others to repeat frequently, having to increase the TV or radio volume. As hearing loss worsens hearing loss can lead to withdrawal from conversations, social isolation, and is even associated with an increased risk of dementia. For children, hearing loss can interfere with access to spoken language, which can lead to cognitive delays as the areas of their brain used for communication may not develop appropriately [15].

3 Audiological evaluation

Beyond tonal audiometry, different tests are used to gather information about the auditory system, and to validate results. These tests include speech audiometry, immitancemetry, otoacoustic emissions, and auditory evoked potentials. The combined interpretation of these various tests help establish a portrait of one's hearing. Unfortunately, our current evaluation methods are not able to fully assess the intricacies of the auditory system. In the following section, we will discuss the main techniques used in audiology for differential evaluation, and the shortcomings of our current assessment methods.

3.1 Speech Audiometry

Two common speech evaluations performed in clinic is the speech reception threshold (SRT) and word recognition score (WRS). For the SRT, patients are asked to repeat spondaic words (two-syllable words with equal stress on each syllable). The SRT is used to validate the results obtained via tonal audiometry. It has been shown that the SRT is approximately equal to the pure tone average (500, 1000, 2000 Hz). For the WRS, patients are asked to repeat mono-syllable words at a comfortable intensity level. The goal is to determine if there is any degradation of clarity when enough volume is provided for the patient [9].

The speech measures described above are presented in quiet conditions. There are, however, other speech measures being used to evaluate how well a patient can hear when in presence of background noise. The use of speech-in-noise tests such as the HINT [16] or the QuickSIN [17] are being progressively included in routine audiological assessments (see below). Speech in noise tests provide a more accurate representation of an individual's real-world performance [18] as it is rare for many patient's daily listening situation to be as quiet as a sound booth. When using speech material, it is particularly important to considerate the patient's most comfortable language. Poor performances may be due to poor understanding of a language rather than hearing difficulties.

3.2 Immittancemetry

Tympanometry

Tympanometry is used to evaluate the middle ear function by measuring the compliance of the tympanic membrane (see Fig. 3). The tympanometer probe includes a miniaturized speaker (for emitting the stimulating sound), a probe microphone (for recording the reflected sound) and an air pump (for altering the pressure in the sealed ear canal). Tympanometers measure the energy absorbed by the eardrum to the sound stimulus emitted by the probe speaker (typically a 226 Hz or a 1000 Hz pure tone but multi-frequency tympanometry can be used to identify ossicular abnormalities, e.g. malformations/diseases affecting the ossicles [19]). When a sound is emitted, part of it is absorbed while the remaining part is reflected and can be captured by a miniaturized microphone to compute the energy absorbed by the eardrum. In a normal situation the eardrum will have a maximum absorption and the collected sound will be very weak. In the case of serous otitis or poor ventilation of the middle ear, the pressure in the external auditory canal and in the middle ear will be unbalanced, resulting in a lower absorption of the eardrum and therefore a higher reflected sound. In order to evaluate compliance, the pressure in the external auditory canal is adjusted using an air pump to compensate and re-equilibrate the pressure on both sides of the eardrum. This pressure variation is presented in “mm of water” (mmH_2O) and can be negative or positive. The peak of a tympanogram is where the eardrum is balanced and allows to determine if the tympanic membrane moves freely or if a pathology is present.

Additionally, wide band tympanometry (WBT) can provide more complete information about the middle ear. With one recording, middle ear function is assessed using a range of frequencies (typically between 226 and 8000 Hz) rather than the traditional 226 Hz or 1000 Hz. WBT is believed to be more reliable for assessing the middle ear in infants [20]. Furthermore, WBT could be a useful method for tracking the progression of otosclerosis [21]. It has even been suggested that WBT can help with the diagnosis of Menière’s disease [22].

Acoustic Reflex Threshold

The acoustic reflex threshold (ART) is defined as the minimal sound level pressure required to trigger the acoustic reflex (usually between 70-105 dB SPL). This reflex aims to protect our ears from loud sounds. In response to intense sounds, the stapedius muscle contracts to stiffen the ossicular chain [9]. This results in a dampening of the vibrations that are transmitted to the inner ear. The acoustic reflex pathway (see Fig. 4a) involves several key structures of the ear, such as the middle ear, the inner ear, the vestibulocochlear nerve (VIII), the cochlear nucleus, the superior olivary complex, and the facial nerve (VII).

By evaluating the presence of the acoustic reflex in different stimulation and recording conditions, clinicians can get additional information regarding the site of lesion. To evaluate the acoustic reflex, a tone is presented at different intensities (usually 70 to 105 dB) in one ear. While the tone is being presented, acoustic immittance is being measured in the same ear (ipsilateral) or the opposite ear (contralateral). A reflex is considered present when the change in immittance is greater than a pre-determined cut-off criterion. The acoustic reflex is evaluated in both ipsilateral and contralateral conditions for both ears resulting in a pattern of absent or present reflexes. The acoustic reflex pattern provides additional information to complete / confirm the results of other audiological evaluations (see Fig. 4b). It is important to note that the site of lesion cannot be determined based solely on the results of this test.

Unfortunately, the acoustic reflex is known to yield many false positives. It has mostly fallen out of favor. In the event that retrocochlear involvement is suspected, the MRI is the gold standard, especially since the availability of MRI has improved. Since a loud sound is used to trigger the ART, this method is avoided with hypersensitive patients and those suffering from tinnitus.

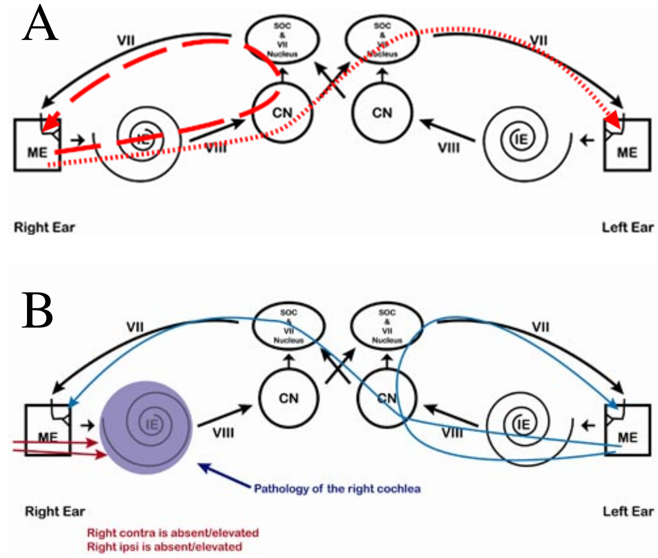

FIGURE 4 – A : Acoustic stapedial reflex model. The ipsilateral and contralateral pathway are indicated respectively by the long dashes and dotted lines. B : Cochlear pathology, right ear. Note that right ipsilateral and right contralateral ARTs are elevated/absent and left ipsilateral and left contralateral ARTs are present. ME = middle ear, IE = inner ear, VIII = vestibulocochlear nerve, CN = cochlear nucleus, SOC = superior olivary complex, VII = facial nerve. Modified from the original figure, courtesy of D. Emanuel [23].

3.3 Distortion Product Otoacoustic Emissions

The role of the outer hair cells is to amplify weak sounds thanks to their actions on the basilar membrane. The counter reaction to this amplification is a ”relaxation” of the basilar membrane which induces a movement of the cochlear fluid, the oval window, the ossicles, and finally the eardrum. Consequently, the eardrum will act like as a loudspeaker that will diffuse a sound instead of vibrating because of a sound. This sound generated by the eardrum is very weak and remains inaudible to the human ear, but a microphone can capture it. Such sounds created by the ear itself are called otoemissions and can be spontaneous (i.e. generated in the absence of any stimulation), or provoked (i.e. produced in response to a stimulus).

When two simultaneous tones of different frequencies are used, the resulting otoacoustic emission is called Distortion product otoacoustic emissions (DPOAEs). DPOAEs are extensively used in pediatric hearing screening routine as a way to obtain non-invasive, quick and reliable information regarding the cochlear status of the neonates. Additionally, DPOAEs are used in several ototoxicity monitoring protocols. Damage to the fragile hair cells caused by ototoxic medication can occasionally be detected via DPOAE even before having any impact on the audiogram (see Fig. 5).

The DPOAEs are a very valuable objective screening methods, especially with the pediatric population. The presence of responses can rule out any hearing loss worse than a mild hearing loss at the tested frequencies. DPOAEs also provide ear specific information. The main drawback of this method is that it requires normal middle ear function for a valid test. A valid test also requires a relatively quiet environment. This is usually not an issue with adults but can become problematic with a child resisting the placement of the probe in the ear.

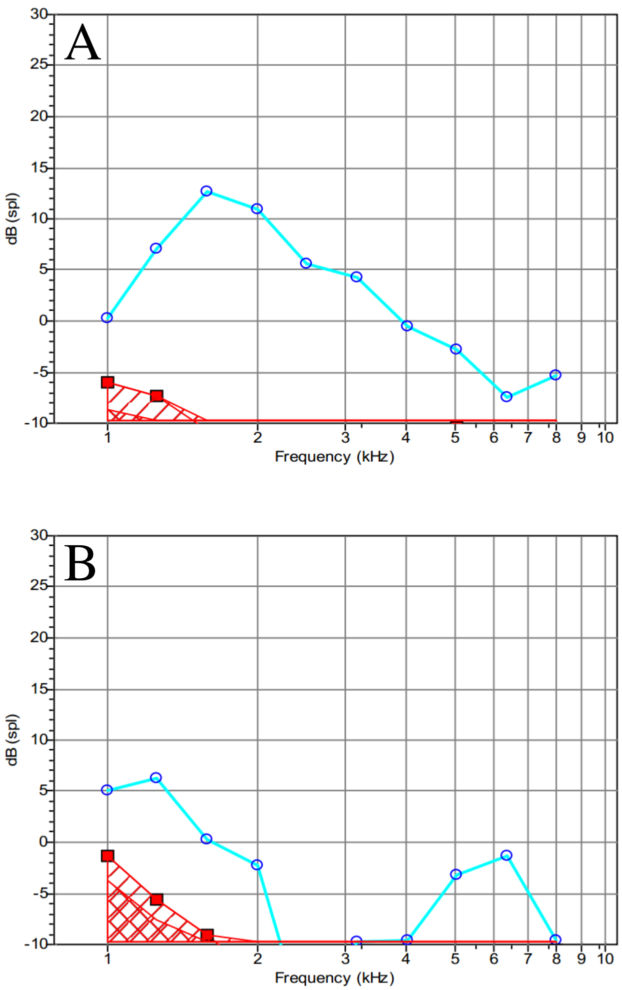

FIGURE 5 – Examples of DPOAEs. A : Presence of DPOAEs for most tested frequency suggest the integrity of inner cochlear hair cells. B : Absent DPOAEs in the 2-5 kHz range suggest damage to inner cochlear hair cells. Noise levels are indicated by the red line and squares.

3.4 Auditory Evoked Potentials

Auditory evoked potentials (AEPs) are an electrical manifestation of the brain response to an auditory stimulus. AEPs can be elicited by using brief acoustic stimuli as clicks or tone pipes to monitor the function of the inner ear or the neural auditory pathways during surgery. When a sound is processed by the auditory system, it elicits a signal arising from different anatomical generators and at latencies that range from a few milliseconds to hundreds of milliseconds.

The earliest components are generated in the cochlea and can be recorded using electro-cochleography from the middle ear (“transtympanic”) or from the auditory canal (“extratympanic”). Electrocochleography recordings are often use for the diagnosis of Ménière disease, and for the intraoperative monitoring of the cochlear and eighth nerve. Subsequent neural responses can be divided into three latency classes [24] : early-latency responses, arising in the first ten msec after the stimulation, long-latency responses, with latencies greater than 50 ms, and middle-latency responses, with intermediate latencies (see Fig. 6).

The early-latency responses are the most often used for clinical purposes. They are relatively easy to record, and their wave shapes and component peak latencies are highly consistent across normal subjects. Sedation and surgical anesthesia produce only minor changes in early-latency responses. Early evoked potentials consist of seven small positive deflections, numbered I to VII, reflecting the passage of auditory information in different neural structures : wave I is generated by the fibers of the auditory nerve afferent to the inner hair cells ; wave II is generated by the passage of nerve impulses through the auditory nerve as well as by the entry into the cochlear nucleus ; wave III is mainly generated by the exit of the cochlear nucleus, as well as by the entry into the superior olivary complex ; wave IV is thought to be generated primarily by the lateral lemniscus and wave V by the inferior colliculus ; and although this is poorly defined because of their instability, waves VI and VII are thought to be generated in the medial geniculate body [25]. Early-latency responses are most often called “auditory brainstem responses” (ABR), even though the term is not completely accurate since wave I and part of wave II are generated in the auditory nerve rather than the brainstem itself.

ABRs latency decreases as the stimulation level increases [26] : the presence of the five well individualized waves is obvious at 70 dB but as the stimulation level decreases, the latency increases, and the amplitude of the waves decreases (see Fig. 7). The objective audiological threshold is defined by the minimum stimulation level that allows a clearly identifiable wave V, which is 20 dB in this example. Tone-ABR thresholds in patients with sensorineural hearing loss are typically 5 to 15 dB higher than their pure-tone behavioral threshold [27].

Auditory Evoked Potentials recorded in normal hearing subjects differ significantly from those recorded in hearing-impaired subjects : the five waves are easily discernable using a stimulation level of 60 dB when ABRs are scalp-recorded on a normal hearing child, but the same measurement performed on a deaf child does not allow to detect any wave (see Fig. 8). Interpeak latency between wave I and V can be used in the diagnosis of retrocochlear (i.e. beyond the cochlea) lesions : values higher than 4.70 ms indicate existence of retrocochlear lesions [29]. The comparison of wave V latency values in both ears can also be used in diagnosis retro-

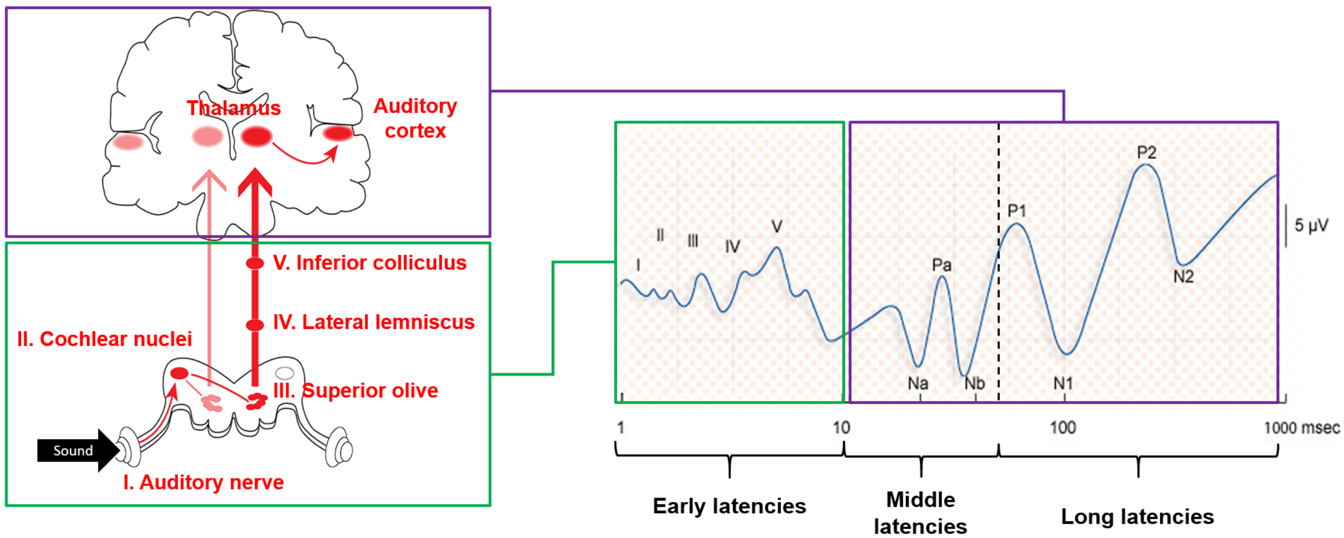

FIGURE 6 – Auditory evoked potentials in normal hearing subjects. Modified from the original figures by S. Blatrix and P. Minary by adding arrows, text, and anatomical brain structures on the left.

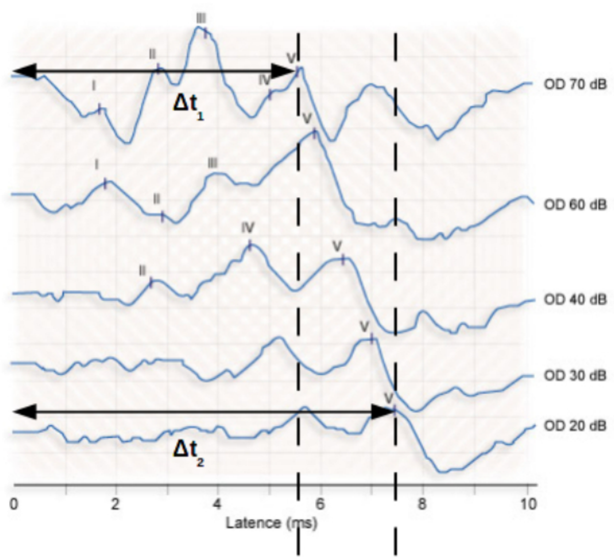

FIGURE 7 – ABRs recorded at different stimulation levels. The latency (Δt) decreases as the stimulation level increase. Modified by adding arrows and text from the original figure by S. Blatrix and P. Minary.

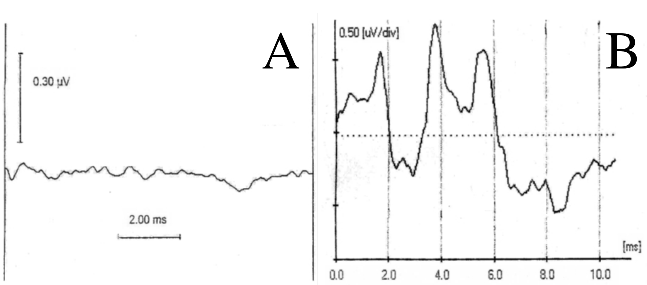

FIGURE 8 – ABRs recorded on the right ear of a deaf child (A) versus those recorded in a normal-hearing child (B) with a stimulation level set to 60 dB. Original figure from O. Valentin [28].

cochlear lesions : an interaural difference great than 0.3 ms indicates retrocochlear lesions [30]. Patients with auditory neuropathy due to a neurodegenerative disease or with a progressive demyelinating pathology present absent or severely abnormal ABR [31]. Acoustic neuroma, a rare slow-growing non-malignant tumor of the 8th cranial nerve also called "vestibular schwannomas" induces a prolonged I-III and I-V delay [32].

One of the main drawbacks of AEPs is that this method requires time-consuming preparation of the skin surface to reduce skin–electrode electrical impedance, and EEG signal acquisition systems that are bulky. Part of this drawback can be overcome by using a portable EEG amplifier [33] and unobtrusive sensors [34], but such devices are not yet available for daily clinical use. Furthermore, like all electrophysiological measurement, AEPs are very sensitive to motion, making this method highly challenging with uncooperative patient.

3.5 Shortcomings

The current clinical test battery poorly represents one's real-world hearing abilities. Patients are tested in a controlled clinical environment that lacks the complexity of real-world listening. Although, there are attempts at developing more ecological-valid assessment methods (e.g. speech-in-noise testing), our assessments method still do not take into account important factors contributing to one's listening abilities. Listening effort, cognitive ability, and one's ability to utilize visual cues are rarely assess and may help explain the discrepancy between clinical results and real-world performance [35].

Furthermore, the audiogram cannot fully encompass the complexity of hearing impairment. In other words, different individuals with the same audiogram may have very different functional difficulties. In the case of hidden hearing loss or cochlear synaptopathy, a patient may present with signifi-

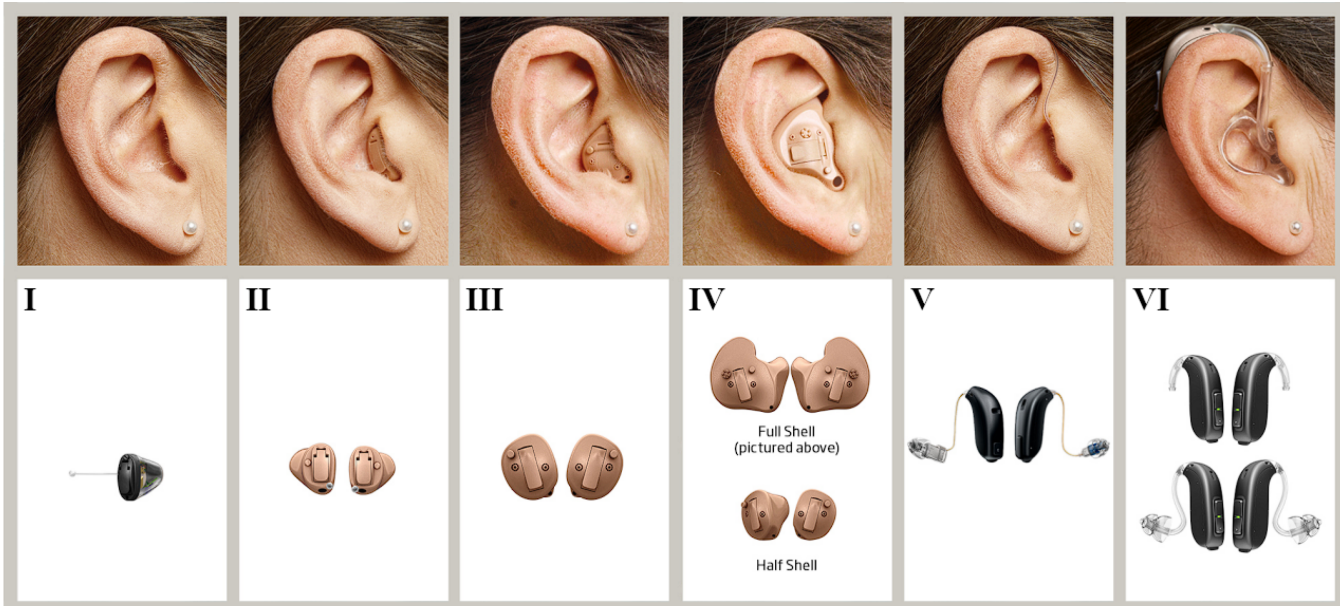

FIGURE 9 – In-the-ear hearing aids (I to IV) versus behind-the-ear hearing aids (V and VI). Modified from the original figure, courtesy of Oticon Medical.

cant listening difficulties despite a normal audiogram. It is believed that the hearing impairment arises from a disconnect between the auditory-nerve fibers and the cochlear hair cells [36]. Also, animal studies have shown that an audiogram is insensitive to inner hair cell damage. Normal hearing thresholds could be obtained following carboplatin-induced selective destruction of inner hair cells, the main afferent pathway originating from the cochlea [37]. Currently, there are no non-invasive methods of evaluating these deficits.

4 Management of hearing loss

4.1 Hearing Aids

Hearing aids are the most common intervention used to help with hearing impairment. The hearing aid is a small device that is equipped with a small microphone and a receiver. Its goal is to pick up the sounds from the environment and deliver an amplified version to the hearing aid user. There are several different types of hearing aids that each have their advantages and disadvantages. Discussion with an audiologist or a hearing aid dispenser is essential for choosing the right hearing aid (See Fig. 9).

The hearing aid is not only a simple sound amplifier. Sounds that are picked up by the microphone are decomposed into several channels. Each channel covers a different frequency range that is processed and amplified differently. Effectively, this allows the hearing aid to be personalized to everyone's hearing loss, as well as perform additional processing such as noise reduction and feedback cancelling. Additionally, hearing aids also employ an amplification strategy called wide dynamic range compression (WDRC) where soft sounds are amplified more than louder sounds. WDRC restores audibility and, at the same time, maintains comfort [39].

Hearing aids can also be programmed with different "presets" for different environments. For example, a standard program will use omnidirectional microphones with mild noise reduction. This allows users to benefit from amplification in most listening situations. However, said program would likely struggle in a noise environment such as a restaurant. For these situations, the hearing aid user would rather benefit from a directional microphone with more aggressive noise reduction. Modern hearing aids are even able to detect different listening situations and automatically switch to the appropriate program.

It is important to note that it requires some adaptation time to get used to the hearing aid. Often, patients are overwhelmed by all the new sounds they can hear again. With time, the brain will get used to these sounds and tune them out [40].

CROS and BiCROS Hearing Aids

In cases of single side deafness or asymmetric hearing loss, a "contralateral routing of signal" hearing aid (CROS) can be considered. The main purpose of these devices is to capture sounds from the individual's hard of hearing side and transfer it to the better side [41]. To do so, the user must wear one hearing device on each ear : a "dummy" hearing aid that serves as the microphone on the hard of hearing side, and a standard hearing aid on the better hearing side. One unfortunate consequence of this hearing system is the need to wear a hearing aid on the good ear. Furthermore, CROS aids only transfer information from one side to the other – it does not restore binaural hearing. Despite these inconveniences, some patients appreciate the CROS as it is non-invasive solution that restores sound awareness on their worse hearing side. The BiCROS functions similarly to the CROS but also provides amplification on the better side.

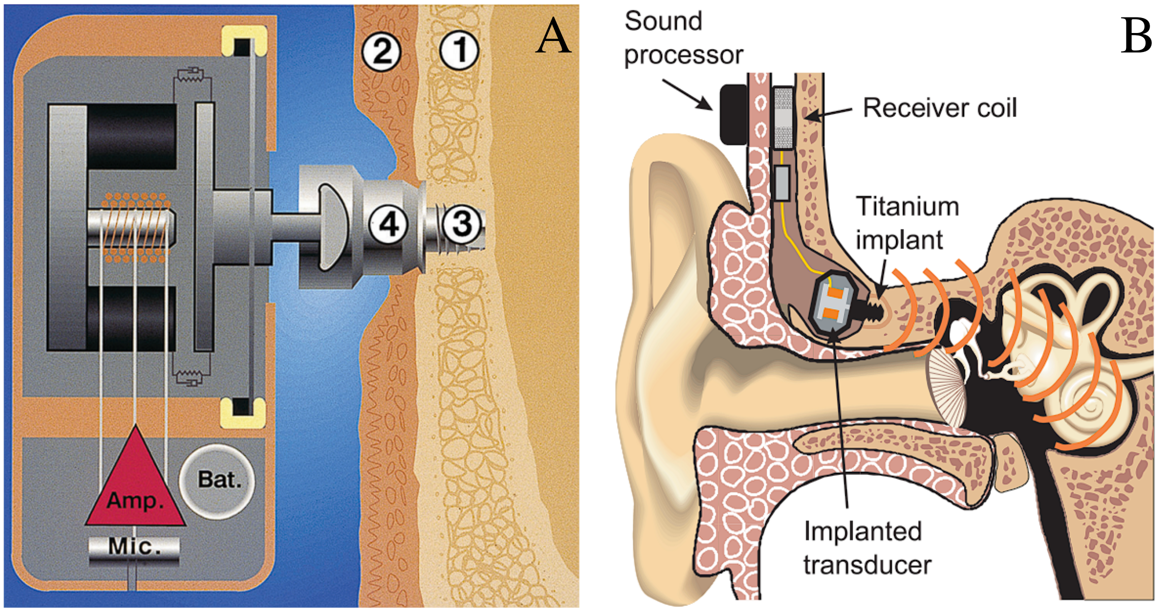

FIGURE 10 – Percutaneous (A) versus transcutaneous (B) bone conduction implants. Image courtesy of B. Håkansson [38].

4.2 Bone Conduction Implants

Bone conduction hearing devices are specialized types of hearing aid. Instead of outputting sound through air conduction these devices vibrate the skull transmits the sounds directly to the cochlea through bone conduction. These devices are considered for patients who have recurrent ear infections or malformation of the external auditory canal as they allow amplification to bypass the outer ear. In most cases, bone conduction hearing devices require a surgical procedure to implant an abutment into the skull. The bone conduction hearing device is then attached to the abutment allowing the vibrations to more effectively be transmitted through the skull to the cochlea. Bone conduction implants can be percutaneous (i.e. the transducer is directly coupled to the bone by means of a permanent skin penetration, like the BAHA®system from Cochlear™ or the Ponto™system from Oticon Medical, see Fig. 10A) or transcutaneous (i.e. one part of the transducer is implanted and the other part is kept outside the intact skin and soft tissue, like the Osia®system from Cochlear™ or the ADHEAR system from MED-EL™, see Fig. 10B).

4.3 Cochlear Implants

The cochlear implant (CI, see Fig. 11) is a biomedical device used to overcome profound deafness by replacing the function of a damaged or destroyed cochlea [42]. The implant consists of two main components. The external part includes the sound processor and microphone and is placed behind the ear. The internal part is placed under the skin and includes an electrode array that is inserted into the cochlea (see Fig. 12).

How does a cochlear implant work ?

First, the acoustic information is picked up by a miniaturized microphone placed in the behind-the-ear component. The sound is then transmitted to a speech microprocessor which analyses and digitises the sound captured by the microphone. After this signal processing step, the stimuli are sent to the external antenna located in the retroauricular region and then to the receiver/stimulator implanted in the temporal bone by radio wave, under the skin. Finally, the receiver/stimulator converts the signals transmitted by the antenna into electrical impulses that are sent to the electrode array to directly stimulate the auditory nerve : the electric impulses transmitted to the brain are then interpreted as sound.

Speech processors and coding strategies

The cochlear implant sound processor, which patients wear over-the-ear like a hearing aid, plays a critical role in the restoration of hearing. Many speech coding strategies have been developed over the past thirty years to the mimic firing patterns inside the cochlea as naturally as possible. Existing coding strategies can be regrouped into three categories : rate coding strategies which emphasis on the temporal representation of the signal [43, 44], place coding strategies which emphasis on the spectral representation of the signal [45], and hybrid coding strategies who combine both place and rate strategies [46]. Among the wide variations of coding strategies, some use a fixed number of channels to reproduce the original sound spectrum, while others used a virtual channel technique to increase the number of electrodes to achieve a better spectral resolution.

The default strategy in all implants uses a fixed set of electrodes to deliver biphasic electrical pulses in a non-overlapping fashion, e.g., by only stimulating one electrode at a time to avoid interactions. The sound signal collected by the external microphone is first pre-emphasized for frequencies above 1.2kHz at 6dB per octave and then separate into several bands using band-pass filters (one per stimula-

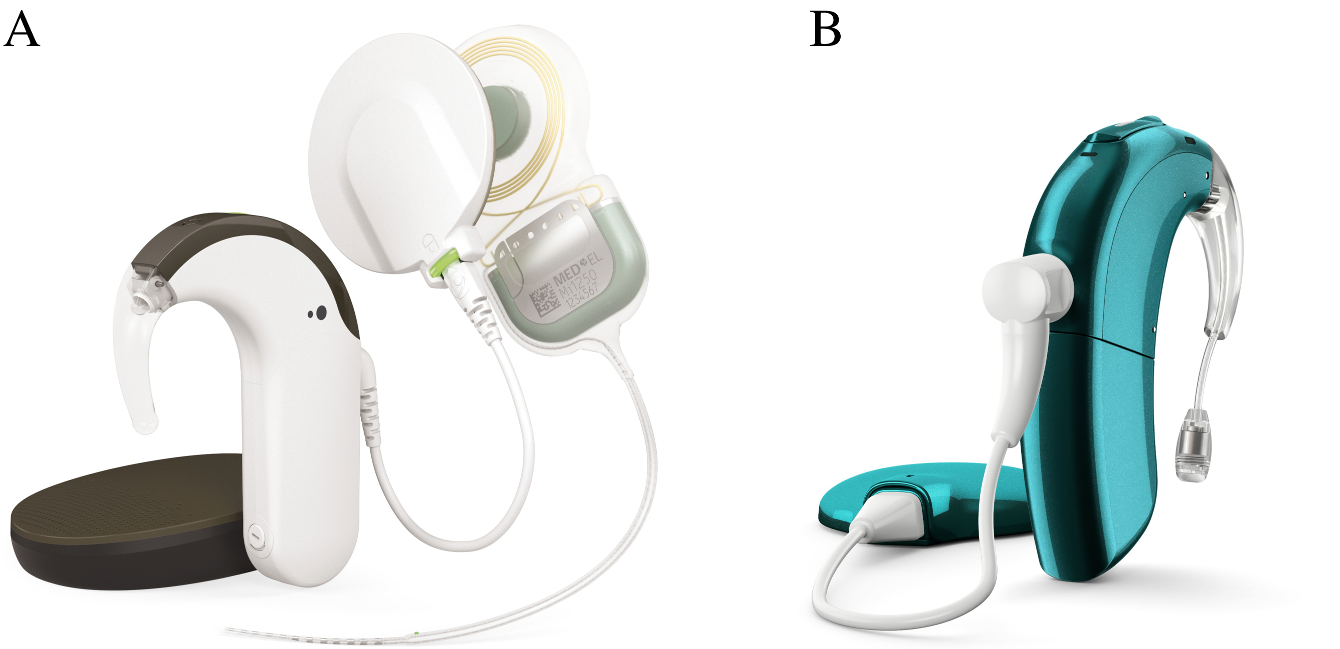

FIGURE 11 – A : external and internal components of the MED-EL SYNCRONY 2 cochlear implant system (image courtesy of MED-EL). B : CI's external components can be tailored specially for children, as the Sky CI™ M sound processor designed for kids by Advanced Bionics (image courtesy of Advanced Bionics).

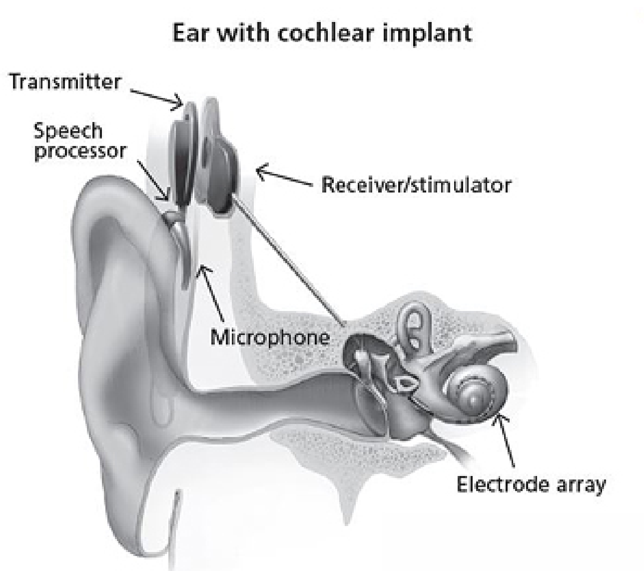

FIGURE 12 – Ear with cochlear implant. Image courtesy of the National Institute on Deafness and Other Communication Disorders (NIDCD, https ://www.nidcd.nih.gov/).

ting electrode). Each band is then rectified and low-pass filtered to obtain the signal envelope which is dynamically compressed using a nonlinear mapping function in order to map the wide dynamic range of sound in the environment (up to about 100 dB) into the narrow dynamic range of electrically evoked hearing (about 10 dB). The envelopes are finally used to modulate the biphasic electrical pulses sent to the stimulating electrodes. One limitation of this strategy is the number of implanted electrodes used to reproduce the sound signal versus the number of auditory nerve fibers (around 30,000). Since the electrodes can only stimulate a limited number of auditory nerve fibers, the resolution and information received by a CI user remains limited.

Drawbacks and limitations

It is undeniable that the cochlear implant is a life-changing device. However, this technology is not without its drawbacks and limitations. Acquiring a cochlear implant involves multiple visits for candidacy evaluation, surgery, device programming. This process can be quite prohibitive for patients who live far away from implant centres. Furthermore, patients must commit to a long and arduous rehabilitation process to learn or "re-learn" how to hear. Unfortunately, even after rehabilitation, there remains a large variability in benefits experienced by cochlear implant recipients. Some patients perform poorly than expected or will show little improvement. Finally, patients will have to adjust to living with implanted electronic device. The cochlear implant can be problematic with MRIs. It is also non compatible with certain medical intervention such as neurostimulation, electrical surgery, and ionic radiation therapy.

4.4 Auditory Brainstem Implants

Auditory brainstem implants (ABIs, see Fig. 13) were first developed nearly 40 years ago to provide hearing to people with hearing loss who can't benefit from a hearing aid or cochlear implant [48]. This is most commonly due to a missing or very small hearing nerve or severely abnormal inner ear (cochlea). The auditory brainstem implant directly stimulates the hearing pathways in the brainstem, bypassing the inner ear and hearing nerve (see Fig. 14). Similar to a CI, an ABI consists of an external ear-level worn device and an internal receiver-

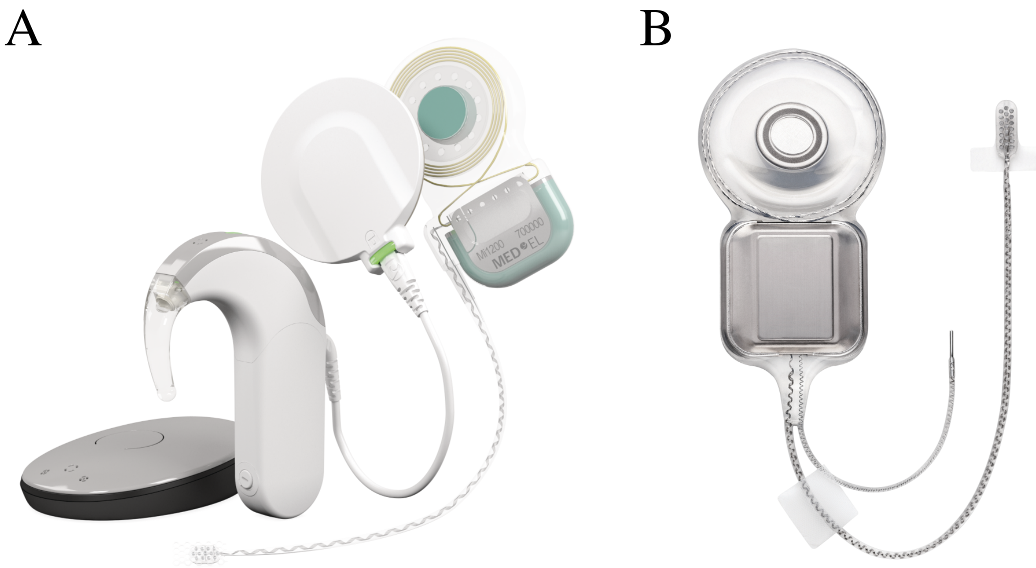

FIGURE 13 – The auditory brain stem implant. A : internal and external components of the ABI made by MED-EL (image courtesy of MED-EL). B : internal components of the ABI made by Cochlear (image courtesy of Cochlear Americas).

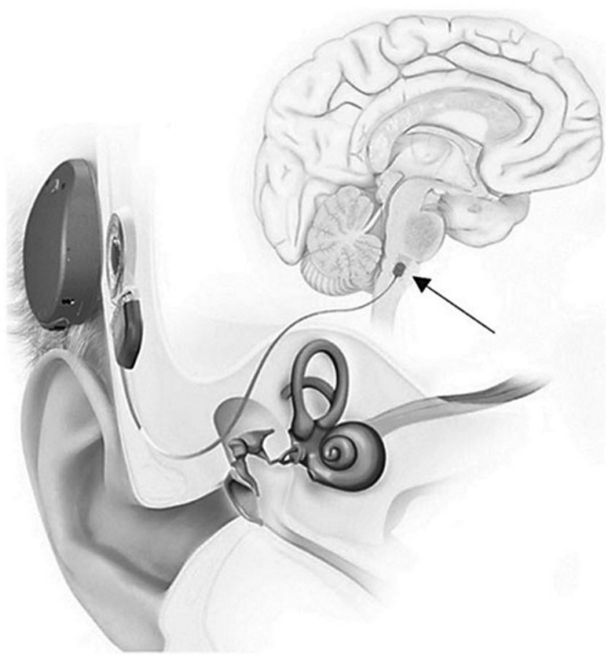

FIGURE 14 – The auditory brainstem implant, with the electrode array placed on the cochlear nucleus (black arrow). Source : Original drawing from Dhanasingh et al. [47] (image courtesy of MED-EL).

stimulator implant. ABI external part is identical to the external CI and includes the same elements : battery, microphone, speech processor, and transmitter. ABI internal part consists of a surgically placed receiver-stimulator placed against the skull and above the craniotomy defect, a multichannel electrode array placed through the lateral recess of the fourth ventricle, and a ground electrode inserted against the calvarium and under the temporalis muscle. Unfortunately, the overall outcomes of the ABI are inferior to the CI. Most users will see benefits in terms of sound awareness but will rarely see great improvements in speech discrimination [49].

4.5 Other interventions

In the event that a patient cannot benefit from a hearing device (medical contraindication, financial limitations), has limited benefits with the hearing device, or does not want to utilize a hearing device (limited perceived benefits, stigmatization), other strategies can be used to improve communication. Certain communication strategies can be employed such as favoring face-to-face conversation, avoiding noisy environments, and repeating and rephrasing. Lip-reading is often done unconsciously but can also be practiced. This provides complementary information to what is heard. Another device-oriented solution is the wireless remote microphone. These devices transmit sounds from a desired source wirelessly to the ears of the user. Wireless remote microphones are particularly effective for improving speech understanding in noise [50]. A more modern solution to communication problems comes under the form of live transcription applications available on the cellphone. These applications essentially provide real-time closed captions of the conversation unfolding around the cellphone. This method provides written information that complements auditory information [51].

5 Conclusions

Hearing loss is one of the most common chronic conditions which can be particularly critical at both ends of the age spectrum. We proposed this overview of the evaluation and interventions/solutions for hearing loss, in an attempt to demystify the audiological world to the Canadian acoustical community. Collaboration between the multiple professionals involved in hearing health and hearing research is vital for the development of better evaluations and interventions.

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References

[1] World Health Organization. Deafness and hearing loss. https://www.who.int/health-topics/hearing-loss#tab=tab_1. Accessed : 2022-10-15.

[2] C.M. Li, X. Zhang, H.J. Hoffman, M.F. Cotch, C.L. Themann, and M.R. Wilson. Hearing impairment associated with depression in us adults, national health and nutrition examination survey 2005-2010. *JAMA otolaryngology - head and neck surgery*, 140(4) :293–302, 2014.

[3] D.M.P. Jayakody, J. Wishart, I. Stegeman, R. Eikelboom, T.C. Moyles, J.M. Yiannos, J.J. Goodman-Simpson, and O.P. Almeida. Is there an association between untreated hearing loss and psychosocial outcomes ? *Frontiers in Aging Neuroscience*, 14 :1–12, 2022.

[4] F.R. Lin, K. Yaffe, J. Xia, Q.-L. Xue, T.B. Harris, E. Purchase-Helzner, S. Satterfield, H.N. Ayonayon, L. Ferrucci, and E.M. Simonsick. Hearing loss and cognitive decline in older adults. *JAMA Internal Medicine*, 173(4) :293–299, 2013.

[5] American Speech-Language-Hearing Association. Effects of hearing loss on development. https://www.asha.org/public/hearing/effects-of-hearing-loss-on-development/. Accessed : 2022-10-15.

[6] S. Kramer and D.K. Brown. *Audiology. Science to Practice (4th Edition)*. Plural Publishing, Inc., 2021.

[7] A.R. Valiente, A.R. Fidalgo, I.M. Villarreal, and J.R.G. Berrocal. Extended high-frequency audiometry (9000–20 000 hz). usefulness in audiological diagnosis. *Acta Otorrinolaringologica*, 67(1) :40–44, 2016.

[8] American Speech-Language-Hearing Association. Guidelines for manual pure-tone threshold audiometry, 2005. doi :10.1044/policy.GL2005-00014.

[9] J. Katz. *Handbook of clinical audiology (7th ed.)*. Lippincott Williams and Wilkins, 2014.

[10] J. Birkenbeuel, M. Abouzari, K. Goshtasbi, O. Moshtaghi, R. Sahyouni, A. Moshtaghi, D. Cheung, D. Gelnett, H.W. Lin, and H.R. Djalilian. Characteristics of mid-frequency sensorineural hearing loss progression. *Otology & Neurotology*, 40(5) :e497–e502, 2019.

[11] T. Zahnert. The differential diagnosis of hearing loss. *Deutsches Arzteblatt international*, 108(25) :433–444, 2011.

[12] H. Lindsey. Making sense of auditory neuropathy spectrum disorder. *The Hearing Journal*, 67(6) :8–12, 2014.

[13] D.W. Smith and A. Keil. The biological role of the medial olivocochlear efferents in hearing : separating evolved function from exaptation. *Frontiers in systems neuroscience*, 9 :12, 2015.

[14] J. G. Clark. Uses and abuses of hearing loss classification, 1981. *American Speech-Language-Hearing Association*, 23(7) :193-500.

[15] B.S. Wilson, D.L. Tucci, M.H. Merson, and G.M. O'Donoghue. Global hearing health care : new findings and perspectives. *The Lancet*, 390(10111) :2503–2515, 2017.

[16] M. Nilsson, S.D. Soli, and J.A. Sullivan. Development of the hearing in noise test for the measurement of speech reception thresholds in quiet and in noise. *The Journal of the Acoustical Society of America*, 95(2) :1085–1099, 1994.

[17] M.C. Killion, P.A. Niquette, G.I. Gudmundsen, L.J. Revit, and S. Banerjee. Development of a quick speech-in-noise test for measuring signal-to-noise ratio loss in normal-hearing and hearing-impaired listeners. *The Journal of the Acoustical Society of America*, 116(4 Pt 1) :2395–2405, 2004.

[18] C. Portnuff and B. Bell. Effective use of speech-in-noise testing in the clinic. *The Hearing Journal*, 72(5) :40, 2019.

[19] T.F. de Moraes, C. Macedo, and M.R. Feniman. Multifrequency tympanometry in infants. *International archives of otorhinolaryngology*, 16(2) :186–194, 2012.

[20] C. Downing, J. Kei, C. Driscoll, R. Choi, and D. Scott. Wideband tympanometry findings in school-aged children : Effects of age, gender, ear laterality, and ethnicity. *Ear and hearing*, 43(4) :1245–1255, 2022.

[21] N. Shahnaz, N. Longridge, and D. Bell. Wideband energy reflectance patterns in preoperative and post-operative otosclerotic ears. *International journal of audiology*, 48(5) :240–247, 2009.

[22] X. Meng, K. Zhu, J. Yue, and C. Han. The role of wideband tympanometry in the diagnosis of meniere's disease. *Frontiers in neurology*, 13 :808921, 2022.

[23] D. Emanuel. Acoustic reflex threshold (art) patterns : An interpretation guide for students and supervisors. https://www.audiologyonline.com/articles/acoustic-reflex-threshold-art-patterns-875. Accessed : 2022-12-23.

[24] T.W. Picton, S.A. Hillyard, H.I. Krausz, and R. Galambos. Human auditory evoked potentials. i. evaluation of components. *Electroencephalogry and Clinical Neurophysiology*, 36 :179–190, 1974.

[25] J.K. Moore. The human auditory brain stem as a generator of auditory evoked potentials. *Hearing Research*, 29 :33–43, 1987.

[26] M.P. Gorga, J.R. Kaminski, K.A. Beauchaine, and W. Jesteadt. Auditory brainstem responses to tone bursts in normally hearing subjects. *Journal of Speech, Language, and Hearing Research*, 31(1) :87–97, 1988.

[27] D.R. Stapells. Threshold estimation by the tone evoked auditory brainstem response : A litterature meta-analysis. *Journal of speech-language pathology and audiology*, 24(2) :74–83, 2000.

[28] O. Valentin. Using auditory steady state responses for measuring hearing protector attenuation and occlusion effect (PhD Thesis), 2016. École de technologie supérieure, Montréal, Canada. Available from : https://espace.etsmtl.ca/id/eprint/1644/.

[29] S. Prosser, E. Arslan, G. Conti, and S. Michelini. Evaluation of the monaurally evoked brainstem response in the diagnosis of sensorineural hearing loss. *Scandinavian Audiology*, 12 :103–106, 1983.

[30] J.H. Hwang, J.C. Chao, H.C. Ho, and S.H. Hsiao. Effects of sex, age and hearing asymmetry on the interaural differences of auditory brainstem responses. *Audiology and Neurotology*, 13 :29–33, 2008.

[31] J.J. Eggermont. Clinical Neurophysiology : Basis and Technical Aspects. Chapter 30 - Auditory brainstem response. *Handbook of Clinical Neurology*, 160 :451–464, 2019.

[32] J.J. Eggermont, M. Don, and D.E. Brackmann. Electrocochleography and auditory brainstem electric responses in patients with pontine angle tumors. *Annals of Otology, Rhinology and Laryngology*, 89(6) :1–19, 1980.

[33] O. Valentin, M. Ducharme, G. Crétot-Richert, H. Monsarrat-Chanon, G. Viallet, A. Delnavaz, and J. Voix. Validation and benchmarking of a wearable eeg acquisition platform for real-world applications. *IEEE Transactions on Biomedical Circuits and Systems*, 13(1) :103–111, 2019.

[34] O. Valentin, G. Viallet, A. Delnavaz, G. Crétot-Richert, M. Ducharme, H. Monsarrat-Chanon, and J. Voix. Custom-fitted in- and around-the-ear sensors for unobtrusive and on-the-go eeg. *Sensors*, 21 :2953, 2021.

[35] H.R. Staff. Disparity between clinical assessment and real-world performance of hearing aids. `https://hearingreview.com/practice-building/practice-management/disparity-between-clinical-assessment-and-real-world-performance-of-hearing-aids`. Accessed : 2022-12-23.

[36] P.Z. Wu, L.D. Liberman, K. Bennett, V. de Gruttola, J.T. O'Malley, and M.C. Liberman. Primary neural degeneration in the human cochlea : Evidence for hidden hearing loss in the aging ear. *Neuroscience*, 407 :8–20, 2019.

[37] E. Lobarinas, R. Salvi, and D. Ding. Insensitivity of the audiogram to carboplatin induced inner hair cell loss in chinchillas. *Hearing research*, 302 :113–120, 2013.

[38] B. Håkansson, M. Eeg-Olofsson, S. Reinfeldt, S. Stenfelt, and G. Granström. Percutaneous versus transcutaneous bone conduction implant system. *Otology & Neurotology*, 29(8) :1132–1139, 2008.

[39] P.E. Souza. Effects of compression on speech acoustics, intelligibility, and sound quality. *Trends in Amplification*, 6(4) :131–165, 2002.

[40] P. Dawes and K.J. Munro. Auditory distraction and acclimatization to hearing aids. *Ear and hearing*, 38(2) :174–183, 2017.

[41] E. Harford and J. Barry. A rehabilitative approach to the problem of unilateral hearing impairment : the contralateral routing of signals cros. *The journal of speech and hearing disorders*, 30 :121–138, 1965.

[42] Artificial Hearing Aids. *Journal of the American Medical Association*, 171(7) :1024–1025, 1959.

[43] B. S. Wilson, C. C. Finley, D. T. Lawson, R. D. Wolford, D. K. Eddington, and W. M. Rabinowitz. Better speech recognition with cochlear implants. *Nature*, 352(6332) :236–238, 1991.

[44] D. B. Koch, M. J. Osberger, P. Segal P., and D. Kessler. Hiresolution and conventionalsound processing in the hiresolution bionic ear : Using appropriate outcome measures to assess speech recognition ability. *Audiology and Neurotology*, 9(4) :241–223, 2004.

[45] M. W. Skinner, G. M. Clark, L. A. Whitford, P. M. Seligman, S. J. Staller, D. B. Shipp, J. K. Shallop, C. Everingham, C. M. Menapace, and P. L. Arndt. Evaluation of a new spectral peak coding strategy (speak) for the nucleus 22 channel cochlear implant system. *The American journal of otology*, 15(2) :15–27, 1994.

[46] J. Kiefer, S. Hohl, E. Sturzebecher, T. Pfennigdorff, and W. Gstoettner. Comparison of speech recognition with different speech coding strategies (speak, cis, andace) and their relationship to telemetric measures of compound action potentials in the nucleus ci 24m cochlear implant system. *Audiology*, 40(1) :32–42, 2001.

[47] A. Dhanasingh and I. Hochmair. Abi-auditory brainstem implant. *Acta Oto-Laryngologic*, 141(sup1) :63–81, 2021.

[48] B.J. Edgerton, W.F. House, and W. Hitselberger. Hearing by cochlear nucleus stimulation in humans. *The Annals of otology, rhinology & laryngology*, 91(2 Pt 3) :117–124, 1982.

[49] K. Wong, E.D. Kozin, V.V. Kanumuri, N. Vachicouras, J. Miller, S. Lacour, M.C. Brown, and D.J. Lee. Auditory brainstem implants : Recent progress and future perspectives. *Frontiers in neuroscience*, 13 :1–8, 2019.

[50] K.S. Rodemerk and J.A. Galster. The benefit of remote microphones using four wireless protocols. *Journal of the American Academy of Audiology*, 26(8) :724–731, 2015.

[51] Fernando Loizides, Sara Basson, Dimitri Kanevsky, Olga Prilepova, Sagar Savla, and Susanna Zaraysky. Breaking boundaries with live transcribe : Expanding use cases beyond standard captioning scenarios. In *Proceedings of the 22nd International ACM SIGACCESS Conference on Computers and Accessibility*, 2020.


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Remembering Alberto Behar

Alberto Behar has been the "go to" person when it comes to noise exposure, standards, and noise control. Sadly, Alberto passed away on November 29, 2022. What follows is a celebration of Alberto and his life's work.

I first met Alberto when he was with Ontario Hydro and was responsible for hearing conservation and noise control. Before that, he worked at the Ontario Ministry of Transportation to design highway noise barriers. At that time, we worked together, with others, on the development of noise standards for the province of Ontario. And Alberto, Meg Cheesman, and I published Noise Control: a primer (Singular Publishing Group, now Plural Publishing Group, in 2000).

Alberto was a professional engineer and Certified Industrial Hygienist and, as an acoustical consultant, had been active for over 55 years in hearing conservation, noise and vibration measurement, assessment, and control. In 1966 he was the Director of the Department of Acoustics at the Instituto Nacional de Tecnologia Industrial in Argentina, and in 1977, as a result of an Argentinian coup, he came to Canada.

He has contributed significantly to Canadian standards and helped develop national and provincial standards, and along the way, he has been the recipient of many awards (such as the Canadian Standards Association Award of Merit in 2013 and Hugh Nelson Award of OHAO in 2001, as well as a Fulbright scholarship). And up until quite recently was a researcher at the Toronto Metropolitan University (previously Ryerson University) in Toronto, dealing mainly with hearing conservation and musicians and the prevention of hearing loss. Acoustics Today, the official journal of the Acoustical Society of America, published an interview with Alberto Behar where he talked about his life- both personal and professional. This can be found at https://acousticstoday.org/interview-professor-alberto-behar/

When told of his passing, some of his colleagues asked to submit something about their association with Alberto

Marshall Chasin, AuD.,
Editor in Chief,
CanadianAudiologist.ca

I first met Alberto as a student attending Acoustics Week in Canada (AWC). He was a regular fixture at these meetings. His questions were always animated, and he seemed to be curious about pretty much everything. In 2007, I became reacquainted with Alberto through our work together on the Board of Directors of the Canadian Acoustical Association. In 2010, I delivered a presentation to the lab he was working in at the time, at the Institute of Biomedical Engineering, University of Toronto. For various reasons, Alberto was looking for a change of scenery and we had discussions shortly thereafter that led to him joining my lab.

For 12 years we worked together on various projects including comfort in hearing protectors, noise-exposure in orchestra musicians, noise attenuation from earplugs, and listening effort. The work resulted in 5 peer-reviewed publications, 5 proceedings papers, and 12 conference presentations. I never paid him. His only request was that I subsidize his annual attendance at AWC. He showed up to the lab like clockwork on Tuesday and Thursday mornings every week outside of holidays. He offered an annual tutorial on acoustics, and he took great pleasure in talking up the students, learning about their projects that were often very far removed from his own interests and training. In 2012 Alberto, Tristan (a former student), and I were all attending AWC in Banff. We took a road trip to Lake Louise. Along the way we came upon a giant.

Grizzly at the side of the road. We rolled down the windows and quietly started taking some photos. Before I knew it, I heard the door slam and Alberto appeared in the middle of the road, situated between the Grizzly and the safety of our rental car. He was out there, of course, he was, trying to get a closer look. We whispered and motioned for him to get back inside. He waived our concerns away and proceeded to do what he was doing. Fearless, in the moment, and in the happy pursuit of curiosity

.

Frank Russo, PhD.,
Department of Psychology,
Toronto Metropolitan University

Tristan (a former Ryerson student), Dr. Frank Russo, and Alberto in Banff at Acoustics Week in Canada (AWC)

Alberto's unstoppable enthusiasm and love of acoustics were highly contagious. I remember his warm welcome when I attended my first meeting of the Toronto Chapter of the Canadian Acoustical Association at the Ontario Hydro building in the early 1980s. Over the next four decades, I saw him warmly welcome hundreds of new students at yearly meetings of the Canadian Acoustical Association, listening thoughtfully to their presentations, engaging them in conversation, and encouraging them in their studies and as they embarked on new careers. His passion for acoustics will continue to live on in so many of those whom he inspired.

Kathy Pichora-Fuller, PhD, FCAHS,
Professor Emerita,
Psychology, University of Toronto

It was my pleasure to have known Alberto since the mid-1980s. I will remember his lovely smile, great humour, and unfailing enthusiasm. He generously shared his time and expertise with students and young professionals, and contributed to the development of methods in acoustics, hearing protection and hearing loss prevention for over 40 years with the Canadian Standards Association and other organizations. His eagerness to help and get involved was remarkable. His focus on keeping things simple rather than complicated and difficult to use for little added benefit is something that he cherished and wisely reminded us of at key moments. He will be dearly missed, but many good memories will remain.

Christian Giguere, PhD.,
University of Ottawa

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The high scientific standards maintained by Canadian Acoustics in its papers owe much to the continuing dedication of the journal's reviewers, who give freely of their time and expertise. JCAA is pleased to pay tribute to this contribution by recognizing those who have participated in the review process. Thus, the Editorial Team of Canadian Acoustics acknowledge with particular gratitude the following reviewers who have reviewed papers during the last 12 months.

Les normes scientifiques élevées maintenues par la revue Acoustique canadienne doivent beaucoup au dévouement constant des réviseurs de la revue, qui donnent généreusement de leur temps et de leur expertise. JCAA est heureux de rendre hommage à cette contribution en reconnaissant ceux qui ont participé au processus d'examen. Ainsi, l'équipe de rédaction de l'Acoustique Canadienne reconnaît avec une gratitude particulière les réviseurs suivants qui ont examiné des articles au cours de la période des 12 derniers mois.

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ACOUSTICS WEEK IN CANADA 2022
SEMAINE CANADIENNE D'ACOUSTIQUE 2022

A LOOK BACK ON ACOUSTICS WEEK 2022 IN ST. JOHN'S NEWFOUNDLAND AND LABRADOR

Benjamin Rich Zendel and Len Zedel

We want to thank all the attendees, sponsors, speakers, and volunteers for your help making Acoustics Week in Canada 2022 a huge success. AWC 2022 was the first in-person version of this conference since 2019. The joy and excitement of everyone was palpable from the first moments of the conference, right until the end of the final session. It was nice to be back in person. It was nice to see people again.

Dr. David Buley taking about the pipe organ in the D.F. Cook Recital Hall

Christy Lawrence and John Lambe from the Canadian Coast Guard giving a plenary talk on acoustic aids to navigation.

With over 83 attendees, the program featured 62 talks, two plenary sessions, a special session on teaching acoustics to high school students, acoustic tours of a Canadian Coast Guard Ship and the D.F. Cook Recital Hall, and a banquet at the provincial museum, The Rooms. The sessions at the conference covered all topics in acoustics including sessions on musical acoustics, noise control, architectural acoustics, underwater acoustics, auditory perception, environmental acoustics, and occupational acoustics. In the first plenary talk at the conference, Dr. Michael Schutz presented some fascinating work he has done on improving the acoustic design of alarms in a medical setting. Some of his findings are now being applied in the shipping industry. Keeping with the theme of the acoustics of warning signals, our second plenary featured Christy Lawrence and John Lambe from the Canadian Coast Guard. They talked about acoustic aids to navigation used by mariners. Tying this theme together, attendees had the opportunity to take a tour of a Canadian Coast Guard ship, docked in St. John's Harbour. While on this tour, attendees were able to enjoy a Harbour Symphony. The Harbour Symphony is a St. John's invention and involves all the ships in the harbour performing a 'symphony' with their horns. After the ship tour and harbour symphony conference attendees listened to a private demonstration of the pipe organ in the D.F. Cook Recital Hall by Dr. David Buley. AWC2022 featured two sessions on teaching acoustics to high school students. In the first session, attendees presented demonstrations they have used in class to teach acoustic principles. In a second round-table session, a small group of high school physics teachers joined us to discuss how we can improve the quality of acoustics education for high school students. We hope this session is continued at future events, because getting students interested in acoustics early will help us grow as an organization. Finally, we had two planned social events during the

The Cayenne Trio performing during the Welcome Reception conference, and a few unplanned events on George Street, the hub of the St. John's entertainment district. The first planned event was a Welcome Reception hosted at the conference hotel. We all enjoyed some tasty hors d'oeuvres, while listening to the jazz stylings of the Cayenne Trio. The next night we had a banquet dinner at the provincial museum for Newfoundland and Labrador, The Rooms. Everyone arrived to an amazing sunset, panoramic views of St. John's Harbour and the sweet singing of Jenny Mallard. People enjoyed a delicious dinner, catching up with old friends, and singing happy birthday to CAA in honour of its birthday. The first Acoustics Week in Canada held in Newfoundland and Labrador was truly one to remember!

AWC relies on two important groups of people to make this conference happen every year, the sponsors and the local volunteer committee. We would like to thank NTI-Audio, LogiSon, EOMAC, AIL Sound Walls, HBK and Dalimar for their financial support of AWC2022. In addition to the sponsors, AWC could not have happened without a dedicated and hardworking team of local volunteers. In particular, we would like to thank the technical chair Cristina Tollefsen, the on-site coordinator Sarah Sauvé, and the website coordinator Axel Belgarde.

We look forward to seeing you all again in Montreal in 2023!

Scenes from the Banquet at The Rooms

Dr. Michael Schutz giving a plenary talk

Co-Hosts, Len Zedel and Ben Zendel welcoming everyone to the Annual Meeting of the Newfoundland Beard Association, The Organization for Rhyming Names, The ZZ Top Fan Club, and finally, Acoustics Week in Canada 2022.

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PRIX ETUDIANT BELL EN COMMUNICATION VERBALE ET AUDITION

Arian Shamei (University of British Columbia)

ECKEL GRADUATE STUDENT PRIZE IN NOISE CONTROL /
PRIX ETUDIANT ECKEL EN CONTROLE DU BRUIT

Maël Lopez (École de technologie supérieure)

THOMAS D. NORTHWOOD STUDENT PRIZE IN ARCHITECTURAL AND ROOM ACOUSTICS /
PRIX ETUDIANT THOMAS D. NORTHWOOD EN ACOUSTIC ARCHITECTURALE ET DES SALLES

Magdeleine Sciard (École de technologie supérieure)

RAYMOND HETU PRIZE IN ACOUSTICS/
PRIX RAYMOND HETU EN ACOUSTIQUE

Alyssa MacLean (Dalhousie University)

CAA BEST STUDENT PRESENTATION AWARD/
PRIX DE LA MEILLEURE PRESENTATION ÉTUDIANTE DE L’ACA

Rewan Toubar (Concordia University)

Award winner **Rewan Toubar** with Awards Coordinator Prof. Victoria Duda (left) and President Prof. Jérémie Voix (right), at the Awards Ceremony during the Acoustics Week in Canada 2022 in St. John's, Newfoundland.

Récipiendaire du prix de présentation, **Rewan Toubar** avec la coordinatrice des prix Prof. Victoria Duda (à gauche) et président Prof. Jérémie Voix (à droite), à la cérémonie de remise des prix lors de la Semaine Canadienne d'Acoustique 2022 à St John's, Terre-Neuve.

CONGRATULATIONS / FÉLICITATIONS!

Canadian Acoustical Association
Association canadienne d'acoustique

PRIZE ANNOUNCEMENT • ANNONCE DE PRIX

CANADIAN ACOUSTICAL ASSOCIATION ASSOCIATION CANADIENNE D'ACOUSTIQUE

Prize

EDGAR AND MILLICENT SHAW POSTDOCTORAL PRIZE IN ACOUSTICS
ALEXANDER G. BELL GRADUATE STUDENT PRIZE IN SPEECH COMMUNICATION AND HEARING
ECKEL GRADUATE STUDENT PRIZE IN NOISE CONTROL
FESSENDEN GRADUATE STUDENT PRIZE IN UNDERWATER ACOUSTICS
RAYMOND HÉTU UNDERGRADUATE STUDENT PRIZE IN ACOUSTICS
THOMAS D. NORTHWOOD GRADUATE STUDENT PRIZE IN ARCHITECTURAL AND ROOM ACOUSTICS
ALBERT S. BREGMAN GRADUATE STUDENT PRIZE IN PSYCHOLOGICAL ACOUSTICS

Prix

PRIX POST-DOCTORAL EDGAR ET MILLICENT SHAW EN ACOUSTIQUE
PRIX ETUDIANT ALEXANDER G. BELL EN COMMUNICATION ORALE ET AUDITION (2E OU 3E CYCLE)
PRIX ETUDIANT ECKEL EN CONTROLE DU BRUIT (2E OU 3E CYCLE)
PRIX ETUDIANT FESSENDEN EN ACOUSTIQUE SOUS-MARINE (2E OU 3E CYCLE)
PRIX ETUDIANT RAYMOND HETU EN ACOUSTIQUE (1ER CYCLE)
PRIX ETUDIANT THOMAS D. NORTHWOOD EN ACOUSTIQUE ARCHITECTURALE ET ACOUSTIQUE DES SALLES (2E OU 3E CYCLE)
PRIX ETUDIANT ALBERT S. BREGMAN EN PSYCHOACOUSTIQUE (2E OU 3E CYCLE)

Deadline for Applications:
June 30th 2023

Date limite de soumission des demandes:
30 juin 2023

Consult CAA website for more information
Consultez le site Internet de l'ACA pour de plus amples renseignements
(http://www.caa-aca.ca)

ACOUSTICS WEEK IN CANADA

MONTRÉAL, QUÉBEC, OCTOBER 3-6, 2023

The **Acoustics Week in Canada will be held from October 3-6, 2023** in downtown Montreal, Quebec. You are invited to be part of this three days conference featuring the latest developments in Canadian acoustics and vibration. The keynote talks and technical sessions will be framed by a welcome reception, conference banquet, ASTM Building Acoustics Standards Committee meeting, technical tour and an exhibition of products and services relating to the field of acoustics and vibration.

Montréal's congress center

Take a few days before or after the conference to enjoy the area! Quebec is famous for its fall colours, when trees all over the place turn bright shades of red, orange, and yellow before losing their leaves. It's an annual spectacle that draws tourists from around the world and remains impressive even to those of us who see it every year! Montreal still has important events to offer at this time of year such as the OFF Jazz Festival and the Festival du nouveau cinema.

Venue and Accommodation

The conference will be held at the Plaza in downtown Montreal (https://plazapmg.com/plaza-centre-ville/). A block of rooms is available at the Bonaventure hotel which is 5-minute walk from the conference center. A special conference rate will be offered for reservations made under "AWC2023 conference" codename. Extend your stay and enjoy the local area at the same special rate. Please refer to the conference website for further registration details: https://awc.caa-aca.ca

Jacques Cartier's Bridge

Plenary, technical sessions.

Plenary, technical, and workshop sessions are planned throughout the conference. Each day will begin with a keynote talk of broader interest and relevance to the acoustics community. Technical sessions are planned to cover all areas of acoustics including:

Montréal Downtown

AEROACOUSTICS / ARCHITECTURAL AND BUILDING ACOUSTICS / BIO-ACOUSTICS AND BIOMEDICAL ACOUSTICS / MUSICAL ACOUSTICS / NOISE AND NOISE CONTROL / PHYSICAL ACOUSTICS / PSYCHO- AND PHYSIO-ACOUSTICS / SHOCK AND VIBRATION / SIGNAL PROCESSING / SPEECH SCIENCES AND HEARING SCIENCES / STANDARDS AND GUIDELINES IN ACOUSTICS / ULTRASONICS / UNDERWATER ACOUSTICS

Abstracts

Abstract for technical papers are due before June 15, 2023 through the conference web site. Two-page summaries for publication in the proceedings are due August 1st, 2023. If you would like to organize a session on a specific topic please contact the Technical Chair as soon as possible.

Exhibition and sponsorship.

The conference offers opportunities for suppliers of products and services to engage the acoustic community through exhibition and sponsorship.

The tabletop exhibition facilitates in-person and hands-on interaction between suppliers and interested individuals. Companies and organizations that are interested in participating in the exhibition should contact the Exhibition and Sponsorship coordinator for an information package. Exhibitors are encouraged to book early for best selection.

The conference will be offering sponsorship opportunities of various conference features. In addition to the platinum, gold and silver levels, selected technical sessions, social events and coffee breaks will be available for sponsorship. Sponsors can have their logo placed on the conference web site within 10 days of their sponsorship. Additional features and benefits of sponsorship can be obtained from the Exhibition and Sponsorship coordinator or the conference web site.

Students.

Students are strongly encouraged to participate. Students presenting papers will be eligible for one of three $500 prizes to be awarded. Conference bursaries will also be available to those students whose papers are accepted for presentation.

Registration details.

Please refer to the conference web site: https://awc.caa-aca.ca

Contacts.

Conference Chair:

Olivier Doutres (ÉTS)
(conference@caa-aca.ca)

Technical Chair:

Thomas Padois (IRSST)
(technical-chair@caa-aca.ca)

Exhibits and Sponsorship coordinator:

Julien Biboud (MÉCANUM)
(awc2023exhibitors@caa-aca.ca)

SEMAINE CANADIENNE DE L'ACOUSTIQUE

MONTRÉAL, QUÉBEC, 3-6 OCTOBRE 2023

La Semaine Canadienne de l'acoustique aura lieu du 3 au 6 octobre 2023 au centre-ville de Montréal, au Québec. Vous êtes invités à assister à cette conférence de trois jours durant laquelle les derniers développements en matière d'acoustique et de vibration au Canada seront présentés. Chaque journée débutera par une conférence plénière qui sera suivie de sessions thématiques. Vous pourrez échanger lors de la réception de bienvenue et du banquet. Une réunion du comité des normes d'acoustique du bâtiment de l'ASTM sera également organisée ainsi qu'une visite technique et une exposition de produits et services liés à l'acoustique et à la vibration.

Palais des congrès de Montréal

Prenez quelques jours avant ou après la conférence pour profiter de la région! Le Québec est célèbre pour ses couleurs d'automne, lorsque les arbres prennent des teintes vives de rouge, d'orange et de jaune avant de perdre leurs feuilles. C'est un spectacle annuel qui attire des touristes du monde entier et qui reste impressionnant même pour ceux d'entre nous qui le voient chaque année ! Montréal garde aussi quelques évènements de marque à cette période de l'année comme l'OFF Festival de Jazz et le Festival du nouveau cinéma.

Lieu et hébergement

La conférence se déroulera au Plaza dans le centre-ville de Montréal (https://plazapmg.com/plaza-centre-ville/). Des chambres seront disponibles à l'hôtel Bonaventure, à 5 minutes à pied du centre de conférence, avec un tarif spécial pour les réservations faites sous le nom “AWC2023 conference”. Prolonger votre séjour à l'hôtel au même tarif afin de profiter du centre-ville et de la région. Veuillez consulter le site web de la conférence pour plus d'informations sur l'inscription : https://awc.caa-aca.ca

Pont Jacques Cartier

Centre ville de Montréal

Sessions plénières et techniques

Des sessions plénières, techniques et des ateliers sont prévues tout au long de la conférence. Chaque journée débutera par une conférence plénière d'intérêt pour la communauté de l'acoustique. Des sessions techniques sont également prévues pour couvrir tous les domaines de l'acoustique, à savoir

AÉROACOUSTIQUE / ACOUSTIQUE DU BÂTIMENT ET ARCHITECTURALE / BIOACOUSTIQUE / ACOUSTIQUE BIOMÉDICALE / ACOUSTIQUE MUSICALE / BRUIT ET CONTRÔLE DU BRUIT / ACOUSTIQUE PHYSIQUE / PSYCHOACOUSTIQUE / CHOCS ET VIBRATIONS / LINGUISTIQUE / AUDIOLOGIE / ULTRASONS / ACOUSTIQUE SOUS-MARINE / NORMES EN ACOUSTIQUE

Résumés

Les **résumés des articles doivent être soumis au plus tard le 15 juin 2023** sur le site Web de la conférence. Les articles de deux pages, à soumettre le 1er août 2023, seront publiés dans les actes de la conférence. Si vous désirez organiser une session sur un sujet précis, veuillez communiquer avec le président technique le plus tôt possible.

Exposition et parrainage

La conférence offre aux entreprises fournissant des produits et des services la possibilité de s'engager auprès de la communauté acoustique par le biais d'expositions et de parrainages.

L'exposition des produits et services facilite l'interaction entre les vendeurs et les personnes intéressées. Les entreprises et les organisations souhaitant participer à l'exposition doivent contacter le coordinateur de l'exposition et du parrainage pour obtenir de plus amples informations. Les exposants sont encouragés à réserver le plus tôt possible pour bénéficier des meilleures places.

La conférence offrira des possibilités de parrainage. En plus des niveaux platine, or et argent, certaines sessions techniques, événements sociaux et pauses café pourront être sponsorisées. Les sponsors peuvent ajouter leur logo sur le site web de la conférence dans les 10 jours suivant leur parrainage. D'autres informations et avantages du parrainage peuvent être obtenus auprès du coordinateur des expositions et du parrainage ou sur le site web de la conférence.

Étudiant·e·s

Les étudiant·e·s sont vivement encouragé·e·s à participer à la conférence. Les étudiant·e·s présentant un article seront éligibles pour obtenir un des trois prix de $500 à décerner. Des bourses de participation seront également offertes aux étudiant·e·s dont les communications sont acceptées pour présentation.

Inscription

Pour plus d'informations sur l'inscription, veuillez consulter le site Web de la conférence. https://awc.caa-aca.ca

Contacts.

Président de la conférence:

Olivier Doutres (ÉTS)
(conference@caa-aca.ca)

Président technique:

Thomas Padois (IRSST)
(technical-chair@caa-aca.ca)

Coordonateur des expositions et du parrainage:

Julien Biboud (MÉCANUM)
(awc2023exhibitors@caa-aca.ca)

canadian acoustics
acoustique canadienne
Journal of the Canadian Acoustical Association - Revue de l'Association canadienne d'acoustique

Invitation

Numéro spécial "Semaine du son Canada UNESCO"

Acoustique Canadienne

Un numéro spécial dédié à "La semaine du son Canada - UNESCO" est prévu pour le numéro de mars 2023 de la revue Acoustique Canadienne et que tous les participants sont invités à soumettre un article servant d'actes de conférence et reprenant les éléments présentés durant cette semaine.

Comment en faire partie?

Pour contribuer à ce numéro spécial, les auteurs sont invités à soumettre un article sous forme d'un résumé de 2 pages, sous la rubrique « **Numéro spécial** » dans notre système en ligne au **https://jcaa.caa-aca.ca** avant le **15 janvier 2023**. Il est possible de soumettre un même article dans les 2 langues officielles.

Chaque article sera révisé par le comité éditorial de l'Acoustique canadienne qui veillera à ce que les politiques de publications de la revue soient respectées (contenu original, contenu non commercial, etc. – voir les politiques de la revue pour de plus amples détails).

De véritables actes de conférences dans lesquels vous voulez paraître!

Comme tous les numéros de la revue Acoustique Canadienne, cette édition dédiée sera publiée en format papier et envoyée à tous les membres nationaux et internationaux de l'Association canadienne d'acoustique. Une version électronique sera aussi disponible en ligne sur le site internet de la revue. Le contenu de ces numéros sera indexé, donc facilement trouvable au moyen de moteurs de recherche majeurs, tels Google, Bing, etc.). Les auteurs sont invités à bien choisir les mots clefs pour maximiser la visibilité de leur article.

Pour toutes questions, vous pouvez communiquer avec Mme Pascale Goday (pascalegoday@gmail.com), éditorialiste invitée pour ce numéro spécial, Romain Dumoulin (deputy-editor@caa-aca.ca), rédacteur en chef adjoint, ou encore Jérémie Voix (president@caa-aca.ca), président de l'Association canadienne d'acoustique.

CANADA LA SEMAINE DU SON

CANADIAN ACOUSTICAL ASSOCIATION
ASSOCIATION CANADIENNE D'ACOUSTIQUE

CANADIAN ACOUSTICAL ASSOCIATION

Minutes of the Board of Directors Meeting
Tuesday, 27 September 2022 13:30 – 16:30 PM (EDT)
Sheraton Hotel Newfoundland, St John's and Zoom videoconference

1. Call to Order

Meeting was called to order at 4:30 PM NDT

Present in person were Jérémie Voix (chair), Victoria Duda, Bill Gastmeier, Bryan Gick, Michael Kiefte, Roberto Racca, Joana Rocha, Mehrzad Salkhordeh, Len Zedel, Ben Zendel. Attending online were Umberto Berardi, Dalila Giusti, Andy Metelka, Hugues Nélisse.

The meeting agenda was approved as proposed (moved by Jérémie, seconded by Mehrzad).

2. President's Report (Jérémie Voix)

Jérémie updated the Board on the status of several ongoing major projects that would necessitate a more active involvement on the part of designated Board members or external resources.

Most important is the migration of the CAA website to the latest WordPress format; Jérémie indicated that he was hoping to line up volunteer help through a direct appeal to members of the Association. Many details of the content rendering must be fine tuned to work properly.

The initiative to create an inventory of training programs in acoustics across Canada needs dedicated volunteers. The goal would be to set up an online repository of all the professional, undergraduate, and graduate courses/training offered through universities, colleges, associations, etc. for the benefit of the entire Canadian acoustic community.

Board of Directors operation manual and procedures update: Michael Kiefte reported no progress to date but remains keen on leading the initiative. Our operation manual has not been updated since early 2000's, whereas the role of several key resources has evolved over time, and it would be good to update this information and transcribe it to a wiki.

Solicitations for Practitioners' Corner feature in Canadian Acoustics: Alberto Behar's efforts in canvassing for submissions have not yet led to substantial results. Bill Gastmeier suggested that the drumming up of interest should be broadened to a membership drive. The matter was left to be brainstormed at some future opportunity.

The language pack improvement initiative for the journal and membership management portal site, aimed at providing clear and unambiguous terminology and directives in both English and French, is now ripe for progression on the latest version of OJS. Roberto Racca is the lead for this effort, and he recommitted to the task.

A proposed Local Chapters "starter kit" needs a dedicated volunteer to develop content and to support related activities. Several groups have shown interest in launching "local chapters", and the CAA-ACA could offer these groups practical resources to facilitate the task and assist with coordination.

Andy Metelka confirmed that he is still interested in developing a version of the French short film "What's an Acoustician?" more attuned to the Canadian context and with bilingual audio; Ben Zendel offered his assistance in locating talent for the voice-over.

Jérémie then updated the Board on the development of new functionality in the OJS journal and membership management portal, after a succession of transitions to different platforms finally culminated in the selection of the PKP environment hosted by Simon Fraser University. The transition was completed in July 2022, and the migration of many scripts and programmatic tools supporting the user experience was being finalized by Cécile LeCocq. A major improvement, Jérémie noted, is the management of advertising in the journal as a form of subscription; this not only simplifies payment for advertising but ensures that notifications are sent when an insertion run is about to end and enables current advertisers to have full access to the journal. Dalila Giusti reported great improvement in the collection of advertising revenue since the system went online.

Lastly Jérémie announced that Board member Alberto Behar would not be seeking re-election after long years of dedicated service to the Association for which Jérémie expressed great appreciation. The vacated position would enable Victoria Duda to seek appointment at the AGM as a regular Director after having held a one-year special tenancy on the Board, and continue in her executive role of Awards Coordinator.

3. Treasurer's Report (Dalila Giusti)

Dalila reported that the Association's finances remained in good state, despite a decrease in revenue from member dues which jives with an overall downward trend in membership numbers that would be further elaborated in the Secretary's report. A few investments (GICs) had come to maturity this year and generated about $28,000 of interest over their terms of 3-5 years from a total invested base of about $350,000. Current investments and re-investments will come due between November 2023 and May 2027.

As the interest on investment is amply supporting the student awards granted by the Association, Dalila indicated that she had included in her budgeting an increase in the monetary value of the prizes, which would be presented by the Awards Coordinator later in the meeting and opened to discussion and voting by the Board. On the other hand, she noted that the Association would need to be parsimonious in its use of the operating fund, which cannot receive monies from investments, given the slump in membership dues and higher costs of operations. Revenue from advertising in the journal, however, has gone up thanks to the immediacy of fees collection with the new online billing; $14,000 were collected in the first round of insertions since the system went live. All that considered, Dalila said she would investigate increasing the investment base with a transfer between $25K and $50K from the Operating to the Capital fund subject to Board approval in the upcoming budget vote.

Looking at the financial picture for the imminent conference, Dalila informed the Board that AWC 2022 was projected to incur a deficit; the exact amount was not yet known. She noted that any unspent student travel allocation could be used to help shore up the conference budget.

Printing costs for the journal are expected to be substantially higher with the inevitable changes in production arrangements, Dalila noted; it will be ideal if they can be supported with increased advertising revenue, but ways to keep costs low should also be sought. The March issue (mailed out last June) was published by a new printing house with very high quality, possibly even excessive; this aspect should be revisited to seek greater cost effectiveness. Dalila added that 100 copies of the September issue, printed just in time, were delivered to Umberto at the airport that day and were being hand-carried to the conference for distribution; they were also expected to be expensive. For the longer term, former chief editor of the journal Ramani Ramakrishnan has volunteered to seek quotes from three printers and provide a cost-benefit analysis leading to a choice.

Dalila went through some highlights of the 2022 and proposed 2023 budgets (previously circulated to all Directors) and a brief discussion ensued especially regarding the student travel support for AWC, which Dalila suggested should be structured in a way that is fair to students incurring the greatest costs. The matter was left to be brainstormed in a separate forum (Jérémie suggested having it on the agenda for the Spring meeting); for the present AWC it was agreed that all out of town student participants would receive $500.

Dalila moved that the budget and related provisions be approved; the motion was seconded by Jérémie and carried unanimously in the Board's vote.

4. Editor's report (Umberto Berardi)

Umberto updated the Board on the challenges faced with the production of the journal, which he had outlined in detail at the previous meeting in the Spring. The editorial workflow problems associated with the hindered functionality of the online journal management system (OJS) have now been largely overcome after the final port to the PKP hosting; a tougher difficulty had been the bankruptcy of the publishing company that had handled the printing and mailing of the physical journal for much of its existence. After having to iterate through another printing house that managed producing one issue before it too went into difficulties, a new printer was engaged that provided a high-quality product but at substantially increased costs. The first issue of Volume 50 (the nominal March 2022 issue) was printed and mailed in June, then priority had to be given to the September issue (Vol. 50 issue 3) because it is the conference issue collecting the proceedings papers and traditionally distributed before the event. 100 copies of that issue, as already mentioned by Dalila, were delivered to Umberto in Toronto that very day for hand-carrying to St. John's, but the frantic editorial and production effort had required to leapfrog completely issue 2 (June 2022). Umberto asked the Board for advice on what to do next – skip the June issue and publish the December one or publish issue 2 out of temporal sequence. Jérémie noted that a journal should never skip an issue as that would create indexing problems by various indexers (Google Scholar, Elsevier, etc.), and the Board recommended to go for the full four issues also to meet obligations to advertisers.

Umberto noted that content is available in reasonable quantity to populate a delayed June issue, though it will not be a very thick one; the December issue will be more substantial. It was noted that it would be preferable from the standpoint of full-year advertisers to have a distinct mailing of each issue even if they were produced in close succession, because it would raise greater readership attention to each ad. After some discussion of the practicality and cost of the alternatives it was agreed that issues 2 and 4 would be mailed out distinctly on whatever production schedule could be achieved.

5. Secretary's Report (Roberto Racca)

Roberto presented as per usual format a comparative table of membership numbers and their trend over the previous 12 months. He noted that the numbers for both the full and student membership categories had steadily decreased, totalling a loss of almost 50 members year on year relative to Fall 2021. As an arguably contributing reason he conjectured that following a rise in numbers leading up to the AWC virtual event of early October 2021, for which membership had been a registration prerequisite, numbers might have fallen through non-renewal because people were not similarly motivated to attend the in-person event in 2022 even at discounted member rates. Roberto noted that, if indeed a cause for the drop, this would raise the possibility that in-person conferences may not be as effective a stimulus for membership after the experience of a virtual event in the two past years.

A discussion followed among Board members on the relevance of the demographics (professional affiliation and career stage) of members who failed to renew. A recommendation was made to the Secretary to generate the needed analytics for interpreting as far as possible any patterns, then reach out to members in an informed approach to re-engage them. Roberto also noted that – although the number of sustaining subscribers tends to endure out of an exemplary commitment of that group – we should think of better ways of recognizing and enhancing the profile in the Association of these organizations who contribute to and empower its activities. One possibility is to feature on a rotating basis, in a prominent placement on the online Journal site, a brief profile of each sustaining organization, e.g. as the "Sustainer of the month". The suggestion was raised to do something similar for student members, whose career objectives would receive a boost from the showcasing of their interests and research in such a manner. These ideas will be explored and may provide a valuable way to engage in a much more tangible and individual manner key sectors of the membership.

6. Awards Coordinator's Report (Victoria Duda)

Victoria presented the summary of the prizes to be awarded this year and noted that no entries were received for the Fessenden prize in underwater acoustics, an especially noticeable absence at a conference where that subject is especially prominent in the program. She stressed the importance of better social media showcasing, particularly on LinkedIn, of not just the winners but also their academic advisor and research topic – thus creating a highly visible promotion across professional circles which would motivate others to pursue the awards also for the sake of the exposure.

Victoria raised the matter of the Hétu prize, which had previously been the subject of some discussion as to whether instead of a preselected book the prize it could be converted to the monetary value of a book. Jérémie had done some background research and found no evidence that the original prize was set up explicitly to be a selected book. Victoria suggested that unless some restrictive evidence was brought up, the change should be presented to the membership at the AGM. Brian proposed and Dalila seconded a motion to make the cash amount $300; all Board members approved.

Referring to a passage of the Association's operations manual, cited in her report, which gives Directors the power to authorize through a majority vote any "expenditures for the purpose of furthering the objects of the corporation", Victoria moved for an increase of 30% of all monetary prizes; Mehrzad seconded. All voted in favour, with the change having effect immediately to increase the current year's prizes.

Lastly Victoria raised the question of whether the Directors' Award should be revived this year; she presented a list of recent articles published in Canadian Acoustics that could qualify for the Award provided at least one author was a member of the Association. Hugues provided some detail on the evaluation and scoring system as was practiced in the past. It was agreed that the award would go ahead this year and Victoria would make the necessary arrangements to enable scoring by the Directors.

7. Social Media Editor's Report (Romain Dumoulin)

Speaking on Romain's behalf, Jérémie gave a brief update on the status of the Association's social media, which are steadily gaining a regular following and featuring an increasing range of content.

He relayed a request from Romain that people use a designated hashtag for any postings related to the conference; this will be communicated to the conference participants at the beginning of the event.

8. Current and Upcoming Meetings

a. AWC 2022: St-John's (Benjamin Zendel & Len Zedel)

The co-chairs informed the Board that the event was fully coordinated and ready to start the following morning. They identified some key statistics and facts:

- Over 80 people registered.
- 70 presentations; two keynote talks.
- Session on teaching of acoustics did not receive strong input – but it is a valuable idea.
- Coast Guard ship tour by prior registration is arranged and set to proceed.
- Harbour symphony – ships' horns chorus – will take place on the Friday noon.

b. ISO TC43 Plenary Montréal 2023 (Jérémie Voix)

Organizing well underway.

c. AWC 2023 Montréal (Olivier Doutres)

Organizing well underway.

d. AWC 2024 Toronto Ryerson (Umberto Berardi)

Still some question of whether a more Western location might be preferable, but Ryerson is ready and committed to host the event at this point.

e. InterNOISE 2025 Ottawa (Joana Rocha and Sebastian Ghinet)

Joana provided an update on the bidding process that now has Ottawa and Brazil (city not specified) as the two competing candidates. The City of Ottawa was very helpful in putting together an outstanding quality bid. Budget turned out to be a primary factor and Brazil seems to have a stronger position than Ottawa; the final word is not out – will know in November.

f. AWC 2025 Ottawa (Joana Rocha and Sebastian Ghinet)

Conditional to InterNOISE bid not being successful for Ottawa. In that case, could instead consider hosting AWC 2024 if Ryerson preferred this option.

9. Varia

No new matters were raised.

10. Next Meeting

To be held in Spring 2023 by video conference.

11. Motion to adjourn

Moved by Jérémie, seconded by Dalila. Meeting adjourned at 7:45 PM NDT.

CANADIAN ACOUSTICAL ASSOCIATION

Minutes of the Annual General Meeting

Thursday, September 29th, 2022, 17:00-18:00 PM (NDT)
Sheraton Hotel Newfoundland, St John's

1. Call to Order

Meeting was called to order 17:05 (NDT) by Jérémie Voix (President), who said a few words of welcome to 31 people in attendance and introduced the meeting agenda. He moved that the agenda be adopted, seconded by Mehrzad Salkhordeh.

2. President's Report (Jérémie Voix)

Jérémie updated the attendees on some of the project initiatives that the Association is pursuing, for some of which he appealed for assistance from volunteers among the membership; he highlighted in particular:

- The migration of the main CAA-ACA web site to the latest WordPress environment.
- The creation of an inventory of training programs in acoustics across Canada.
- An outreach among members of the noise control consulting industry to solicit editorial contributions to a Practitioners' Corner regular feature in Canadian Acoustics.
- The coordination and support of local chapters promoting acoustics knowledge and the activities of the Association, through visibility on the CAA web site and the creation of a "starter kit".

Moving on to new business, Jérémie informed the members that the Open Journal System portal, which had experienced major malfunctions following its migration to the professionally hosted environment OpenJournalSystems.com, has been moved to the PKP platform hosted by Simon Fraser University. The transition was completed in July 2022 and is working well; the migration of scripts and tools supporting functionality from membership management to journal production was being finalized by Cécile Le Cocq. A major improvement that is now fully implemented, Jérémie noted, is the management of advertising in the journal as a form of subscription; this not only simplifies payment for advertising but ensures that notifications are sent out when an insertion run is about to end and enables current advertisers to have full access to the journal.

Lastly Jérémie announced that long-time Board member Alberto Behar, whom he thanked publicly for his years of service to the Association, would not be seeking re-election. This would enable Victoria Duda, currently reaching the end of a one-year special tenancy on the Board as allowed by the Association articles, to seek appointment as a regular Board member and continue in her executive role of Awards Coordinator. Jérémie noted that Victoria's presence would help balance gender representation on the Board, and he also advocated for an increase in future rollover of Board positions to new participants through the establishment of a more formal cycle.

3. Treasurer's Report (Dalila Giusti)

Jérémie, delivering the report on behalf of Dalila in her absence, highlighted key points from the financial statements of the Association. He presented a comparative table of accounts balances over the previous few years, showing a solid financial position with over $553,000 in assets between capital fund (from which awards are distributed), operating fund (for general expenses) and investments. He noted that the interest from investments (held in several GICs that protect the principal and guarantee a minimum rate of return, which over the years has often been substantially exceeded) is the source of funding for awards and pointed out that assets from the operating fund can be moved to the capital fund but not vice versa. He then presented a list of disbursed awards, noting that by decision of the Board the monetary value of all awards save the Science Fair scholarship had been permanently increased by 30%; the total payout in prizes for 2022 is $9,300 (a few awards including the Fessenden prize were not bestowed for want of applicants) against an interest income of $28,320.

Jérémie presented the current year budget comparing actuals to forecast on both sides of the balance sheet; he commented on a higher-than-expected revenue from advertising thanks to the guaranteed payment under the new online management system, but a substantial increase in journal production costs caused by the need to engage new printing houses as the pandemic caused the long-time incumbent as well as others to fail. Pending the actualizing of the remaining production costs for the journal and the financial performance of the current conference (the first in-person since the pandemic), the definitive financial position for the 2022 fiscal year remains uncertain. Jérémie then presented the proposed budget for 2023, which conservatively forecasts a deficit of about $10,000. He moved for the budget to be approved, which was seconded by Roberto Racca; the motion carried.

4. Secretary's Report (Roberto Racca)

Roberto opened his presentation with a table of membership numbers and their trend over the previous 12 months. He noted that there had been a decrease in numbers in both the full and student membership categories, totalling a loss of almost 50 members year on year relative to October 2021. He surmised that following a rise in the lead-up to the Acoustic Week in Canada virtual event of early October 2021, for which membership was a prerequisite, numbers might have fallen by attrition as people were not similarly motivated by lower registration fees for members to attend the in-person event in 2022. Although the downward trend cannot be solely attributed to this cause, Roberto noted, this alerts to the possibility that in-person conferences may not be as effective a stimulus for membership after the experience of a virtual event in the two past years. That factor aside, he continued, it remains imperative that the Association provide greater value and motivation to its members if the trend in membership numbers is to be turned upward. While inviting contribution of any suggestions to that end, Roberto mentioned an idea discussed recently with the Board for raising the visibility of some key segments of the Association's ranks through rotating monthly postings on the CAA-ACA web site of institutional and individual profiles of one or more sustaining subscriber(s) and student member(s). This and other initiatives aimed at recognizing and showcasing the qualifications of members and institutional supporters of the Association would be considered and acted on by the Secretary and other members of the executive and Board.

5. Awards Coordinator's Report (Victoria Duda)

Victoria presented a list of the 2022 award winners and the monetary value of each prize. She emphasized the fact that prizes had been increased by 30% by recommendation of the Board and announced that the Hétu prize had been converted from a preselected book to a $300 cash value. Noting that not all the prizes had been awarded that year for want of nominees, Victoria exhorted the coordinators of individual awards to reach out more broadly to university faculty and publicize the winners and their supervisors in social media to give a strong profile and appeal to the awards and the Association.

6. Editor's Report (Umberto Berardi)

Umberto gave an update on the challenges faced with the production of Volume 50 of Canadian Acoustics in 2022. There had been difficulties associated with the functionality of the online journal management system (OJS) that have now been largely overcome; a bigger challenge had been the bankruptcy of the publishing company that had handled the printing and mailing of the physical journal for much of its existence but could not survive the downturn caused by the pandemic. An alternative printing house handled the printing and distribution of the March issue (mailed in June) before it too was unable to remain in business; a new printer had then been engaged to produce the all-important September conference issue that was distributed at the current event, with excellent quality of product but higher costs than in the past. Umberto noted that on the advice of the Board it had been decided to next publish the June issue to ensure consistency of indexing (approved article content was already available), followed by the December issue.

Umberto noted that there were some critical vacancies on the editorial board in fields that included Bioacoustics, Physical Acoustics and Underwater Acoustics, and he invited suggestions or volunteering by qualified candidates. He pointed out that the new online production system required some new training for the editors. Finally, Umberto noted that features of the journal such as the Practitioner's Corner had been neglected of late but will be revitalized, because Canadian Acoustics should be of value to all sectors of our membership, not only the scientific community.

7. Social Media Editor Report (Romain Dumoulin)

Jérémie gave a brief presentation on behalf of Romain Dumoulin, showing a few screenshot examples of recent posts on Twitter and LinkedIn related to promoting events at the present conference, and displaying trend statistics that indicate a steady increase in following and activity on the platforms that the Association uses. He noted that the publishing of CAA-ACA news, events and initiatives on LinkedIn and other media is a main focus, and encouraged the submission of relevant items to post.

8. Meetings Present and Future

AWC 2022: St John's, Newfoundland (Benjamin Zendel and Len Zedel, Memorial University, co-Chairs)

Len Zedel and a member of the AWC 2022 organizing committee, Cristina Tollefsen of DRDC Atlantic in Halifax, shared the stage and provided an update on the current conference, the first to be held as an in-person event since 2019. They reported that 80 participants had come to the conference, 16 of them students – a respectable attendance especially given the far-flung location of the event and the uncertainties still associated with travel in the unpredictable circumstances of the pandemic. Noting the ocean facing setting and maritime traditions of St John's they remarked on the three underwater acoustics sessions on the program, two of them on shipping noise. They congratulated on their dedication the core volunteers who helped most directly with the organizing of the conference, and thanked for their support the sponsors and exhibitors who made possible various activities throughout the event and provided a focus of interest. Len spoke about some of the unique sharing of knowledge that took place at this edition of AWC including the session on teaching of acoustics, and advocated for future congresses the planning of session topics that would promote cross-disciplinary thinking. Shifting attention to the social aspects of the gathering, he commented on a very well attended students social evening and the upcoming banquet, Coast Guard ship tour and Memorial University school of music visit. Lastly, he remarked on the high quality and very positive reception of the two plenary sessions, one by Michael Schutz on improving safety-critical alert sounds based on learning from musical acoustics, and the other by two members of the Canadian Coast Guard on the acoustic components of aids to navigation.

Jérémie thanked and complimented the AWC 2022 organizers and proceeded to give an overview of planned future annual conferences and related meetings. He commented on the progress being made in organizing for 2023 a CAA-sponsored event in Montréal of the ISO TC43 plenary meeting (chair: Jérémie Voix, ÉTS) , which prompted a comment from Peter van Delden of RWDI who argued for greater participation of subject experts in standards committees as a service to the acoustics community. Jérémie announced that and AWC 2023 would also be hostedin Montreal (chair: Olivier Doutres, ÉTS) and moved on to flexible plans for AWC 2024, which could be held in the Toronto area (chair: Umberto Berardi, Ryerson) subject to the outcome of a bid led by Joana Rocha for hosting InterNOISE 2025 in Ottawa. Joana took the floor for an update on that subject; she noted that Ottawa's proposal was submitted to INCE several weeks earlier in Glasgow and is in competition with Brazil, whose very aggressive budget might yet carry the day. Should the large organizational responsibility for InterNOISE 2025 not fall to Ottawa, Joana noted, AWC 2024 could be held in Ottawa under her chairing (co-chair: Sebastina Ghinet). She pointed out that Ottawa has a large scientific and technical community related to acoustics, which would promote a substantial attendance.

9. Board of Directors Elections

Jérémie introduced the current slate of directors, including Victoria Duda on an expiring one-year special appointment, and indicate that all would stand for re-election save for Alberto Behar whose vacated position as regular Board member could be taken up by Victoria. He called for any other nominations from the floor; there being none, he asked for a vote by show of hands to re-elect the members of the Board. The attendees ratified the reappointment and expressed appreciation for Alberto's service.

10. Varia

None on the agenda, nor raised from the membership.

11. Motion to Adjourn

Moved by Jérémie, seconded by Mehrzad Salkhordeh. Meeting adjourned at 17:55 (NDT).

CANADIAN ACOUSTICS ANNOUNCEMENTS - ANNONCES TÉLÉGRAPHIQUES DE L'ACOUSTIQUE CANADIENNE

Looking for a job in Acoustics?

There are many job offers listed on the website of the Canadian Acoustical Association!

You can see them online, under http://www.caa-aca.ca/jobs/

August 5th 2015

Acoustic Training in Canada Database: Help us to help the younger generation and seasoned professionals

CAA is building a comprehensive list of all training programs offered in acoustics in Canada and we need your help! Below is a survey to help us populate that database that will eventually be available on CAA website. Please return all valuable input at your earliest convenience to Mr. DeGagne (wdegagne@caa-aca.ca)!

Dear CAA members, past members and friends, The purpose of this survey is to develop an online database of all the professional, undergraduate, and graduate acoustical courses and training programs offered through universities, colleges, associations, etc. This database would benefit the entire Canadian acoustic community in the following manner: 1. Track the different acoustical courses and training programs offered nationally 2. Allow CAA members to plan their acoustical training and easily select their perfect training program to meet their career aspirations 3. Allow CAA members to compare and contrast courses and training programs from different institutions 4. Allow institutions and the CAA to determine where the training gaps are and to plan for future programs demands To help us populate this database, simply return the following information at your earliest convenience to Mr. William DeGagne (wdegagne@caa-aca.ca), volunteer for CAA: 1. Place of the Course or Training program (university, colleges, etc.): 2. Name of Course or Training program: 3. Approx. date the Course or Training was followed: 4. Level (graduate, undergraduate, college course or professional training program, etc.): 5. Brief description of the Course or Training program: 6. Webpage of Course or Training program: 7. Location of Course or Training program (City, Province): 8. Course or Training program language: Thanks for you help towards the younger generation and seasoned professionals! :-)

May 31st 2021

INTER-NOISE 2023 to be held August 20-23, 2023, in Makuhari Messe (Japan)

We are very pleased to inform you that the website of INTER-NOISE 2023 has been launched. Its link is https://internoise2023.org/.

The INTER-NOISE 2023 is held at Makuhari Messe (https://www.m-messe.co.jp/en/) from August 20-23, 2023, which is sponsored by International Institute of Noise Control Engineering (I-INCE) and is co-organized by Institute of Noise Control Engineering of Japan (INCE/J), Acoustical Society of Japan (ASJ).

August 12th 2022

Alberto Behar Passed Away

Beatriz and Alberto Behar, died peacefully on Tuesday, November 29th, 2022 surrounded by their loved ones in Toronto, Canada.

Following their wishes, there will not be a funeral or any other kind of ceremony. However, should you wish to celebrate their life, we encourage you to make a donation in their names to the Canadian Heart and Stroke Foundation, the Canadian Kidney Foundation or to a charity of your choice. They lived their lives filled with adventures, joy and on their own terms. Although we are saddened by their departures, they leave great memories in our hearts. With love, their children, grandchildren and great granddaughters, as well as all colleagues from the Canadian Acoustical Association

December 19th 2022

À la recherche d'un emploi en acoustique ?

De nombreuses offre d'emploi sont affichées sur le site de l'Association canadienne d'acoustique !

Vous pouvez les consulter en ligne à l'adresse http://www.caa-aca.ca/jobs/

August 5th 2015

Répertoire des formations en acoustique au Canada : aidez-nous à aider la jeune génération et nos professionels d'expérience

L'ACA est en train de dresser une liste complète de tous les programmes de formation offerts en acoustique au Canada et nous avons besoin de votre aide ! Vous trouverez ci-dessous un sondage qui nous aidera à alimenter cette base de données qui sera éventuellement disponible sur le site Web de la CAA. Veuillez retourner vos précieux commentaires à M. DeGagne (wdegagne@caa-aca.ca) dans les plus brefs délais !

Chers membres, anciens membres et amis de l'ACA, Le but de cette enquête est de développer une base de données en ligne de tous les cours et programmes de formation en acoustique professionnels, de premier et de deuxième cycle, offerts par les universités, les collèges, les associations, etc. Cette base de données profiterait à l'ensemble de la communauté acoustique canadienne de la manière suivante : 1. Suivre les différents cours et programmes de formation en acoustique offerts à l'échelle nationale. 2. Permettre aux membres de l'ACA de planifier leur formation en acoustique et de choisir facilement le programme de formation idéal pour répondre à leurs aspirations professionnelles. 3. Permettre aux membres de l'ACA de comparer et d'opposer les cours et les programmes de formation de différentes institutions. 4. Permettre aux institutions et à l'ACA de déterminer où se trouvent les lacunes en matière de formation et de planifier les demandes de programmes futurs. Pour nous aider à alimenter cette base de données, il vous suffit de retourner les informations suivantes dans les meilleurs délais à M. William DeGagne (wdegagne@caa-aca.ca), bénévole pour l'ACA : 1. Lieu du cours ou du programme de formation (université, collèges, etc.) : 2. Nom du cours ou du programme de formation : 3. Date approximative à laquelle le cours ou la formation a été suivi. 4 : 4. Niveau (études supérieures, premier cycle, cours collégial ou programme de formation professionnelle, etc :) 5. Brève description du cours ou du programme de formation : 6. Page web du cours ou du programme de formation : 7. Lieu du cours ou du programme de formation (ville, province) : 8. Langue du cours ou du programme de formation : Merci pour votre aide à l'intention de la jeune génération et de nos professionels d'expérience ! :-)

May 31st 2021

MEMBERSHIP DIRECTORY 2022 - ANNUAIRE DES MEMBRES 2022

This member directory is generated from the Canadian Acoustical Association membership database records. Please feel free to update or correct this information directly on `http://jcaa.caa-aca.ca`.

Ce répertoire des membres est généré à partir des informations de la base de données des membres de l'Association canadienne d'acoustique. Merci de mettre à jour ou corriger toute information directement sur `http://jcaa.caa-aca.ca`.

Code	Subscription type	Type d'inscription
1	Individual Member	Membre individuel
2	Student Member	Membre étudiant
3	Indirect Subscriber (Canada)	Abonné institutionnel indirect (Canada)
4	Sustaining Subscriber	Abonné de soutien
5	Indirect Subscriber (USA)	Abonné institutionnel indirect (É-U)
6	Indirect Subscriber (International)	Abonné institutionnel indirect (International)
7	Emeritus Member	Membre Emeritus
8	Full-Page Advertisement (1 year)	Publicité pleine-page (1 an)
10	Direct Subscriber	Abonné institutionnel - Direct
13	Half-Page Advertisement (1 year)	Publicité demie-page (1 an)
14	Quarter-Page Advertisement (1 year)	Publicité quart de page (1 an)
15	Retired Member	Membre retraité

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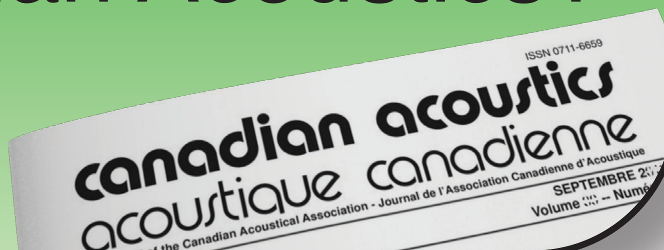

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