

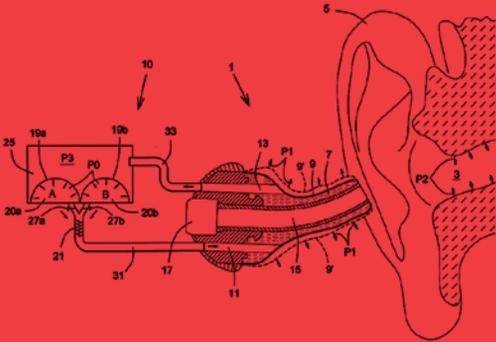


ABOUT THE NSERC-EERS RESEARCH CHAIR

The NSERC-EERS Industrial Research Chair in In-Ear Technologies (CRITIAS) was created in September 2016 as part of a long-standing and successful partnership between EERS (previously Sonomax) and École de technologie supérieure (ÉTS).

The partnership was initiated in late 1999 when Jérémie Voix began doctoral work on the development of an “intelligent” earplug under the direction of Professor Frédéric Laville of ÉTS. With financial support from the NSERC Collaborative Research and Development Grants Program and from the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST), the young researcher launched his work and quickly established himself as an R&D leader. Working together, Jérémie Voix and the team, led by Nick Laperle, developed a unique technology designed to protect industrial workers from noise-induced hearing loss (NIHL). The resulting hardware and software solution, is protected by over 50 patents and trademarks and has been marketed all over the world.

Following 10 years of collaborative work, the partnership became more firmly established when Jérémie Voix accepted a position as an associate professor at ÉTS and founded the CRITIAS research chair in 2010, now supported by the National Science and Engineering Research Council of Canada (NSERC) and dedicated to his original quest: to develop a true “bionic” ear that provides effective protection, amplification, communication, monitoring and biosensing within a single in-ear device. Together, Nick Laperle and Jérémie Voix won first prize at the 2016 “Hear and Now” Noise Safety Challenge hosted by American federal government agencies.



MISSION AND RESEARCH FOCUS

CRITIAS focuses on the development of various technologies designed to complement the human ear, from “intelligent” hearing protection and communications in high-noise environments to the integration of in-ear brain-computer interfaces, and wearable hearing diagnostics.

Research chair activities focus on three areas:

01 // DIGITAL HEARING PROTECTION

Continuous dosimetry (24 hours)
Individual susceptibility to hearing loss
Objective attenuation measurement in real-time

02 // COMMUNICATION IN HIGH-NOISE ENVIRONMENTS

In-ear microphone voice pick up
Onboard radio-communication system
Radio-acoustic virtual environment (RAVE)
Selective amplification
Speech enhancement

03 // IN-EAR BIOSENSING

Brain-computer interfaces (BCI)
Cognitive biometry
Hearing fatigue and recovery measurement
In-ear biosignals
In-ear electroencephalography





CHAIRHOLDER

Jérémie Voix, P.Eng., Ph.D.

BENEFITS OF RESEARCH CHAIR ACTIVITIES

Development of knowledge and technologies required for the design of a bionic earplug that could also become a brain-computer interface. The earplug will integrate the following features in a single device:

- Protect the wearer against harmful noise while enhancing speech and useful auditory perception
- Enable in-ear communication: transmission and reception within the ear
- Enable measurement of biosignals in the occluded ear canal as well as the measurement of brain waves using electroencephalography (EEG)

Integration of technologies developed by the research chair into SonoFit® technology developed by EERS (an earmold that can be instantly adapted to the wearer's ear).

Development of innovative hearing products for the general public and industrial, military, and medical markets.

Fit-testing technology developed during initial collaborations between Sonomax and ÉTS is now being marketed globally by 3M, U.S. multinational and is proving to be a considerable technical and commercial success.

Professor Jérémie Voix is an acoustics specialist with nearly 20 years of experience in workplace noise mitigation. Since 2000, he has worked concurrently in academic and industrial settings, published his fundamental and applied research results, and continued to register patents for an advanced individual hearing protection solution. Professor Voix has authored or co-authored over 100 scientific publications as well as a dozen patents. As a hearing protection expert, he is regularly invited to contribute to the organization of international conferences and to review articles and theses. He has been awarded several prizes and distinctions in recent years, including the Ordre des ingénieurs du Québec "Hommage reconnaissance pour contribution exceptionnelle" (2017) and the ÉTS Board of Director's "Prix d'excellence en recherche - Chercheur émergent" (2017). He was appointed Research and Innovation Ambassador by the ÉTS Alumni Association and received TechnoMontréal's Inspiration|Innovation award (2012).

Professor Voix is President of the Canadian Acoustical Association (CAA), and Associate Director (Scientific and technological Research) at the Centre for Interdisciplinary Research in Music Media and Technology (CIRMMT), housed at McGill University's Schulich School of Music, where he is also an Adjunct Professor. He is as well an associate member of the International Laboratory for Brain, Music and Sound Research (BRAMS) and co-founder of the ÉTS-IRSST joint infrastructure laboratory for acoustic research (ICAR-Infrastructure commune en acoustique pour la recherche). Member of the Canadian Standards Association Z94.2 committee on Hearing Protection (CSA S304.3-SC), he is an active member of the American National Standard Institute (ANSI) S12-WG11 working group. He is also in charge of writing the technical draft for the future ANSI S12.71-201X standard, which will govern field attenuation measurement systems for hearing protectors.

RESEARCH CHAIR PARTNERS



CRSNG
NSERC



Fondation
de Gaspé Beaubien

COLLABORATORS



Infrastructure commune
en acoustique pour la
recherche ÉTS-IRSST



Centre for Interdisciplinary Research
in Music Media and Technology



International Laboratory for
Brain, Music, and Sound Research



McGill

CONTACT:

Professor Jérémie Voix, P. Eng., Ph.D.

Phone: 514-396-8437

E-mail: jeremie.voix@etsmtl.ca

Web: critias.etsmtl.ca

Département de génie mécanique
École de technologie supérieure
1100 Notre-Dame Street West
Montréal (Québec) Canada H3C 1K3