



DR. RICHARD J. BELLUCCI

# Translational Hearing Center

Creighton University

April 2025 Newsletter



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## A Message From Our Director, Peter Steyger, PhD

This group photo was proposed and organized by one of our graduate students, Vignesh, and within 24 hours 20 center members from Creighton attending ARO (from a total of 28) convened for this photo.

This image shows how much the Center has grown from ~7 members 7 years ago into a community with a common goal, a sense of belonging and camaraderie with a shared spirit to achieve the goals of the Center.

This is the first time a group photo has meant so much to me. Many senior colleagues (my peers!!) have said to me how impressed they were with the growth and visibility of the Center. I am thankful and blessed to be surrounded and blessed by so many talented individuals who have made this possible, and that includes those not at ARO, particularly yourselves, Research Core and support staff.

And all of those attending ARO are thankful for the support of the Creighton University School of Medicine, the Bellucci Depaoli Family Foundation, NIH-NIGMS and other funding agencies that support the mission of the center to identify new etiologies of hearing and vestibular deficits, and to preserve or restore hearing and vestibular function.

# Auditory & Vestibular Technologies Core Updates

## ZebraFish SubCore

In preparation for our CoBRE Phase 2 submission we have made changes to our cores. The Zebrafish subcore has been transferred to the Auditory & Vestibular Technologies (AVT) Core effective February 1, 2025. Users should expect the Zebrafish sub core to continue normal operations. All future information related to Zebrafish can now be found on the AVT core webpage. Additionally, we have decided to transition the Drug Discovery and Delivery Core into a self-service core. Please reach out to Zebrafish subcore manager Linda Goodman (lindagoodman@creighton.edu) for further information regarding the AVT Zebrafish subcore.



- Behavioral Analysis
- Drug Screening
- Genetic Manipulation
- Zebrafish Imaging

The Zebrafish services of the Auditory & Vestibular Technologies core provide support for behavioral, developmental, and neurobiological studies. Researchers have access to fish housing, breeding, and use of several instruments specific for using zebrafish as a model organism. We can support researchers and facility users through any of the following services. Additional project-specific support for users can be arranged as needed.

## Mass Spectrometry

Molly McDevitt, PhD, Mass Spectrometry sub core manager, was selected to be one of 15 attendees at a Symposium for Proteomics Core Directors. All expenses are covered! Molly traveled to Arkansas in March to attend and explored new techniques with other core directors. This symposium was put on by the IDeA National Resource for Quantitative Proteomics. Please reach out to Molly McDevitt with any questions.

**Mass Spectrometry Contact:**  
[mollymcdevitt@creighton.edu](mailto:mollymcdevitt@creighton.edu)



## Auditory & Vestibular Technologies Core



### **Molecular Biology Subcore**

Located in Room 209 of Criss I building, the Molecular Biology subcore facility is equipped with instruments commonly used for molecular biology and genomic experiments. Milliplex Analyzer, QuantStudio 3 Real-Time PCR System, ChemiDoc MP Imaging System, and The 10X Chromium Controller are all available for use. Please reach out to the Molecular Biology subcore manager Sarath Vijayakumar with any questions.

Molecular Biology:

[sarathvijayakumar@creighton.edu](mailto:sarathvijayakumar@creighton.edu)

### **Advanced Imaging Sub-Core**

Our Advanced Imaging and Molecular Biology subcores continue to serve researches with their needs. The Advanced Imaging subcore offers multiple advanced research microscopes that are available for imaging-based experiments as well as a selection of sophisticated software packages that can be utilized for image analysis. Please reach out to the Advanced Imaging sub-core manager Anthony Stender with any questions.

Advanced Imaging Contact:

[anthonystender@creighton.edu](mailto:anthonystender@creighton.edu)



The Auditory & Vestibular Technologies (AVT) Core is established to provide infrastructure to support Research Project Leaders and principle investigators associated with the Dr. Richard J. Bellucci Translational Hearing Center to conduct auditory and vestibular research across the full range of experimental model systems, from single molecule analysis to whole organism models. The AVT Core is located within the Criss Building complex of Creighton University School of Medicine and is under the direction of core director Michael Nichols, PhD.

The AVT Core facilities and its personnel can also enhance the scope of technical options, foster collaboration for multidisciplinary research, play an important role to prepare talented new investigators submitting new research proposals, and in the technical training of graduate students and post-doctoral fellows. The AVT Core will continue to incorporate new methodologies as Core options to provide leading-edge technologies to center investigators.

**[Click Here for Core Fee Schedule](#)**

# New Center Faculty Members

## New Faculty Members

The Bellucci Translational Hearing Center is excited to announce the addition of our newest faculty members; Allison Coffin, PhD, Kelsey Anbuhl, PhD, and Hui Hong, PhD.



**Allison Coffin, PhD**

As one of our three new hires, Dr. Allison Coffin has joined the Center as our Assistant Director. Dr. Coffin brings her valuable experience to support the Center's initiatives as well as continued growth and development to advance the Center's commitment to hearing research and innovation.



**Hui Hong, PhD**



**Kelsey Anbuhl, PhD**

Dr. Hui Hong and Dr. Kelsey Anbuhl are both highly qualified and eligible to apply for Research Project Leader awards within our CoBRE. They both represent the Center's mission to advance the commitment to hearing research and innovation.

[Click Here for a full list of Center members](#)

# Pilot Project Awardees

## Oleg Korzyukov



Age-related neurodegeneration is a devastating brain condition, manifesting in the deterioration of essential cognitive functions such as auditory processing. Central auditory processing relies on the transmission of information from the brainstem to cortical neuronal populations and involves the interplay between networks distributed

across temporal and frontal lobes. Neurodegeneration affecting these auditory networks is a significant factor contributing to age-related neurodegenerative diseases like Parkinson's disease (PD) and Alzheimer's disease (AD).

Central auditory processing networks become functionally integrated in different configurations depending on the ongoing tasks, such as passive listening or auditory-controlled voice production. Thus, neurodegeneration-related aberrations in these networks may give rise to disease-specific bioelectrical brain indices that can help disentangle multiple neurodegenerative processes. Understanding the mechanisms behind these processes is crucial for proposing appropriate clinical interventions.

The long-term goal of this research is to identify and functionally characterize disease-specific bioelectrical markers associated with age-related neurodegeneration that impacts auditory processing within temporal and frontal brain neuronal networks during passive listening and voice production tasks. Our approach aims to develop and validate bioelectrical brain markers that will help identify individuals at heightened risk of AD and/or cognitive impairment, potentially before clinical symptoms appear. Furthermore, characterizing these disease-specific bioelectrical indices in PD during auditory processing will assist in distinguishing between different neurodegenerative processes, leading to earlier diagnosis and more effective management.

Using Magnetoencephalography (MEG) and Electroencephalography (EEG), we will study the timing and brain localization of neuronal activity elicited during various stages of auditory processing. This approach can help probe the neurodegenerative status of neuronal populations contributing to auditory function. We hypothesize that measurable neurodegenerative effects in the frontal and temporal cortical areas involved in auditory processing can serve as disease-specific biomarkers for neurodegenerative processes in AD and PD.

## Andrew Wagner



The vestibular system is responsible for sensing the complex head motions that occur during daily life. As a result, vestibular dysfunction can cause symptoms of dizziness, nausea, and/or unsteadiness during routine activities. Relative to other causes of dizziness, vestibular dysfunction leads to a greater decline in quality of life and a higher utilization of medical resources. Due to the considerable variability in clinical presentations, personalized rehabilitation strategies are needed to address the symptoms of chronic vestibular dysfunction. This pilot project aims to facilitate the development of personalized vestibular therapies by testing the feasibility of using a novel vestibular assessment to define specific targets for vestibular rehabilitation in patients with chronic vestibular dysfunction. To accomplish this goal, we will leverage several recent scientific and technical advances that together allow us to administer an efficient, comprehensive, and specific battery of vestibular tests. This includes measuring each individual aspect of the human vestibular system (semicircular canals, otolith organs, central canal-otolith integration) using each of three distinct vestibular modalities (gaze stability, postural control, and spatial orientation). The long-term goal for this pilot project is to inform future, larger scale projects that aim to (1) define targets for personalized rehabilitation, (2) establish "functional vestibular phenotypes" based upon patterns of physiological impairment, and (3) parse the specific effects of aminoglycoside exposure on the human vestibular system throughout the lifespan.

# Research Project Leaders Updates

## Our Current Research Project Leaders

Details about Litao's RPL are here: Transcription factor POU4F3 is indispensable for the differentiation and homeostasis of sensory hair cells, the essential cell type converting mechanical vibrations into electrical signals for hearing function. During hair cell differentiation, the pioneer factor activity of POU4F3 is required for ATOH1 to access many inaccessible elements to up-regulate hair cell genes. In mature hair cells, reduction of POU4F3 transcription activity due to mutations in one allele leads to hair cell death and hence progressive hearing loss (DFNA15, autosomal dominant non-syndromic hearing loss 15). It remains unclear how the expression of POU4F3 gene is regulated at different developmental stages and there is no feasible method to stimulate the POU4F3 gene in a cell type-specific and temporal-regulated manner. Using mouse models, we plan to investigate the regulatory roles of Pou4f3 enhancers to understand the transcription regulation of the Pou4f3 gene. In addition, we will epigenetically manipulate Pou4f3 enhancers to stimulate Pou4f3 expression specifically in hair cells for a potential therapeutic treatment of hearing loss in DFNA15 patients. Through this proposed study, we will gain a better understanding of how POU4F3 gene is regulated at the transcription level, and potentially find a therapeutic approach to treat DFNA15 patients.



**Litao Tao, PhD**



**Justine Renaud, PhD**

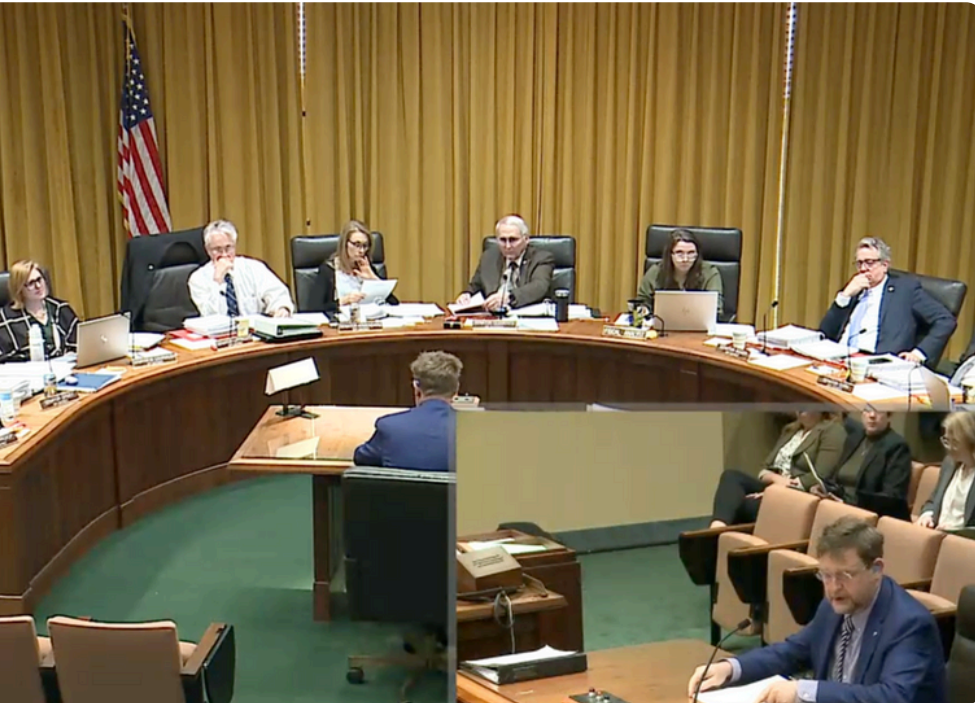
Ménière's disease (MD) is characterized by symptoms such as hearing loss and vertigo, but its underlying cause is still unclear. Research on the temporal bones of MD patients has identified a condition known as endolymphatic hydrops, marked by an expansion of the scala media, indicating a disruption in fluid balance within the inner ear. Endolymph, a vital fluid within the membranous labyrinth, is essential for maintaining hearing and balance. However, the mechanisms that regulate this fluid are not yet fully understood. Given the critical role of fluid homeostasis in the inner ear, our research aims to investigate the formation of endolymphatic hydrops and its impact on neuronal dysfunction.

In this research, we will investigate inner ear dysfunction in an animal model of endolymphatic hydrops. We will correlate hearing and balance thresholds with the ionic and protein composition of endolymph and perilymph. We will test if there is degradation of the blood endolymph barrier during development of endolymphatic hydrops. Finally, we will conduct transcriptomic analysis on the hydropic neurons to better understand the cause of neuronal dysfunction during the development of endolymphatic hydrops.

These studies are essential for comprehending potential mechanisms underlying disruptions in inner ear homeostasis and the development of conditions like MD. This understanding will be essential in developing targeted therapies for MD and related conditions.

# BTHC Director Gives Testimony

## Dr. Steyger's Testimony to Nebraska Appropriations Committee



Dr. Peter Steyger gave his testimony to the Nebraska Appropriations Committee to emphasize the importance of LB 692 funding for biomedical research in the Agency 25 Budget. LB 692 funds for biomedical research are incredibly effective for upgrading research infrastructure. These funds allow Creighton to conduct groundbreaking research to preserve or restore our ability to hear in the face of multiple threats, and most importantly for Nebraska, from aging, medications for cancers, as well as the various sources of debilitating noise exposures. LB 692 funds have boosted the Center's and Creighton's research infrastructure in multiple ways that benefit all Nebraskans.



### More About Richard J. Bellucci, MD

Dr. Bellucci's mission in starting the Bellucci DePaoli Family Foundation was to ensure the important work of hearing preservation and restoration continues. The Foundation offers funding to impressive PhD candidates and post-doctoral fellows making important contributions in auditory research, plus support for acquiring necessary research equipment. During the procedure, the stapes (a tiny bone in the ear) is removed and replaced by a prosthetic device, gifting patients with certain types of hearing loss to regain their hearing. Dr. Bellucci was Chair of Otolaryngology at the Manhattan Eye, Ear & Throat Hospital (1963-79) and Chairman of Otolaryngology at New York Medical College (1966-80), completing his residency at the former. He trained many ear, nose, and throat specialists who practice today throughout the United States, Canada, and beyond. Dr. Bellucci was also the Director of several impressive residency programs. In addition to running his own private practice and serving as a longtime president of the American Otological Society, he volunteered time and services in his later years at the Hopital de Sacre Coeur in Milot, Haiti, exemplifying the Jesuit spirit of service.

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## Center Alumni

### Bellucci Translational Hearing Center Alumni

The Bellucci Translational Hearing Center alumni have consistently demonstrated their exceptional research capabilities while contributing valuable insights across various areas of research. Researchers from Creighton University, Boys Town National Research Hospital, and University of Nebraska Medical Center were awarded either a Pilot Project or Research Project, respectively. Each of their respective projects have led to groundbreaking studies and innovations. Our alumni continue to be a great representation of the Center. These individuals were critical to help the Center establish a strong foundation and collaborative culture that is continued by the Center's current projects. We are grateful for their commitment to their respective projects and wish all of our alumni success on their future endeavors!

#### Research Project Leader Alumni

**Tal Teitz, PhD**  
**Tejbeer Kaur, PhD**  
**Padmashri Ragunathan, PhD**  
**Jeff North, PhD**  
**Litao Tao, PhD**

#### Pilot Project Alumni

**Brian North, PhD**  
**Gwen King, PhD**  
**Litao Tao, PhD**  
**Gopal Jadhav, PhD**  
**Steven Fernandes, PhD**  
**Yusi Fu, PhD**  
**Sarath Vijayakumar, PhD**

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