

# SOUND MINDS

*UCI Center for Hearing Research (CHR): Provide an intellectually stimulating and interactive home to advance collaborative and multidisciplinary research, training, and service in hearing loss and other communication disorders.*

Dear Colleagues and Friends,

2017 has been a critical year for CHR as it was the first time that CHR became financially independent. Although budget constraints required temporary discontinuation of our seminar series, we have enjoyed a productive year thanks to strong commitment and common interest in research, teaching and service. There are at least five multi-investigator projects currently in progress at CHR. As evidenced in Research Highlights on page 2, many of the papers published by CHR members in 2017 were collaborative work from two or more laboratories. The strong collaborative spirit was also exemplified by the 12<sup>th</sup> Annual Symposium on age-related sensory disorders, which itself was a result of our successful application for a highly competitive UC multi-campus research grant (see page 2 for a picture of the project leader Raju Metherate with the UC President Janet Napolitano). Our NIH training grant is also a major reason for the success and productivity that CHR has enjoyed in the last decade. To date, the training grant has supported 24 students and post-docs, including six at present (page 3). These trainees have benefited from the rich intellectual environment provided by 37 CHR members and over 100 associate researchers. A third reason CHR has remained engaged and unified is its service-oriented culture and outreach activities. Solena Mednicoff, a third-year doctoral student and CHR trainee, wrote an essay detailing her experience in conducting free hearing tests for local elderly people (page 4). Needless to say, CHR's success continues to rely on the guidance and support from the advisory board members and donors (page 4).

It is worth noting that CHR members also served various leadership roles in 2017. In addition to three department chairs (Cognitive Sciences–Ramesh Srinivasan; Mathematics–Hongkai Zhao; Neurology–Steve Small), Karina Cramer is the director of Interdepartmental Neuroscience Program, Raju Metherate was appointed Associate Dean of Undergraduate Education for the Ayala School of Biological Sciences, Fan-Gang Zeng was nominated to serve on the National Deafness and other Communication Disorders Advisory Council, and Ginny Richards served as the Chair of Council on Academic Personnel.

In other news, I am proud to announce that John Middlebrooks will receive a 5-year award from the Wellcome Trust, one of the world largest biomedical research charities based in England. This multinational project aims to enhance restoration of hearing by cochlear implants and involves Robert Carlyon's lab at Cambridge, UK and Jan Wouter's lab at Leuven, Belgium.

Arnold Starr delivered a keynote speech at the Nobel Forum in Stockholm on November 2, 2017, where he discussed auditory neuropathy, a disease he discovered and named in 1990s.

I would like to congratulate Brent Edwards, a CHR advisory board member, on his appointment as the Director of the prestigious National Acoustic Laboratories in Sydney, Australia.

Lastly, on UCI Giving Day, Jeff Carroll, a CHR alumnus with help from the Lions Club, issued a \$27k challenge asking for at least 20 donors to help raise funds for the CHR. Thirty people responded and, surpassing Jeff's challenge, contributed a total of \$32k. Thanks to their generous support, we are now able to renew the [CHR Seminar Series in 2018](#).

Happy Holidays,  
Fan-Gang Zeng, CHR Director



## Research Highlights

- **Karina Cramer** co-edited a volume on *Auditory Development and Plasticity* for the Springer Handbook of Auditory Research. The book was in honor of another CHR member, **Ed Rubel**, who retired from the University of Washington and has been spending time with us at UCI.
- **John Middlebrooks** also co-edited a book for the Springer Handbook of Auditory Research, on *The Auditory System at the Cocktail Party*.
- **Hossein Mahboubi** and **Harrison Lin**, along with Neil Bhattacharyya at Harvard, found hearing loss in the United States to be under served and under treated: 17% of 240 million adults suffer some degree of hearing loss but a third of these 240 million people have never seen a clinician for their hearing problems (*JAMA Otolaryngology Head Neck Surgery*).
- **Hamid Djalilian** and colleagues developed an invisible hearing aid that converts sound into mechanical vibrations, which directly drive the eardrum for high transmission efficiency and sound quality (*Laryngoscope*).
- CHR trainee **Sierra Broussard** and her advisers **Greg Hickok** and **Kourosh Saberi** took an engineering approach manipulating amplitude and phase components of speech to study their independent roles in speech recognition (*PLoS One*).
- CHR trainee **Luke Baltzell** and his advisers **Ramesh Srinivasan** and **Ginny Richards** recorded brain responses to speech in human subjects, and found that brain oscillations track the overall acoustic energy rather than the more abstract linguistic properties of the speech stimulus to help parse continuous sounds into discrete speech units (*Journal of Neurophysiology*).
- CHR member **Wei Dong** of VA Loma Linda simultaneously measured intracochlear pressure from two cochlear locations in Gerbils to demonstrate that a reverse traveling wave plays a significant role in generating the distortion product otoacoustic emission, a tool widely used in clinical hearing screening and assessment (*Journal of Association for Research in Otolaryngology*).

## The 12<sup>th</sup> CHR Annual Symposium

On May 6, 2017, researchers and clinicians gathered at UCI to discuss the sensory-cognitive function and treatment of age-related disorders. **Donald Caspary** of Southern Illinois University presented on the central mechanisms of age-related loss, **Michael Silver** of UC Berkeley talked about the effects of acetylcholine on perceptual and neural tuning, **Paul Newhouse** of Vanderbilt University discussed nicotinic effects on cognitive operations in normal and pathological aging, and **Fan-Gang Zeng** examined perceptual and cognitive declines in the aging auditory system. The symposium was organized by **Raju Metherate** and co-sponsored by the UC Multicampus Research Programs and Initiatives (MRPI). In the left picture below, Metherate attended a ceremony at UC President Janet Napolitano's residence for the MRPI awardees. In the center and right pictures, Zeng, Newsome, Metherate, Caspary and Silver enjoyed coffee and discussion at the symposium.



## CHR Trainees

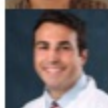
An NIH training grant supports graduate students for up to two years, typically in the 2nd and 3rd year of a doctoral program. Support is also available for postdoctoral researchers, including medical residents for up to two years. These trainees audit an Auditory Neuroscience (N260) course, present at CHR Journal Club, and select and host outside speakers to broaden exposure to hearing research and enhance their professional development. In its first five years, the program has supported 18 individuals, including 12 predoctoral and 6 postdoctoral fellows. Current CHR trainees are highlighted below.



**Solena Mednicoff** is a third year PhD student in Cognitive Neuroscience. Having studied classical piano since the age of five, Solena has a strong passion for music and investigates how musical sensitivity is rooted in speech and language through behavioral and fMRI techniques.



**Matt Richardson** is a PhD candidate in Cognitive Sciences. He is working on hearing disorders and using psychoacoustics and EEG tools to understand both sensory and cognitive mechanisms that contribute to tinnitus ("ringing in the ears").



**Ron Sahyouni** is an MD/PhD student at the UCI School of Medicine and Dept. of Biomedical Engineering. He studies neuroprosthetic approaches to facial reanimation and the role of head injury on auditory processing. He is an avid drummer and music enthusiast.



**Forrest Weghorst** is a second-year PhD student in Neurobiology and Behavior. He works with Dr. Karina Cramer, where he studies molecular signaling pathways necessary for precise axonal targeting in the auditory brainstem of chicks and mice.



**Alessandro (Alex) Presacco** is a postdoc in John Middlebrooks's lab. He is working on developing new auditory prostheses, particularly using the penetrating auditory nerve electrode.



**Gabe Elias** is a post-doc working with Dr. Norbert Fortin in the Center for Neurobiology of Learning and Memory. His research focuses on behavioral factors regulating learning induced plasticity within the auditory system and the influence that plasticity has on how other brain regions represent and process auditory information.

## New Member and Alum Spotlights

Two new members joined CHR in 2017.

**Charles Chubb**, Professor of Cognitive Sciences, is a vision researcher who has recently been working on audition. He found that when discriminating between certain music major/minor modes, normal-hearing listeners either excel at the task or perform at chance (*J Acoustical Society America*). CHR is funding his pilot study using fMRI to explore brain differences between these high and low performers.

**Mary Fagan** is Assistant Professor in the Department of Communication Sciences and Disorders at Chapman University. She did her undergraduate study at San Diego State University, doctoral work at University of Missouri and post-doc research at Indiana University. She is studying language development in children with hearing loss, especially those who have received cochlear implants.

**Hongbin Chen** received a PhD in Biomedical Engineering at UCI in 2006 and is Vice President for R&D at Nurotron Biotech Inc. He has been elected Fellow at the American Institute for Medical and Biological Engineering, representing the top 2% of the medical and biological engineering community, for his contribution to cochlear implant development.



## Hearing Test Day by CHR trainee Solena Medicoff

Going to the Evergreen Classroom at Geneva Presbyterian Church on March 29, 2017 was one of my first outreach opportunities in graduate school. When Katie Turner had first told me about the hearing screening for a group of seniors, I was ecstatic to finally get the chance to work with people outside of the lab.

The week before we went to the center, Katie taught us how to use various hearing test instruments. How to use each instrument seemed straightforward enough – audiometer to measure hearing level over frequency, tympanometer to measure middle ear transmission, and an integrated speaker and microphone system to measure otoacoustic emissions. Yet, I was still slightly nervous to perform any type of hearing testing for the first time, especially only being taught a week prior.

On the hearing test day, we were greeted with an excellent group of people who warmly welcomed us and were excited to have their hearing tested and hear Dr. Harrison Lin speak on hearing loss. As Dr. Lin gave his talk, the larger group broke into smaller groups so we could test people in separate rooms and have them rotate through each different screening. I ended up using the audiometer to measure audiograms. A majority of the group we screened already had a good idea of how well they could currently hear, with some being fitted with hearing aids. Some had even brought audiograms from previous hearing screenings to show us. I was able to compare two individual's audiograms that had been taken within the year prior with their current measurements from that day, and it was encouraging to see that there was minimal deviation between the two.

Being able to actively participate and build rapport with others was a great change to typical research and lab work. It was a great reminder of the importance of all aspects of hearing research, and being able to directly see the connection between our experimental lab work and these hearing screenings was especially motivating. No matter what age, hearing directly affects us all; it is important to take care of it and continually get tested, so we can continue experiencing the music, sounds, and joys of life.



### CHR Open House

When: January 30, 2018 5:30-7:30pm

Where: 116 Medical Science E

What: Meet faculty/students, tour labs, test hearing

RSVP: Sahara George <georgese@uci.edu>

### CHR Advisory Board:

- Bishnu Atal, Retired Technical Director of AT&T Bell Labs and Research Professor, University of Washington, Seattle, WA
- Brent Edwards, Director of the National Acoustic Laboratories in Sydney, Australia
- Richard Miyamoto, Professor and Chairman of Otolaryngology-Head and Neck Surgery, Indiana University, Indianapolis, IN
- Peter Narins, Distinguished Professor, UCLA, Los Angeles, CA
- Neil Segil, Research Professor, University of Southern California, Los Angeles, CA
- Linda Smith, CEO, Providence Speech and Hearing Center, Orange, CA
- Thomas C.K. Yuen, CEO of PrimeGen Biotech, Irvine, CA

### Visit UCI Giving to donate to CHR

CHR is supported by the UCI Office of Vice Chancellor for Research, Lions Club International, McAfee Family Foundation, Thomas and Misako Yuen Family Foundation, and Irvine Taiwanese Presbyterian Church. We also thank the following individuals who supported CHR in 2017: Lee Bardwell, Jeff Carroll, Ping Chen, Bernard Choi, Neil Clark, Stephanie Cruz, Daniel Gajski, Shawn Gao, Osvaldo Gomez, Sandra Keh, Ruipu Li, Ling Lin, Xi Lin, Sheng Liu, Raju and Lori Metherate, John Middlebrooks, David Ochi, Jennifer Ramos, Hugang Ren, Amy Schulz, Kathy Sinajon, Arnold Starr, Cynthia Tatsuta, Danika Wong, Rachel Wong, Fan-Gang Zeng and anonymous donors.

### Sound Minds Editors:

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