

NEWSLETTER

HEARING SYSTEMS IN PROFILE

January 2016



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News, awards and prizes



Talented female researchers receive fundings

No less than three talented postdoc researchers, all women, have recently received significant fundings to start new projects. In October, Abigail Kressner received a grant of approximately DKK 2 million from the Danish Council for Independent Research to study cochlear implant channel selection errors at Hearing Systems. Abigail Kressner, who originates from Chicago, US, took her PhD at Georgia Institute of Technology in the School of Electrical and Computer Engineering and has been employed at National Acoustic Laboratories in Sydney (AUS) where she also did some similar studies with cochlear implants.

Photos by Jens Cubick and Eva Helena Andersen



In November postdoc Sara Madsen was awarded the Carlsberg Foundation's Postdoctoral Fellowship in Denmark. The postdoc funding comes with DKK 1,092,000 for the project "Human auditory scene analysis in the impaired auditory system".



DTU recently welcomed 20 highly talented researchers who have been granted a H.C. Ørsted Cofund postdoc fellowship. One of them is Golbarg Mehraei, a recent PhD graduate from the Health Science Technology department at Massachusetts Institute of Technology and Harvard, who has joined the Hearing Systems group for two years.



First cochlear implant test person

The Hearing System research group has now started tests with cochlear implant (CI) users. In September 2015, Wiebke Lamping PhD student at Hearing Systems, did tests with the first CI user at DTU. The experiment is concerned with the different perceptual dimensions of pitch in CI listeners and takes place in the new laboratories in 354 Lyngby Campus.

"Getting in contact with people that wear a CI does give me a better insight into the problems they might have in their everyday live. It is also the first time that the new laboratory facilities are used for experiments with CI users and it is great to be involved in the process," Wiebke Lamping says. Photo by Jens Cubick



Torsten Dau awarded with a travel grant

In September 2015 Torsten Dau, Head of Hearing Systems, has received a grant from "Vera and Carl Johan Michaelsen's scholarship" for his research. The grant is 50.000 DKK and is intended for travelling purposes. Photo by Alexandre Chabot-Leclerc



Building a cigar box guitar

Lately, the DTU Skylab, a cross-disciplinary hub and community for student innovation and entrepreneurship, has been occupied every week with students from the Master of Acoustical Engineering building music instruments; cigar box guitars, to be more precise. This project is part of the new master course called "Music Technology and Music Perception" and the goal of this course is to train acoustical engineers to work on musical applications.

"Music and acoustics are strongly linked: from designing a loudspeaker, a concert hall to build a musical instrument. It is therefore important for each acoustician to have a basic knowledge of music theory in order to be able to communicate with musicians, music listeners or sound engineers. So they will have to understand their needs and speak the same languages," the teacher Jeremy Marozeau explains.

Jeremy Marozeau had a pedagogical vision and went to DTU Skylab, which is a cross-disciplinary hub and community for students to come up with new ideas and test them in workshops.

"These days, acousticians have lots of tools to model and objectively quantify the acoustic properties of a room or a sound generator. In the other courses, the Master students learn some vocabulary tools. But the engineers should also learn to rely on their ears and not only on the computational models. In this class, they learn to build an instrument from scratch with very little indications to start with. They need to use their own ears more as a guide," he says. Photo by Wiebke Lamping



After each presentation there was the opportunity to ask questions to the scientists and to discuss test methods for individual differences.

Photo by Eva Helena Andersen

ISAAR 2015

Two hundred professional researchers, scientists, and PhD students from all over the world travelled to Nyborg, Denmark in order to participate in the fifth International Symposium on Auditory and Audiological Research which the organizers from Hearing Systems and the board members had prepared. This year's theme was "Individual hearing loss - Characterization, modelling, compensation strategies". Many of the scientists presented material on a large scale, involving a number of test subjects and many interesting conclusions and ideas for how to conduct scientific experiments in the future.

One problem several of the presenters focused on was that people's sensitivity to noise exposure could vary significantly and that some people may be more genetically predisposed to be sensitive to noise.

The last part of the symposium was dedicated to individual diagnostics and compensations strategies. Brent Edwards, EarLens Corp US, gave an interesting outlook on hearing aid fitting through novel diagnostics and self-fitting tools:

"We should find out what the meaningful improvements in

treatment for the patient and clinician are so that we can implement research results concretely in clinical practice," Brent Edwards said and stressed that patient control will play an increasingly larger role in the future for hearing care.

30 lectures were given in the auditorium, 53 posters were presented, and 200 professionals from 17 countries the hearing aid industry, clinics, university research departments and students participated in the symposium.

Read more about the ISAAR symposium at our webpage (news September) and at www.ISAAR.eu



Graphic design by Helene Ingerslev

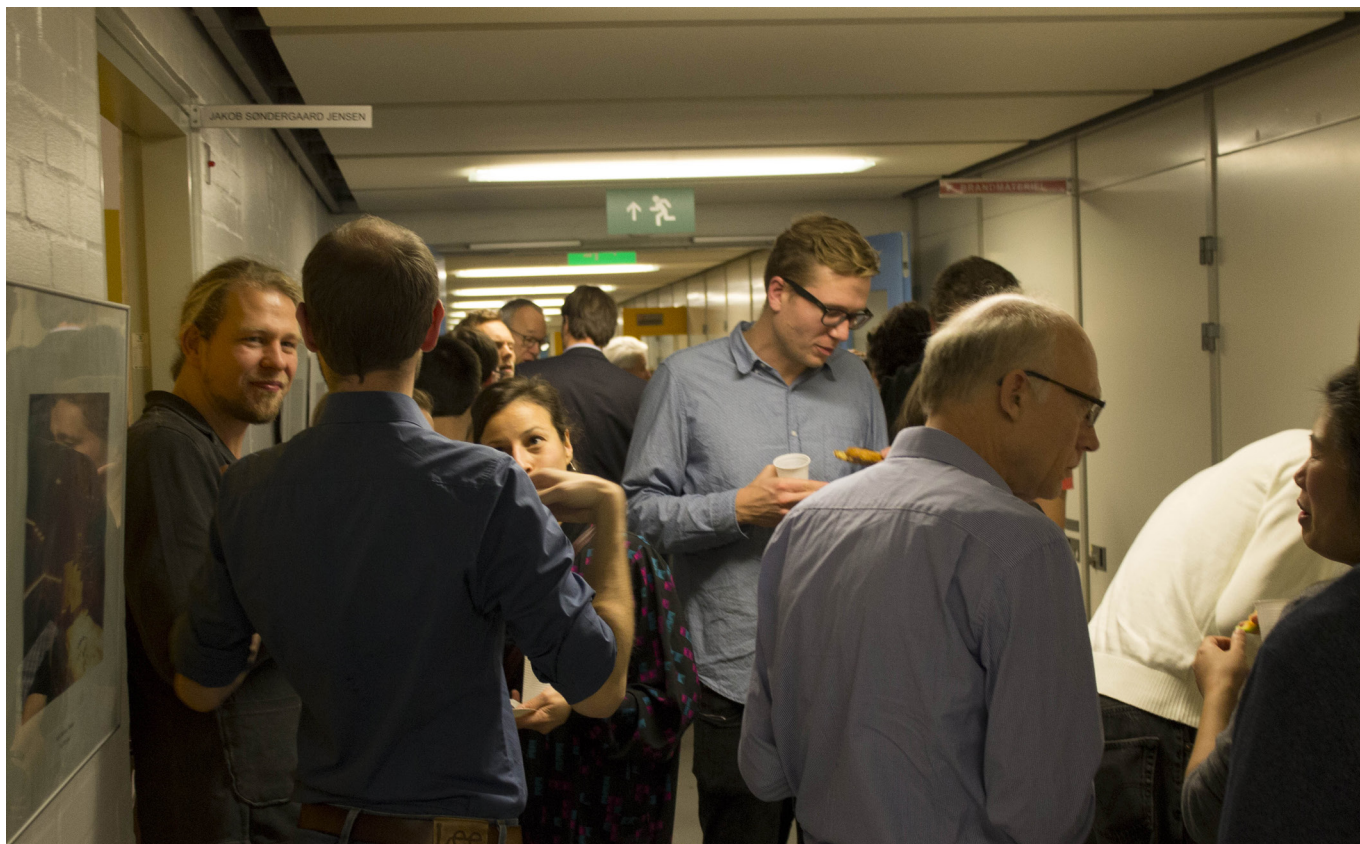


Photo: Johannes Käsbach

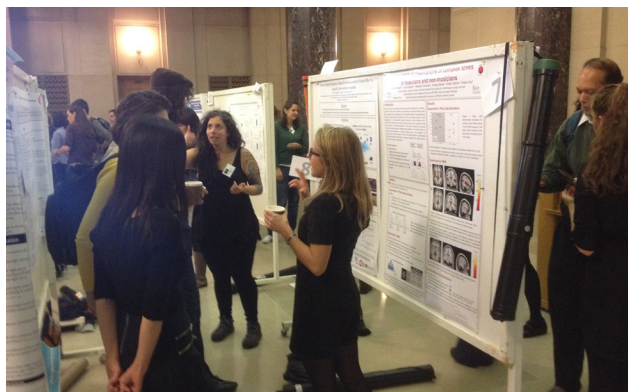
Overwhelming interest for the Hearing Systems Presentation Day

Also this year there has been an overwhelming interest in the still growing research group from collaboration partners, researcher colleagues and alumni at this year's Hearing Systems Presentation Day on Friday October 6th 2015. As in previous years, the researchers from Hearing Systems presented their current activities and research projects, mainly in the form of nine short talks and 15 posters. These presentations summed the results from current PhD, postdoc and other research projects, starting with auditory coding and representations, followed by projects about auditory modelling and speech perception, and ending up with artificial and aided hearing. Head of Hearing Systems Torsten Dau took the audience on a historical journey from when Hearing Systems started as CAHR (Centre for Applied Hearing Research) twelve years ago and how the group has grown including the new fundamental research centre CHeSS (Oticon Centre of Excellence for Hearing and Speech Science) and has established a close collaboration with various partners and external experts such as Danish Research Centre for Magnetic Resonance and several EU projects,

lately COCOHA, Cognitive Control of a Hearing Aid Horizon 2020. James Harte, Head of Interacoustics Research Unit (IRU), was quite impressed by this year's performance:

"The standard of the presentations was incredibly high. I was impressed with everyone's ability to balance their talks by introducing difficult concepts in an accessible way, motivating their own research, and then explaining the core of their work to a high scientific standard. This kind of clear communication takes a great deal of preparation and work, but is a vital and valued skill in both the academic and private sectors," he said. Edward Collet, PhD student at University of Toulouse, FR, got his Master's degree in Engineering Acoustics at DTU in 2011 and has been working as lab technician in system architecture and system design. He was impressed by how the research group has developed since he left the group:

"It's really pleasing to see that the research group is growing in such a healthy manner. Being here today and attending the presentations made me understand why I enjoy research and want to get back into this field," he said.



Erasmus Mundus Network celebrating BRAMS anniversary

On October 21-23 2105, several Hearing Systems researchers went to Quebec, CA, to celebrate the tenth anniversary symposium of the international laboratory for Brain, Music, and Sound Research (BRAMS). The Erasmus Mundus Network held a session on auditory cognitive neuroscience with talks and poster presentations from the participating scientists. Over the last decade, BRAMS has grown and prospered to become one of the well-recognized groups worldwide for research on music, speech, and human auditory cognitive neuroscience. In this anniversary symposium, several prominent scientists were invited to help us think about where the next ten years of research should be taking us, and novel topics including genetics, education, aging, and social neuroscience were covered.

There were many inspiring talks about music and the brain, with musical interludes in between. Barbara Canlon from the research group Experimental Audiology at Karolinska Institutet in Stockholm Sweden, gave a speech on how circadian rhythms (the biological clock of our cells) are modified in the aging auditory system, about the finding that their period differs along the aging cochlea, and how they might explain differences in recovery from noise trauma for nighttime versus daytime exposure. There were other interesting talks from Rudolf Rübsamen, head of the Research Group for General Zoology and Neurobiology at Leipzig University Germany, who made a case against across-species generalization, suggesting that inhibitory processes in the binaural system may occur at a different level in humans compared to other mammals. Uri Hasson, Princeton Neuroscience Institute, New Jersey US, argued for fMRI correlates of the content of human communication by showing correlations between cortical responses of neural systems while having a conversation. The Erasmus Mundus network is representing ten European countries, Canada, and the USA.

Staff news



On December 4th 2015 Alexandre Chabot-Leclerc successfully defended his PhD project "Computational auditory scene analysis based on a model of human binaural processing". Alexandre Chabot-Leclerc has started as Python technical trainer and developer at Enthought, Austin Texas, January 1. Photo by Jens Cubick.



From October 1st, Bastian Epp has been promoted to Associate Professor



Assistant Professor Sébastien Santurette accepted a new joint position as Assistant Professor at both DTU and at the Copenhagen area hospitals.



From January François Guérit, PhD student, will take nine months leave from his PhD. He will then be research Assistant in the lab of Bob Carlyon, in Cambridge (UK) doing research with cochlear implants users.



Since September 2015 Juan Camilo Gil Carvajal has worked as Research Assistant on the topic Spatial hearing with incongruent auditory and visual cues



Since September 2015 Raul Sanchez Lopez has worked as Research Assistant on the topic Characterization of spectro-temporal modulation perception and its connection to speech intelligibility in noise in NH and HI listeners

New Postdoc projects



“Cochlear implant channel selection errors”

Abigail Kressner

Cochlear implants aid profoundly deafened individuals by directly stimulating the auditory nerve through a set of electrodes that sit in an array along the cochlea. At each stimulation cycle, typically a subset of these electrodes are chosen for stimulation based on set of selection criteria. Cochlear implant recipients are performing remarkably well with the current state of implant technology in quiet; however, their performance quickly decreases in complex listening environments with interfering signals. The overall objective of this project is to determine how sound can be more optimally encoded in cochlear implants in the presence of interfering noise.



“Degradation of hearing perception with age”

Golbarg Mehraei

This project is concerned with the degradation of hearing perception with age and the underlying neural mechanisms involved with these deficits. Specifically, we would like to understand why older listeners have difficulties in segregating sounds in everyday acoustic scenes and whether and how the cortical neural encoding patterns of acoustic streaming differs in young vs. older listeners. We hope that this information can facilitate the design of systems that can compensate for the deficits older listeners experience.

New PhD projects



“Binaural Fusion in Cochlear Implant Users”

Niclas Alexander Janßen

Cochlear implants can provide profoundly deaf people with the ability to hear again and understand speech reasonably well. However, many CI users continue to experience perceptual problems in various listening situations. It has been suggested that a better synergy between a residual acoustical hearing and the electrically evoked auditory sensation from CI in the other ear can lead to significant improvements in situations including listening to music, speech perception and identification of the multifarious sounds in everyday environments. This work's goal is to investigate how to fit both hearing devices in order to optimize their synergy, so that sound localization and segregation are possible.



“Controlling a hearing aid by electrically assessed eye-gaze”

Antoine Favre-Félix

This PhD project focuses on technologies that can help fulfilling the goal of steering the hearing aid by in-the-ear electrical signals. In particular, another electrical signal obtained from the EEG-electrodes will be considered: The Electrooculography (EOG) signal. It is proposed to steer the hearing-aid signal processing to the intended source of interest via the EOG signal which represents an electrical measure of the eye position that is measured as a voltage difference between electrodes placed typically on either side of the head near the eyes. The results of this project are expected to provide the basis for advanced signal processing strategies in future hearing instruments.

A COCOHA project. DTU/Eriksholm Research Centre

Recent publications

Recent articles

Mitsuya T, MacDonald E, Munhall KG, Purcell DW (2015) Formant compensation for auditory feedback with English vowels
Journal of the Acoustical Society of America 138 (1) 413-424

Catic J, Santurette S, Dau T (2015) The role of reverberation-related binaural cues in the externalization of speech
Journal of the Acoustical Society of America 138 (2) 1154-1167

Zaar J, Dau T (2015) Sources of variability in consonant perception of normal-hearing listeners
Journal of the Acoustical Society of America 138 (3) 1253-1267

Jørgensen S, Cubick J, Dau, T (2015) Speech Intelligibility Evaluation for Mobile Phones
Acta Acustica United With Acustica 101, 1016 – 1025

Vannson N, Innes-Brown H, Marozeau J (2015) Dichotic Listening Can Improve Perceived Clarity of Music in Cochlear Implant Users.
Trends in Hearing 19

Bianchi F, Santurette S, Fereczkowski M, Dau T (2015) Relation between temporal envelope coding, pitch discrimination, and compression estimates in listeners with sensorineural hearing loss
Journal of the Acoustical Society of America 137(4)

Zaar J, Dau T (2015) Sources of variability in consonant perception and their auditory correlates
Journal of the Acoustical Society of America 137 (4) 2306

Bianchi F, Santurette S, Wendt D, Dau T (2015) Pitch Discrimination in Musicians and Non-Musicians: Effects of Harmonic Resolvability and Processing Effort. JARO Doi:10.1007/5

Hjortkjær J (2015) Sound objects – Auditory objects – Musical objects
Danish Musicology Online (Special edition) 47-56

Conference papers

Song W, Marschall M, Gil Corrales JD (2015) Simulation of realistic background noise using multiple loudspeakers
Presented at: 3rd International Conference on Spatial Audio, 2015, Graz

Ma N, Brown G, May T (2015) Exploiting deep neural networks and head movements for binaural localisation of multiple speakers in reverberant conditions
Presented at: INTERSPEECH 2015, Dresden

May T, Bentsen T, Dau T (2015) The role of temporal resolution in modulation-based speech segregation
Presented at: INTERSPEECH 2015, Dresden

Pelzer A, Santurette S, Bianchi F, Dau T (2015) Fast assessment of auditory spectral and temporal resolution.
Fortschritte der Akustik DAGA'15, pages: 932-935. Presented at: DAGA 2015, Nürnberg

Käsbach J, Wiinberg A, May T, Jepsen M, Dau T (2015) Apparent source width perception in normal-hearing, hearing-impaired and aided listeners. Presented at: DAGA 2015, 2015, Nürnberg

Encina Llamas G, Epp B, Harte J, Dau T (2015) Evaluation of peripheral compression and auditory nerve fiber intensity coding using Auditory Steady-State Responses (ASSR). Presented at: 5th International Symposium on Auditory and Audiological Research, 2015, Nyborg

Bianchi F, Hjortkjær J, Santurette S, Siebner H, Zatorre R, Dau T (2015) Cortical pitch representations of complex tones in musicians and non-musicians. Presented at: Tenth anniversary symposium of the international laboratory for Brain, Music, and Sound Research, 2015, Montréal

Cubick J, Sánchez R, Song W, MacDonald E (2015) Comparison of binaural microphones for externalization of sounds
Presented at: 3rd International Conference on Spatial Audio, 2015, Graz

Boldt JB, Bertelsen AT, Gran F, Jorgensen S, Dau T (2015) Single channel speech enhancement in the modulation domain: New insights in the modulation channel selection framework. Presented at: 40th IEEE International Conference on Acoustics, Speech and Signal Processing, 2015, Brisbane (p) 5748-5752

Conference posters

Epp B, Sánchez R (2015) Extraction of OAEs During Multi-Frequency ASSR Recordings With the Goal to Estimate Peripheral Compression
38th Annual MidWinter Meeting of the Association for Research in Otolaryngology, Baltimore, MD

Gil Carvajal JC, Santurette S, Cubick J, Dau T (2015) Effects of incongruent auditory and visual room-related cues on sound externalization
Presented at: Tenth anniversary symposium of the international laboratory for Brain, Music, and Sound Research, 2015, Montréal

Paredes Gallardo A, Epp B, Dau T (2015) Can auditory steady-state responses reflect place-specific cochlear dispersion? Presented at: 5th International Symposium on Auditory and Audiological Research, 2015, Nyborg

Kristensen LB, Wendt D (2015) Effects of syntactic complexity on word recognition in noise
Presented at: 7th Workshop on Speech in Noise, DK 2015

PhD thesis

Chabot-Leclerc A (2015) Computational auditory scene analysis based on a model of human binaural processing

MSc projects

Modelling the perceptual components of loudspeaker distortion. Sune Olsen
Supervisors: Ewen MacDonald, Finn Agerkvist (DTU)

Objective evaluation of cochlear implant stimulation strategies. Michael Buch Mejsner
Supervisors: Tobias May (DTU), Co-supervisors: Jeremy Marozeau and Torsten Dau (DTU)

Detection and annoyance of warning sounds for electric vehicles. Gustav Nordahl Jacobsen
Supervisors: Jeong-Guon Ih (KAIST), Ewen MacDonald (DTU), Wookeun Song (Brüel & Kjær)

Evaluation of auditory-inspired speech segregation using automatic speech recognition. Eleftherios-Marios Kotsonis-Tzannes

Supervisors: Tobias May, Torsten Dau (DTU)

The influence of visual cues on sound externalization. Juan Camilo Gil Carvajal

Supervisors: Jens Cubick, Sébastien Santurette, Torsten Dau (DTU)

Detection of vestibular schwannoma using chirp-evoked, auditory brainstem responses. Jeffrey Andrew Hullfish

Supervisors: James Harte (IRU), Sinnet Kristensen (IRU), Claus Elberling (Oticon), Torsten Dau (DTU)

Hearing-aid settings in relation to profiles of functional hearing. Raul H. Sanchez Lopez

Supervisors: Morten Løve Jepsen (Widex), Torsten Dau (DTU)

Bachelor Projects

Development of a microcontroller based teaching platform for implementation of digital filters. Mikkel Heber Hahn Petersen and Tobias

Toft Christensen. Supervisor: Bastian Epp (DTU)

Influence of a remote microphone on localization with hearing aids. Johan Gabriel Selby

Supervisors: Ewen MacDonald, Adam Weissner (GN Resound)

Perception of gaps and overlaps in conversational turn-taking. Anna Josefine Sørensen

Supervisors: Ewen MacDonald, Adam Weissner (GN Resound)



MSc and BSc students 2015. Photo by Eva Helena Andersen

