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Getting involved
Research at the UCL Ear Institute can be organised into four research units:
1) Cell and Molecular Biology
2) Neurophysiology and Computation
3) Human Perception and Audiology
4) Medicine and Clinical Trials

These units are not mutually exclusive and collaborations across the teams often result in pioneering research projects which rely on participation by members of the public.

If you would like to get involved in any of our work please get in touch. Projects exist from completing a one off questionnaire to regular listening experiments, DNA sample donations to hearing aid trials. For children we have listening games and training programmes.

If you wish to take part in one of our studies, please visit the participate section of our website:
www.ucl.ac.uk/participate

The Ear Institute Newsletter is a quarterly update on our research and teaching achievements to demonstrate our progress and activities that are impacting on the world of hearing and ENT.

Editors: Dr Debi Vickers
Mrs Kate Faxen

www.ucl.ac.uk/ear
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@uclearinstitute
Jobs, courses and seminars

The 1st Ear Care and Microsuctioning Short Course at the EI

This September saw the first introductory course on Ear Care and Micro-suctioning run at the Ear Institute. It was very well received and attended by professionals from a wide range of backgrounds including GPs, nurses, audiologists (NHS and private sector) and hearing aid dispensers; all interested in widening their scope of practice and adding ear care and wax removal to their skills base. The course included lectures and hands-on workshops, which were based at the EI and the RNTNE where delegates practiced using microscopes and identified all the equipment needed to set up a microsuctioning service. Prof. Shak Saeed facilitated the coordination with the RNTNE, which was instrumental to running the workshops. The course benefited from the excellent clinical skills and experience of our ENT colleagues Prof. Hisham Khalil, Mr. Sherif Khalil and Dr. Simon Gane; and Mrs. Angela Griggs and Ms. Mary Kelly who have extensive experience of teaching and practice in nursing.

This course highlighted the key role that the EI can play in providing similar courses and widening the scope of professionals that can benefit from them. The excellent feedback provided helped in building on the aims of this course so that follow-up practice and examination of clinical competence will be provided following the introductory course. This will provide the delegates with all the necessary steps to be able to provide this service and obtain a Certificate of Competence from the EI.

There is already extensive interest in the next course, which will be taking place in September 2014.

Ear Care Course Coordinators:
G. Al-Malky, M. Kelly and S. Gane

In the media

Thought leader: Doris-Eva Bamiou

Dr Doris-Eva Bamiou was interviewed for News Medical website’s “Thought Leaders” series about auditory processing disorders.


Grants awarded

EMBalance: €3.5m to improve diagnosis of balance disorders

Lead by Doris-Eva Bamiou from the UCL Ear Institute, a consortium of 10 partner institutions across seven European countries have won an EC grant for €3.5M to develop a decision support system for physicians, with the hope that GPs and other doctors will be equipped with a new, online information system to help diagnose and treat a range of balance disorders. The EMBalance project is funded by the European Commission under the 7th Framework Programme.

We hope to have a full report in the next issue.

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How vision affects hearing

Stephen Town has been awarded an Action On Hearing Loss, Pauline Ashley small grant for £16,407 to investigate **How vision affects hearing: multisensory integration in auditory cortex**.

One of our greatest challenges when listening is trying to pick out one signal in a noisy background. In such situations we can use visual information to help us make sense of incoming sensory information. This is most obvious when using lip movements to help understand speech, and for those with hearing impairments, vision is particularly important, but how neural circuits within the brain actually integrate information from our eyes and ears is unclear.

To understand such processes we record the responses of neurons in auditory and visual cortex to visual, auditory and audiovisual stimuli. We are particularly interested in a region known as SSY (Suprasylvian Cortex) that connects to, and is hypothesized to drive visual activity within, auditory cortex. We can cool SSY to reversibly inactivate neurons and measure the effects on visual responses in auditory cortex. Such experiments demonstrate that some SSY neurons do indeed excite neurons in auditory cortex while others modulate or suppress visual activity. These findings suggest that multisensory integration involves a complex interconnected network of brain regions.

Understanding the role of specific network connections such as those between SSY and auditory cortex are difficult as cooling inactivates all SSY neurons, not just those that connect to auditory cortex. However recent developments in optogenetics allow us to target inactivation to specific anatomical pathways by introducing light-sensitive proteins into SSY neurons that, when illuminated, silence neuronal activity. While these neurons can be inactivated by illuminating the cell bodies in SSY, it is also possible to inactivate only those neurons that connect to auditory cortex by illuminating axon terminals within auditory cortex. The Action on Hearing Loss Pauline Ashley small grant provides us with the opportunity to establish these optogenetic techniques in our lab and to study how multisensory integration depends on those SSY neurons that project directly to auditory cortex.
Tissue boundary formation in the embryonic inner ear: cellular mechanisms and molecular effectors

Dr Nicholas Daudet has been awarded over £400,000 by the BBSRC to investigate tissue boundary formation in the embryonic inner ear. He explains that the very elaborate structure and function of the vertebrate inner ear, containing the sensory organs for hearing and balance, have been shaped by millions of years of evolution. Fish and reptiles have a simple inner ear, which contains a small number of sensory patches and relatively poor hearing capability. In birds and mammals, the increase in number of sensory patches and the accompanying changes in inner ear architecture have led to the acquisition of ever more specialized vestibular and auditory functions. The formation of the inner ear during embryonic life seems to recapitulate this evolutionary history: most of the sensory patches originate from a common ‘prosensory’ region by progressive segregation. However the signals that control this segregation and establish the spatial boundaries of sensory domains remain mysterious. The aim of this project is to tackle this question in the chicken and mouse embryonic inner ear, using a combination of functional and ‘gene discovery’ approaches.

Dr Ifat Yasin receives Action on Hearing Loss grant for £142,106

The aim of this study is to measure efferent control of cochlear amplification with modulated sounds [using a forward-masking technique (Yasin et al, 2013)] in hearing-impaired individuals. The results will be used to improve our understanding of the effect of a hearing impairment on the processing of modulated sounds using a model of the auditory periphery (Ferry and Meddis, 2007) with efferent feedback to predict speech understanding in noise (Clarke, 2012). The findings will further advance models of peripheral hearing which can be used to inform processing strategies for hearing aids.

Wellcome Trust Research Training Fellowship awarded to Nish Mehta

Dr Nishchay Mehta, part of the evidENT team, has been awarded £240,197 by the Wellcome Trust to look at development of an evidence-based protocol in managing adults with recurrent tonsillitis. His supervisors will be Profs Martin Birchall, Anne Schilder and Andrew Hayward.

Research with commercial sponsors:

Principal Investigator: Dr Priya Singh
Award Amount: £75,255
Sponsor: Autifony Therapeutics
Title: First in Man Clinical Trial for a Novel Compound to Improve Hearing and Reduce Symptoms of Tinnitus

Principal Investigator: Dr Doris-Eva Bamiou
Award Amount: £47,060
Sponsor: GN Resound Ltd
Title: Effects of frequency modulation systems on listening and related skills in children with APD (Part funding to support studentship)
Spatial cues

Listening in rooms can be challenging, especially when reflections from walls and ceilings make it difficult to distinguish sounds arriving direct from a source from the mixture of potentially confounding sounds arriving a few milliseconds later. Examining the ability to extract spatial information in a sound mixture, we found that listeners appear to ‘glimpse’ reliable spatial information during the early, rising portions of modulated sounds, ignoring later-arriving, potentially conflicting, spatial cues. Employing the brain imaging technique magnetoencephalography (MEG), we then demonstrated that cortical brain activity follows a similar pattern – neural activity is most influenced by spatial information conveyed early in the sound waveform, when the sound energy is relatively low. These findings have implications for the design of hearing technologies such as hearing aids and cochlear implants; by emphasising early arriving spatial information in complex sounds such as speech, it may be possible to enhance listeners’ ability to determine the true source.


Brain picks out salient sounds from background noise by tracking frequency and time

New research carried out by Dr Maria Chait and colleagues from the Wellcome Trust Centre for Neuroimaging, UCL and the University of Maryland, reveals how our brains are able to pick out important sounds from the noisy world around us. The findings, published in the journal eLife, could lead to new diagnostic tests for hearing disorders.

Our ears can effortlessly pick out the sounds we need to hear from a noisy environment - hearing our mobile phone ringtone in the middle of the Notting Hill Carnival, for example - but how our brains process this information (the so-called ‘cocktail party problem’) has been a longstanding research question in hearing science.

Researchers have previously investigated this using simple sounds such as two tones of different pitches, but now researchers at UCL and Newcastle University have used complicated sounds that are more representative of those we hear in real life. The team used ‘machine-like beeps’ that overlap in both frequency and time to recreate a busy sound environment and obtain new insights into how the brain solves this problem.

In the study, groups of volunteers were asked to identify target sounds from within this noisy background in a series of experiments.

Sundeep Teki, a PhD student from the Wellcome Trust Centre for Neuroimaging
at UCL and joint first author of the study, said: “Participants were able to detect complex target sounds from the background noise, even when the target sounds were delivered at a faster rate or there was a loud disruptive noise between them.”

Dr Maria Chait, a senior lecturer at UCL Ear Institute and joint first author on the study, adds: “Previous models based on simple tones suggest that people differentiate sounds based on differences in frequency, or pitch. Our findings show that time is also an important factor, with sounds grouped as belonging to one object by virtue of being correlated in time.”

Professor Tim Griffiths, Professor of Cognitive Neurology at Newcastle University and lead researcher on the study, said: “Many hearing disorders are characterised by the loss of ability to detect speech in noisy environments. Disorders like this, that are caused by problems with how the brain interprets sound information, rather than physical damage to the ear, remain poorly understood.

“These findings inform us about a fundamental brain mechanism for detecting sound patterns and identifies a process that can go wrong in hearing disorders. We now have an opportunity to create better tests for these types of hearing problems.”

The research was funded by the Wellcome Trust and Deafness Research UK.


More recent publications


Garcia-Lazaro JA, Belliveau LAC, & Lesica NA (2013) Independent Population Coding of Speech with Sub-Millisecond Precision. JNEUROSCI.3711-13


Research updates

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How is speech encoded in brain activity?

Our ability to understand speech is based on the patterns of activity that it creates in the neurons in our brain when we hear it. We have millions of neurons that are dedicated to hearing, so the number of possible activity patterns is innumerable. How can we ever hope to understand how speech is encoded in these patterns?

In our experiments, we typically record the activity of a few dozen neurons while presenting speech, and then we try to understand how the speech that we presented is related to the activity that we recorded.

In a recent study, we asked whether the problem of understanding how speech is encoded in brain activity was even tractable given our current experimental technology, i.e. is it possible to understand how speech is encoded in millions of neurons by studying just a few dozen at a time?

We started by asking a simple question: can we predict the joint activity patterns that we recorded from a few dozen neurons by pretending that we recorded that activity from each neuron separately?

The answer to this question will only be yes if the neurons are ‘statistically independent’, meaning that the activity of one neuron does not affect the activity of the others. There are many reasons why neurons would not be statistically independent; there are intrinsic rhythms that modulate the activity of entire brain areas, and dense interconnectivity between neurons that allows them to have a direct influence on each other. However, we found that neurons were indeed statistically independent, at least at the level of the inferior colliculus (IC), the major auditory area in the midbrain. This greatly simplifies the problem of understanding how speech is encoded, since we can build a database of recordings from thousands of neurons by pooling data across different experiments and it will be as if we had recorded all of the neurons at the same time. Now comes the hard part – knowing that it is possible to figure out how speech is encoded in brain activity is one thing, actually doing it is quite another …
ARO 2014
A list of who’s representing the Ear Institute at ARO 2014

The UCL Ear institute will be represented around 20 times at this year’s ARO conference in San Diego! Here’s a pretty complete list of who’s where when!

Saturday 22nd Feb
1pm onwards

Ghada Al-Malky: #037, Poster Session: Inner Ear: Damage & Protection 1, Survey Of Current Auditory Monitoring For Ototoxicity In Oncology, Audiology And Cystic Fibrosis Services In The UK

Roberta Donato : #059, Poster session: Auditory Pathways: Midbrain, Adaptive Coding of Sound Level in Auditory Midbrain Neurons: an in vivo Intracellular Study


Bjorn Christianson: #095, Poster session: Auditory Cortex and Thalamus I, Representation of ITD in the Human Brain: Evidence for the τ-limit?

Katherine Wood: #102, Poster Session: Localization: Physiological Reversible Inactivation of Primary Auditory Cortex by Cooling in the Awake, Behaving Ferret: Effect on Sound Localisation Ability

Vit Drga: #146, Poster Session: Psychoacoustics 1, Effect of Precursor Duration on Cochlear Gain and Compression Estimates

Dan Jagger: #184, Poster Session: Development 1, The Meckel Gruber Syndrome Protein TMEM67/Meckelin Regulates Basal Body Planar Polarization and Ciliogenesis in the Organ of Corti

Sunday 23rd Feb
1pm onwards

Stephen Town: #268, Poster Session: Auditory Cortex & Thalamus 2, Timbre discrimination in ferrets: Exploring the neural basis of perceptual constancy

Lorcan Browne: #338, Poster Session Inner Ear: Anatomy & Physiology, Phosphoinositide Signaling Provides a Brake on Spiral Ganglion Neuron Excitability

Katie Smith: #339, Poster Session Inner Ear: Anatomy & Physiology, Kv1.2 is a Key Regulator of Intrinsic Excitability in Post-hearing Spiral Ganglion Neurons

Monday 24th Feb
12pm-1pm

Jennifer Bizley : Mentoring Program, How To Look for a Job & Start a Lab

1pm onwards

Bjorn Christianson: #447, Poster session: Auditory Cortex and Thalamus III, Adaptation to ITDs in Auditory Cortex
David Greenberg, #457, Poster Session
Auditory Pathways: Binaural Circuits,
Sensitivity of Inferior Colliculus
Neurons to Interaural Timing
Differences within the Envelopes of
Acoustic Waveforms

Jimena Ballestero: #458, Poster Session
Auditory Pathways: Binaural Circuits,
Resonant and Integration Properties
of Principal MSO and LSO Neurons

Nicolas Barascud: #602, Poster Session:
Psychoacoustics: Multimodal & attention,
Auditory Cortex is Highly Sensitive to Regularity in Sound Sequences

Huriye Atilgan: #613, Poster Session:
Psychoacoustics: Multimodal & Attention,
Temporal Coherence Leads to the Formation of Auditory-Visual Objects II: Detection of Auditory Timbre Deviants

Ediz Sohoglu: #616, Poster Session:
Psychoacoustics: Multimodal & attention,
The Influence of Task-irrelevant Sounds and Images on Change Detection in Complex Acoustic Scenes

Wednesday 25th Feb
8:30-11:45am

Anwen Bullen: #20, Podium: Inner Ear: Hair Cells Anatomy & Physiology,
Inner Hair Cell Membranes in Three Dimensions: Links Between Membranes, Mitochondria and Vesicles

Need to know more? The full meeting agenda is available on the ARO website:

PhD/MDRes updates
Since our last newsletter we welcome new students:

Nicholas Boyd-Gibbins, working with Joerg Albert on study titled – Mode of Action (MoA) analysis of slow-acting feeding inhibitors and pharmacological profiling of a model chordotonal organ. Part funded by Syngenta AG.

Ana Gasparinho Gonclaves, working with Sally Dawson & Jonathan Gale – DRUK/AoHL funded studentship on study titled Understanding the role of stress rangules in the inner ear.

Sara Weber, working with Nico Daudet in Action on Hearing Loss funded study Id4 and negative signals in the control of hair cell formation.

Georgios Stavrinos will be starting on 24th February, working with Doris Bamiou on study titled Effects of frequency modulation systems on listening and related skills in children with APD. Part funded by GN Resound Limited.

There have also been many successful Upgrades and Vivas which will be listed in the next issue.

Do you know any Superhearers?

An EI team are looking to recruit “Superhearers” for a genetic study. “Superhearers” are described as people over the age of 65 who still have the hearing of a 20 year old! If you think you know any, please ask them to visit the Superhearers website for more information.

http://www.ucl.ac.uk/superhearers
A word from Soundseekers

Sound Seekers working with Ear Institute staff to upgrade an audiology diploma course at the University of Nairobi, by Emily Bell

Since The Commonwealth Society for the Deaf (later Sound Seekers) was founded in 1959, sponsoring the training of health staff from developing countries in basic audiology has been one of our key activities. Over recent years, we have sponsored candidates to go to the University of Nairobi to participate in the one-year diploma course. Since 2008, Sound Seekers has sponsored six students from Tanzania, Malawi, Zambia and Cameroon to do this course. On completion of the course, these candidates returned to their home countries and former hospitals of employment, where we have supported them with audiology equipment and a supply of consumables, as well as visits by UK audiologists to provide them with ongoing learning.

Since I started in January 2012 I have visited all eight countries where Sound Seekers is active, some more than once. As a result of these visits, it became clear that the Sound Seekers project model needed clarifying and reviewing. In particular it was noted that graduates of the University of Nairobi diploma course did not have the experience or confidence to carry out many of the tasks that they were assumed to be able to undertake independently and the expectation that these individuals would be able to launch both a quality static and sometimes a mobile audiology service on return to their home country, without supervision, was clearly unrealistic.

We strongly believe that, where possible, Sound Seekers should continue to sponsor our African audiology students to train within Africa. Audiology training in Africa is scarce, and the diploma level course at the University of Nairobi is one of the only non-degree level courses available. As we don’t have the funds to sponsor candidates to take on degree level study, we have decided to invest a pot of money to support the upgrading of the diploma course, a move which is warmly welcomed by the University of Nairobi - who recognise that a revamp is needed.

We are delighted that Dr Cherilee Rutherford and Dr Priya Singh are assisting us with this project. In October, the course coordinator for the diploma course - Serah Ndegwa, a Kenyan audiologist who trained at the University of Manchester - came to London for a few days to agree what the next steps should be to make this happen. Cherilee invited Serah to meet UCL students, observe lectures and visit the skills lab. In February 2014, we are hoping that Cherilee will visit Serah at the University of Nairobi in order to see the set up, meet the other staff and students and work collaboratively on revising the syllabus.

We are really happy to have Cherilee and Priya’s enthusiastic and expert input, and believe that the fact that they both hail from South Africa is a huge advantage in terms of understanding the complexities of this project. We’re also working hard on working respectfully with Serah: we want this to be a truly joint project, not just a donor issuing a series of instructions. If you would like to know more, please don’t hesitate to drop in and see us!
**Other News**

**Careers morning**

On 30th September 2013 the Ear Institute held a Careers Workshop for postgraduates and postdocs, which was run by Jenny Bizley, Maria Chait and Dan Jagger. The Workshop had a particular focus on the job application procedure, interview preparation, the range of currently available Fellowship schemes, and role of the Athena SWAN charter in academic career progression. The event concluded with short talks from a number of EI PIs on how they have reached Lecturer/Reader positions via different pathways. Following positive feedback from the participants this session will be run biennially, and other events (including a Fellowship application workshop) are also planned for 2014.

UCL staff and students can access notes from the event via our AthenaSWAN webpage:

http://www.ucl.ac.uk/ear/staffresources/athenaswan

**The Ear Institute is successful in acquiring funding as part of a UCL-wide bid to HEFCE**

This is the Graduate Support Scheme and its aim is to evaluate methods to improve recruitment of under-represented groups into PG taught programmes. Our bid was successful in obtaining the following:

- Two fully funded bursaries for two students including fee waiver for £10,000 each
- A funded mentor for 18 months
- Funding to develop and run a pilot summer school
- £30,000 towards development of an e-learning course
- A hardship fund up to £400
- Childcare bursaries: to provide help to any of our students where the cost of childcare may be an important disincentive to continuing their study

This is a fantastic opportunity for both students and the Ear Institute, and we welcome any participation and contribution towards the completion of these projects over the next 18 months. If you feel that there is a particular project you would like to be involved with or lead, please contact Dr Priya Singh.

**Dr Fishman appointed to Tissue Engineering Parts A, B, & C: Young Investigator Council**

Many congratulations to Dr Jonathan Fishman (UCL PhD graduate 2013) who has recently been appointed to the Tissue Engineering Parts A, B, & C: Young Investigator Council. Six candidates from across the globe were selected from an impressive pool of over 350 international candidates.


**UCL PeerJ Institutional Arrangement**

UCL recently took out an ‘institutional arrangement’ with PeerJ. This means that any UCL author who has an article accepted at PeerJ will not need to pay for their personal publication plan (the university library will automatically pay this fee for them via functionality on our site).

https://peerj.com/institutions/20/university-college-london-ucl/
A royal visit

On the 11th February, just as this newsletter was going to press, HRH The Duke of York visited the UCL Ear Institute with Action on Hearing Loss. The aim was to show HRH the scope of Action on Hearing Loss’s biomedical research program. Expect a full report in the next issue!

IDA Institute thinktank

In January the UCL EI hosted a thinktank by the Ida Institute and UK collaborators to create a vision for Hearing Healthcare 2020. Participants from different sectors convened with Cherilee Rutherford & Priya Singh representing the EI. It was a creative exercise in ‘design thinking’ and many interesting ideas were generated to form part of the vision from a UK perspective.

Halloween HA workshop

In October, students on the MSc Audigical Sciences programme participated in a hearing aid features workshop, presented in collaboration with Phonak, Starkey, Oticon & Widex. In the spirit of Halloween we saw some interesting costumes and enjoyed a few treats while learning about the sometimes scary world of HA features! A huge thank you to Sue Falkingham (Starkey), Neil Daniel (Phonak), Paul Leeming (Widex), and Charlotte Bufton (Oticon) for joining us and making this a fun experience.

Guess the ear

Congratulations to the winner of last issue’s prize of a box of chocolates; Cathy Thornewill from the UCL Ear Institute correctly guessed that it was Prof Andy Forge’s ear pictured! Your prize is on it’s way!

Below is a picture of another of the Ear Institute’s Principal Investigators’ ears... but whose?

If you think you know then why not email kate.faxen@ucl.ac.uk before 1st May 2014 to be entered into a prize draw. The winner will be announced in the next newsletter.

Donate

Donations can be made to the Ear Institute from our website or via the following link:
https://www.ucl.ac.uk/online-giving/giving-to?PROJECT_CODE=18

Or make donations specifically for microtia research at the Ear Institute via this link:
https://www.ucl.ac.uk/online-giving/giving-to?PROJECT_CODE=23

Submissions

If you would like to submit something for the next newsletter please email:
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by 1st May 2014 please.