

Career Development Fellowship (REF: 40664) Auditory scene analysis with cochlear implants

Further Particulars

The aim of our research is to better understand the mechanisms that form our ability to analyze the auditory scene, that is to 'hear out' one source from a potpourri of sources. We primarily focus on binaural hearing mechanisms which help listeners locate sound sources and understand speech in noisy and reverberant spaces. We are particularly interested in situations when there is reduced or degraded information, as is the case with cochlear implants.

The aim of this project is to study the mechanisms of binaural hearing leading to the high robustness against reverberation observed in the normal hearing auditory system. This research is placed in the context of improving hearing devices. Towards this aim several directions can be followed, depending on the education and interest of the post-holder. (1) We have recently presented a method to improve sound localization in reverberant space with simulated listening with cochlear implants¹. The successful candidate could refine and implement the method for evaluation with bilateral users of cochlear implants. The efficacy of the new method for improving aspects of binaural hearing in noisy and reverberant space would be assessed in experiments. (2) Recently, we have conducted a range of experiments that shed light on the processes underlying the audibility of sound reflections in rooms^{2, 3}. The project could continue these studies using psychophysical experimentation and particularly aim to model results. (3) If we can hear sound reflections or not depends highly on previous exposure to the room⁴. Repeated exposure to the same sound reflections results in echoes becoming inaudible. The aim of this project part is to shed more light on the processes underlying this type of adaptation. (4) Through collaboration with the National Biomedical Research Unit in Hearing our group is a leading contributor to studies on the benefits from implants in patients with single-sided deafness. Because these implant users have a normal hearing ear, they are an interesting group to study aspects of binaural hearing in noisy and reverberant space. The post-holder would conduct listening experiments on how the brain combines information delivered in such different ways on both ears.

This project will make extended use of our unique methodological toolkit for psychophysical studies of binaural hearing in the free-field, with virtual acoustics and with direct stimulation of cochlear implants. In our Simulated Open Field Environment in our anechoic chamber we can play sounds via multiple loudspeakers from different directions⁵. We simulate sound reflections of arbitrarily shaped rooms which we then play via the loudspeakers, thereby exposing our listeners to a realistic reverberant sound field which we can carefully control. Our toolbox further benefits from various approaches to simulate listening with cochlear implants and to control the stimuli delivered by cochlear implants from a computer.

The successful candidate will be part of the "Auditory perception and signal processing" research group which uses a variety of approaches and techniques to investigate auditory perception: headphone and free-field studies of hearing, direct

stimulation of cochlear implants, and comparing outcomes between different listener groups. The work will also be closely related to other Institute of Hearing Research projects that study auditory perception. The Institute of Hearing Research boasts world leading experts in auditory cognition, neuroimaging, evoked potentials, speech and hearing science, binaural psychoacoustics, auditory perceptual learning, and auditory neurophysiology. Our wide range of expertise provides a highly dynamic and stimulating working environment where collaboration is positively encouraged. You will also have access to excellent in-house technical and computer support.

The position will involve all aspects of the experimental process, including generating hypotheses, designing new paradigms, conducting experiments, data analyses and publishing findings in scientific journals. The multi-disciplinary nature of this work means that you are not expected to arrive with all the skills. However, experience in any of the following disciplines or research areas would be of value: engineering, physics, neuroscience or related, any record in hearing research, acoustics or psychophysics. Good computer skills are also essential as most of our experiments are developed and analyzed in MATLAB.

The aim of the MRC Career Development Fellowship is to support post-doctoral scientists in a period of early or changed career training, enabling their establishment as productive research scientists in their chosen field. Importantly, the fellowship will provide training in both research and transferable skills in preparation for the broader requirements of a scientific career in academia, industry or in alternative career paths. The scheme aims to produce skilled post-doctoral researchers well placed to further the MRC's scientific mission and contribute to the UK's science base and the wider national economy.

The Career Development Fellowship is for 3 years, but may be extended by a maximum of 12 months if justifiable in terms of personal training requirements. The appointment is expected to a starting salary of £26,022 but can rise to £31,758 with relevant qualifications and experience and is subject to a 6 month probationary period. Where appropriate, relocation expenses of up to £2000 will be payable. The post has an entitlement of 30 days annual leave and 10.5 public holidays, and the post holder will be eligible for membership of the MRC Pension Scheme.

The MRC is an equal opportunities employer.

- [1] J. J. M. Monaghan and B. U. Seeber, "Exploring the benefit from enhancing envelope ITDs for listening in reverberant environments," in Int. Conf. on Implantable Auditory Prostheses, Asilomar, CA, 2011, p. 246.
- [2] B. U. Seeber, "The contribution of intrinsic amplitude modulation to the precedence effect at high frequencies (A)," J. Acoust. Soc. Am., 129:2623, 2011.
- [3] B. U. Seeber and E. R. Hafter, "Failure of the precedence effect with a noise-band vocoder," J. Acoust. Soc. Am., vol. 129, pp. 1509-1521, 2011.
- [4] T. Djelani and J. Blauert, "Investigations into the Build-up and Breakdown of the Precedence Effect," Acta Acustica - Acustica, vol. 87, pp. 253-261, 2001.
- [5] B. U. Seeber, et al., "A System to Simulate and Reproduce Audio-Visual Environments for Spatial Hearing Research," Hearing Research, 260: 1-10, 2010.

See www.ihr.mrc.ac.uk for more publications and information about our research.

For an informal discussion about this vacancy please contact Dr Bernhard Seeber on +44 (0) 115 922 3431 or email to seeber@ihr.mrc.ac.uk.