

## **Department**

### **Academic Unit**

The unit is led by Professor Manohar Bance, Professor of Otolaryngology and Skull Base Surgery at the University of Cambridge. The department is active in all aspects of research in Clinical and Translational Hearing, Balance and Skull Base research. We have basic science labs within the hospital which are exploring aspects of auditory and vestibular science, and a translational programme to wrap basic science around the very large clinical throughput for research purposes is in place. Research training will take place in a research group working within Cambridge Neurosciences. Extensive collaborations are in place with neurosciences and engineering.

The Otolaryngology Unit has a wide referral base and a heavy clinical and operative caseload. The unit provides training and experience in all aspects of Otolaryngology (see below) and neuroscience research. There is a particular emphasis on hearing and balance research. Two main areas of research are in optimizing auditory implants, site of lesion testing, and in building organ models of the inner ear. There are close links with the MRC Cognition and Brain Sciences Unit. Candidates for the training programme will have completed a period of research leading to a PhD. We aim to train ENT surgeons to the highest clinical and academic standards.

### **Clinical Unit**

#### **Background**

The general workload of the Department of Otolaryngology covers a population of 700 000 whilst its subspecialty work covers a population of 7 million. It provides for the management of all aspects of ENT surgery including a significant emergency workload.

The Department has a high national profile. Otoneurological and Skull Base Surgery has a world-wide reputation. Over the past thirty years both these services have grown to become one of the largest programmes in Europe and have acquired a high national and international standing. These services are provided by Patrick Axon, Neil Donnelly and James Tysome along with their neurosurgical colleagues and more recently Professor Manohar Bance, and are augmented by an extremely strong Audiology and Hearing Implantation department and attract tertiary referrals from not only around the UK but also internationally.

The skull base team include 4 Neurotologists / Skull Base Surgeons and 3 Neurosurgeons offering a 360 degree approach to the skull base. The extended multidisciplinary team comprises, 4 Neuroradiologists, 2 Plastic Surgeons, 2 Neuro-oncologists, 2 Geneticists, 4 Nurse Specialists and 4 Senior Clinical Fellows. The Department is one of four national centres for the management of Neurofibromatosis type 2 and one of three centres to offer auditory brainstem implantation.

The Cambridge Hearing Implant Programme covers a population 7 million. It performs over 200 adult and paediatric cochlear implants annually. In addition, the unit has auditory brainstem implant, bone conduction hearing implant and middle ear implant programmes. The Centre has unrivalled facilities dedicated to the management of deafness. It has close links with the Department of Psychoacoustics at the MRC Brain and Cognition Sciences Unit in Cambridge. The Centre has implanted over 1500 adults and children.

The Department performs a large volume of middle ear surgery. The core belief is to maintain or restore normal middle ear anatomy and hearing. The Department of Audiology offers outstanding quality of care in the fields balance, tinnitus and hearing aids.

The quality of the clinical work undertaken by the skull base, otology and hearing implantation team is reflected in over 300 publications published in peer reviewed journals over the past 30 years and numerous book chapters written in leading textbooks.

### **Clinical Facilities in the Department of Otolaryngology**

There is a dedicated ENT and Audiology outpatient clinic comprising 9 clinical rooms and 8 audiological booths. There are state of the art facilities for Vestibular and Electrophysiological testing. There is a Hearing Implantation Unit, The Emmeline Centre. The increased volume of work undertaken in each of these clinics and the increasing integration between audiological and hearing implant services have resulted in planning for a major capital programme for a new Translational Research Centre for Hearing and Balance.

Dedicated ENT and Neurosurgical operating theatres are provided with the latest operating microscope and facilities for otology including otoendoscopy and laser surgery. Both endoscopes and the microscope are linked to the latest digital video facilities. The Day Surgery Unit is similarly equipped.

We have both adult and paediatric inpatient beds supported by access to PICU, ITU and NCCU facilities.

### **Research**

Research is primarily conducted in the discipline of Otology. There are 4 full time otologists. Cambridge is a major hub for tertiary care Otology in the UK, and is one of the biggest centres in this area worldwide. Last year, based on UK figures, we implanted the largest number of cochlear implants, we are currently 1 of 2 national centres for auditory brainstem implants, and 1 of 4 national centres for NF2 management. Cambridge hosts a prestigious Otology and Neurotology Fellowship, with Alumni Fellows from all around the world, and has trained many of the academic leaders in Otology in the UK and internationally.

Professor Manohar Bance has recently been appointed as Professor of Otology and Skull Base Surgery at the University of Cambridge, and has expanded the translational research centre in this area. We are bringing together basic scientists at the former MRC Brain and Cognition Unit who work with the electrophysiology of cochlear implants (Dr Robert Carlyon and his team, funded by the University, MRC and the Wellcome Trust), a cadaveric research lab to understand electrical interfaces to human tissues, and animal work with Dr Ian Winter, on various models of hearing loss and cochlear implantation. Professor Brian Moore is one of the pioneers of psychoacoustics in the world, and also co-supervises projects in the team. Currently, there is an emphasis on developing site of lesion tests in hearing loss using electrophysiology and psychoacoustics.

There will be 2 PhD students in hearing based at Addenbrooke's, two Post-docs, an ACF and another ACL, and two more PhD students with two post-docs based at the Cognition and Brain unit. In addition Dr Deborah Vickers has recently been recruited to Cambridge to work on cortical brain measures of hearing through cochlear implants.

We have a close relationship to the Engineering Department at the University of Cambridge in the development of many new technologies (new sensors for the cochlea: Drs Flewitt, Malliaris, Sambadan, Owens, Pattison and Daley) new machine-neural interfaces (Dr

Malliaris), and new acoustic measurement tools (Dr. Agarwal), and new imaging analysis tools for the ear (Drs. Gee and Treece). We have applied for several collaborative grants to develop this interface further.

On the skull base surgery front, we maintain an active database and research registry of vestibular schwannoma patients, and run the national database in this area (Mr. Patrick Axon). Mr Axon also maintains a research program in pulsatile tinnitus and its relationship to increased intracranial pressure, in conjunction with Neurosurgery (Professor Hutchinson) and Interventional radiology (Dr Higgins). Mr Tysome is interested in novel therapeutics and imaging for vestibular schwannomas.

In vestibular research (run by Mr Donnelly and Prof Bance), we have active collaborations with the body movement lab (Dr Tom Stone), and are developing new technologies for balance and vestibular rehabilitation, along with Mr Donnelly from ENT, which are based on multimodal sensory feedback. We have recently received grant funding (Cambridge Centre for Digital Build Britain) for research using this facility and previous MPhil students in this field.

Mr. James Tysome has a background in molecular biology and a particular interest in the Eustachian tube. He has hosted PhD students to develop tools for objective measures in this emerging area of otology and well as MPhil students investigating novel therapies for vestibular schwannomas, vestibular implantation and balance in NF2.

The research at Addenbrooke's will be supported by an ENT clinical research nurse, a clinical audiologist and a research assistant. This is funded by a mixture of grants, support from the Dept. of Clinical Neurosciences and industry funding.

Cambridge is also home to a state-of-the-art temporal bone cadaveric lab, which runs the junior trainee temporal bone drilling courses 4 times a year, and an international advanced otology course once a year. The Clinical Lecturer would be expected to be involved in teaching of these courses, and in teaching of the regional otology Fellow, audit and teaching as part of the Department's duties.