

## **2015 Oxford Brain Mechanics Workshop: CMU-Oxford Alliance**

**19 and 20 January 2015, St Hugh's College, Oxford**

Described by Professor Andrew Hamilton, Vice-Chancellor of the University of Oxford, as 'one of the greatest challenges of our century', the *2015 Oxford Brain Mechanics Workshop* sought to highlight the complexity inherent in studying the brain.

Held over two days at St Hugh's College in Oxford and attracting over 100 attendees, the event brought together speakers from the various disciplines of brain mechanics research represented under the banner of the [International Brain Mechanics and Trauma Lab \(IBMTL\)](http://www.brainmech.ox.ac.uk/) as well as representatives from Carnegie Mellon University (CMU) in the USA.

The workshop introduced the burgeoning strategic partnership between IBMTL and CMU's '[Brainhub](http://www.brainmech.ox.ac.uk/)' project. This emerging collaboration, to develop shared research into the study of brain function, injury and disease, welcomed Dr Subra Suresh, President of CMU, who was introduced by Professor Andrew Hamilton, demonstrating the clear indication of how both institutions recognise the growing importance of both the research being done and the need for world-class institutions to collaborate on complex issues.



CMU President, Dr Subra Suresh (left) and University of Oxford Vice-Chancellor, Professor Andrew Hamilton (right).

The workshop highlighted the truly interdisciplinary and global nature of the research into brain trauma, disease and brain function encountered at this growing interface between mechanics and biology, with notable speakers from the neurosurgery, medical imaging, physics, mathematics, biology and engineering fields present.

The workshop was organised by Professors Alain Goriely and Antoine Jerusalem, Co-Directors of the IBMTL in Oxford. The IBMTL's multidisciplinary team, from the UK, Europe and the USA, is motivated by the need to study brain cell and tissue mechanics, and its relation with brain function, disease and traumatic brain injury.

### **St Hugh's College and wartime neurosurgery**

St Hugh's was a highly appropriate venue for the workshop, as the college was requisitioned by the British Government during World War II and set up as a specialist hospital for brain and head injuries resulting from the war. This unique specialised head injury unit created in Oxford (popularly known as 'The Nutcracker Suite') was the brainchild of Sir Hugh Cairns, often described as the father of neurosurgery, who had been appointed neurosurgeon to the army at the outbreak of the war.

The hospital's archive is still held at the College and a sample of some of the material held in the archive was on display – a unique reference to the past study of brain injury, amongst many of those who will help form the narrative for the future study of the brain.



## Programme

### Monday 19 January

- 09.00 – 09.10**      **Welcome remarks – Professors Alain Goriely & Antoine Jérusalem (IBMTL)**
- 09.10 – 09.25**      **Professor Andrew Hamilton – Vice-Chancellor, University of Oxford**
- 09.25 – 10.15**      **Dr Subra Suresh - President, Carnegie Mellon University**  
*Cell properties and human diseases*
- 10.15 – 10.45**      **Mr Jayaratnam Jayamohan, University of Oxford**  
*When a brain isn't a brain – fluid, coverings and their implications for modelling*
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- 11.15 – 11.45**      **Professor Ellen Kuhl, Stanford University**  
*Neuromechanics of human brain development*
- 11.45 – 12.15**      **Professor José-Maria Peña, Universidad Politécnica de Madrid**  
*Soft computing methods in brain simulation*
- 12.15 – 12.45**      **Professor Antoine Jérusalem, University of Oxford**  
*Multiphysics & multiscale modelling approaches in traumatic brain injuries*
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- 14.30 – 15.00**      **Professor Philip R LeDuc, Carnegie Mellon University**  
*Mechanics and neural response at Carnegie Mellon University*
- 15.00 – 15.30**      **Professor Michel Destrade, NUI Galway**  
*Measuring the stiffness of brain matter non-invasively with elastic shear waves*
- 15.30 – 16.00**      **Mr Tom Cadoux-Hudson, University of Oxford**  
*Tumour Growth and gain of function mutation: a novel onco-metabolite allows for specific tumour targeting in primary brain tumour diagnosis and treatment*
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- 16.30 – 17.00**      **Dr Anna Hoerder-Suabedissen, University of Oxford**  
*Development of neocortical subplate neurons*
- 17.30 – 18.00**      **Dr Baptiste Pierrat, University College Dublin**  
*Identification of the regional mechanical properties of brain tissue: inverse finite element method for automated 3D mapping*

**Tuesday 20 January**

- 09.45 – 10.15**            **Professor Alain Goriely, University of Oxford**  
*A conceptual model for brain swelling and damage propagation*
- 10.15 – 10.45**            **Professor Jimmy Hsia, Carnegie Mellon University**  
*Using micro and nano-technologies to guide cell behaviour*

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- 11.15 – 11.45**            **Dr Natalie Voets, University of Oxford**  
*Cortical folding in schizophrenia and temporal lobe epilepsy: MRI markers of aberrant brain development?*
- 11.45 – 12.15**            **Dr Kristian Franze, University of Cambridge**  
*The in vivo control of neuronal growth by mechanical signals*
- 12.15 – 12.45**            **Mr Nick de Pennington, University of Oxford**  
*Sculpting neurosurgical oncology*

