



Cardiff University
School of Psychology

Studentship Title:	PhD in Psychology
Research Area/ Project Title:	Brain Complexity and Consciousness
Location:	CUBRIC
Expected Start Date:	1 st October 2018
Duration:	3 years
Deadline for Application:	23 rd February 2018

We are currently accepting applications to be considered for School of Psychology funding.

Description of Research Opportunity:

This PhD studentship offers an excellent opportunity for candidates interested in the broad area of brain imaging, neuroscience, and/or consciousness, to conduct research on one or more of the following topics, using the cutting-edge brain imaging facilities at [Cardiff University Brain Research Imaging Centre \(CUBRIC\)](#), one of Europe's largest brain imaging centres. The candidate is also encouraged to develop their own research ideas and will be supported in pursuing their own research interests.

(1) Brain Complexity - Organizing Principles of the Human Brain

The human brain is highly complex and is composed of many different regions, each serving a unique set of functions. What enables different brain regions to have different functions? Is it attributable to their inherent structural differences? If so, how do structurally distinct brain regions work together in a coordinated manner? To understand the organizing principles of the human brain, this project will study: (A) how different brain regions differ structurally; (B) how their structural differences underpin their functional differences; and (C) whether the empirically-observed function of a brain region is indeed what the structure of this brain region is theoretically optimal for.

(2) From Brain Complexity to Behavioral Complexity - Variability across Individuals

Mirroring the brain complexity, human behavior and consciousness are highly complex. For example, our perception of an image is rarely a truthful reflection of the physical features of the image, but is instead biased by the contexts of the image; moreover, our susceptibility to such contextual illusions can vary over ten-fold across healthy individuals. How does behavioral complexity arise from brain complexity? What brain properties give rise to the variability in behavior and consciousness across individuals? To understand the links between brain and consciousness, this project will study: (A) how different individuals differ in their brain structure; (B) how the inter-individual differences in brain structure affect brain function; and (C) lead to inter-individual differences in behavior and consciousness.

(3) Brain and Behavioral Plasticity - Impacts of Learning and Sleep

A remarkable feature of human brain and behavior is their adaptability and plasticity, or as Darwin put it, "survival of the fittest". The changes in brain structure not only occur when we are awake and learning, but also continue as we fall asleep. What enables us to have adaptability and plasticity? Is sleep essential for that? To understand the mechanisms of brain and behavioral plasticity, this project will study: (A) how learning and sleep interact to influence brain and behavior; (B) whether different mechanisms of brain plasticity may be at play during wake *versus* sleep; and (C) whether the contrast between wake and sleep in brain plasticity may hold key to our behavioral plasticity and our ability to constantly learn.

See some of our recent work on these topics at: [Schwarzkopf et al., Nature Neuroscience, 2010](#); [Song et al., Journal of Neuroscience, 2011](#); [Kanai et al., Nature Reviews Neuroscience 2011](#); [Song et al., Journal of Neuroscience, 2013](#); [Song et al., Nature Communications, 2013](#); [Tononi et al., Neuron, 2014](#); [Song et al., Neuron, 2015](#); [Tononi et al., Nature Reviews Neuroscience 2016](#); [Song et al., Journal of Neuroscience, 2017](#);

Or a short summary of our recent work at: <http://www.braincomplexity.com/research>

Research Environment & International Collaboration:

Cardiff University is internationally renowned for its excellence in neuroscience and psychology research (ranked 2nd in UK), and is home to the £44M CUBRIC, one of Europe's largest brain imaging centres. The candidate will join the lively neuroscience and psychology research communities at Cardiff University, where researchers from different disciplines collaborate to gain a holistic understanding of human brain and behaviour. As part of the studentship, the candidate will have access to CUBRIC's cutting-edge brain imaging facilities including:

- one of the only three Connectom MRI scanners in the world, specially designed for imaging brain microstructure
- one 7T MRI scanner
- two 3T MRI scanners
- one MEG scanner
- three EEG labs
- five brain stimulation labs with TMS and tES setup
- six cognitive testing labs
- six sleep study bedrooms built to clinical standard

See details of CUBRIC's [ambition](#), [cutting-edge facilities](#), [£44M funding](#), and [award-winning building](#).

The candidate will work with [Dr. Chen Song](#) and [Prof. Derek Jones](#), and benefit from the local expertise in brain imaging and consciousness research. In addition, the candidate will collaborate internationally with leaders in the field, including [Prof. Giulio Tononi](#) at University of Wisconsin-Madison and [Prof. Geraint Rees](#) at University College London.

Award:

The studentships will commence in October 2018 and will cover your tuition fees (at UK/EU level) as well as a maintenance grant. In 2017-18 the maintenance grant for full-time students was £14,553 per annum. As well as tuition fees and a maintenance grant, all School of Psychology students receive conference and participant money (approx. £2250 for the duration of the studentship). They also receive a computer and office space, additional funding for their research, and access to courses offered by the University's Doctoral Academy and become members of the University Doctoral Academy.

Eligibility:

Full awards (fees plus maintenance stipend) are open to UK Nationals, and EU students who can satisfy UK residency requirements. To be eligible for the full award, EU Nationals must have been in the UK for at least 3 years prior to the start of the course for which they are seeking funding, including for the purposes of full-time education.

As only one studentship is available and a very high standard of applications is typically received, the successful applicant is expected to have:

- a first / upper second class / equivalent undergraduate degree and/or a master's degree, in neuroimaging, neuroscience, psychology, biology, engineering, mathematics, computer science, or related disciplines
- strong motivation, curiosity and passion for research
- strong analytic background
- strong programming skills
- good scientific writing skills

How to apply:

You can apply online - consideration is automatic on applying for a PhD in Psychology, with an October 2018 start date (programme code RFPDPSYA).

Please use our online application service at

<http://www.cardiff.ac.uk/study/postgraduate/applying>

and specify in the funding section that you wish to be considered for School funding.

Please specify that you are applying for this particular project.

Application deadline: 23rd February 2018 with interviews (either in person or by Skype) being held in March 2018 and decisions being made by end of March beginning of April.

Please address any informal enquiries to:

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**For further information please contact:
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