# Australian Course in Advanced Neuroscience

# 2012

15 April – 5 May 2012 • Moreton Bay Research Station • North Stradbroke Island

## Program

### WEEK 1: NEURAL INTEGRATION & EXCITABILITY

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| **Sunday 15 April** | |
| 5.00 pm | Welcome |
| 5.15 pm | Safety induction<br>*Kevin Townsend, Manager, Moreton Bay Research Station* |
| 6.00 pm | Welcome Dinner |
| **Monday 16 April** | **Electrophysiology fundamentals** |
| 9.00 – 10.30 am | Course overview<br>Basic membrane biology and circuit analysis<br>*Alan Finkel, Finkel Foundation, Melbourne* |
| 11.00 am – 12.30 pm | Principles of electrophysiological recording<br>*Greg Stuart, John Curtin School of Medical Research, Canberra* |
| 1.30 pm<br>Laboratory Session | Familiarisation with equipment and software |
| **Tuesday 17 April** | **Ion channels** |
| 9.00 – 10.30 am | Ion channel structure and function<br>*Jacqui Gulbis, Walter & Eliza Hall Institute, Melbourne* |
| 11.00 am – 12.30 pm<br>Laboratory Session | Brain slice preparation |
| 1.30 – 6.30 pm<br>Laboratory Session | Basics of patch clamping |
| 8.00 – 9.30 pm | Student talks about their own research<br>(6 students, 10 min talk, 5 min questions) |

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| **Wednesday 18 April** | **Action potentials** |
| 9.00 – 10.30 am | The Hodgkin-Huxley action potential<br>*John Bekkers, John Curtin School Med Res, Canberra* |
| 11.00 am – 12.30 pm | Axons and excitability<br>*Maarten Kole, Netherlands Institute for Neuroscience, Amsterdam, The Netherlands* |
| 1.30 – 6.30 pm<br>Laboratory Session | Protocol design<br>Whole-cell current clamp recording from brain slices |
| 8.00 – 9.30 pm | Student talks about their own research<br>(6 students, 10 min talk, 5 min questions) |
| **Thursday 19 April** | **Cable theory & Neuronal modelling** |
| 9.00 - 10.30 am | Cable theory and its practical consequences<br>*Stephen Williams, Queensland Brain Institute, Brisbane* |
| 11.00 am – 12.30 pm | Tutorial: The NEURON simulation program<br>*John Bekkers, Maarten Kole* |
| 1.30 pm<br>Laboratory Session | Patch clamping practice<br>Whole-cell current and voltage clamp |
| **Friday 20 April** | **Single-channel recording** |
| 9.00 – 10.30 am | Single-channel recording and analysis<br>*Angelo Keramidas, Queensland Brain Institute, Brisbane* |
| 11.00 am – 7.00 pm<br>Laboratory Session | Voltage clamp<br>Cell-free patches and single-channel recording |
| 8.00 – 9.00 pm | *Hot Topic Talk:* Wiring and re-wiring peripheral nerve circuits: good growth and bad growth<br>*Janet Keast, University of Melbourne* |
| **Saturday 21 April** | **Modulation of excitability & Review** |
| 9.00 – 10.30 am | Modulation of ion channels<br>*Pankaj Sah, Queensland Brain Institute, Brisbane* |
| 11.00 am – 12.30 pm | Review of lab skills and data analysis<br>*The laboratory demonstrators* |
| 1.30 pm<br>Laboratory Session | Modulation of action potential firing<br>Transfection of HEK cells |
| **Sunday 22 April** | Free day |

## WEEK 2: SYNAPTIC TRANSMISSION

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| **Monday 23 April** | **Synaptic transmission & Molecular biology** |
| 9.00 – 10.30 am | Introduction to the physiology of synaptic transmission<br>*Peregrine Osborne, University of Melbourne* |
| 11.00 am – 12.30 pm | Molecular/genetic approaches to studying ion channels<br>*Joe Lynch, Queensland Brain Institute, Brisbane* |
| 1.30 pm<br>Laboratory Session | Recording from ion channels expressed in HEK cells<br>EPSCs and minis in hippocampus |
| **Tuesday 24 April** | **Neurotransmitter release & Neurotransmission** |
| 9.00 – 10.30 am | Cell and molecular biology of transmitter release<br>*Jane Sullivan, University of Washington, Seattle, USA* |
| 11.00 am – 12.30 pm | Excitatory and inhibitory neurotransmission<br>*Steve Petrou, Florey Neuroscience Institutes, Melbourne* |
| 1.30 pm<br>Laboratory Session | Pharmacology of EPSC and IPSCs<br>I/V plots |
| **Wednesday 25 April** | **Short-term plasticity & Synaptic integration** |
| 9.00 – 10.30 am | Short-term synaptic plasticity<br>*Jane Sullivan, University of Washington, Seattle, USA* |
| 11.00 am – 12.30 pm | Synaptic integration<br>*Matthew Larkum, University of Bern, Switzerland* |
| 1.30 pm<br>Laboratory Session | Short-term synaptic plasticity |
| **Thursday 26 April** | **Long-term plasticity & Memory** |
| 9.00 - 10.30 am | Long-term synaptic plasticity and memory<br>*Cliff Abraham, University of Otago, Dunedin, NZ* |
| 11.00 am<br>Laboratory Session | Hippocampal long-term potentiation |
| 8.00 – 9.00 pm | Hot Topic Talk: The genomics revolution and solving neurological diseases – a clinician scientist's perspective<br>*Sam Berkovic, University of Melbourne* |

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| **Friday 27 April** | **Microcircuits** |
| 9.00 – 10.30 am | Neuronal microcircuits and networks<br>*Matthew Larkum, University of Bern, Switzerland* |
| 11.00 am<br>Laboratory Session | Dendritic recordings, pair recordings<br>Recordings from interneurons |
| **Saturday 28 April** | **Autonomic neuroscience & Review** |
| 9.00 – 10.30 am | The autonomic nervous system<br>*Ian Gibbins, Flinders University, Adelaide* |
| 11.00 am – 12.30 pm | Review of lab skills and data analysis<br>Designing the laboratory project<br>*The laboratory demonstrators* |
| | Free afternoon |
| **Sunday 29 April** | Free day |

## WEEK 3: FLUORESCENCE IMAGING

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| **Monday 30 April** | **Fluorescence imaging I** |
| 9.00 – 10.30 am | Introduction to fluorescence microscopy<br>*Jack Waters, Northwestern University, Chicago, USA* |
| 11.00 am – 12.30 pm | Techniques in calcium imaging<br>*George Augustine, Korea Institute of Science and Technology, Seoul, South Korea* |
| 1.30 pm<br>Laboratory Session | Calcium imaging in brain slices |
| **Tuesday 1 May** | **Fluorescence imaging II** |
| 9.00 – 10.30 am | Advanced techniques in fluorescence microscopy<br>*Jack Waters, Northwestern University, Chicago, USA* |
| 11.00 am – 12.30 pm | Manipulating neurons with light<br>*George Augustine, Korea Institute of Science and Technology, Seoul, South Korea* |
| 1.30 pm<br>Laboratory Session | Fluorescence imaging in brain slices |

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| **Wednesday 2 May** | **Visual neuroscience & Project** |
| 9.00 – 10.30 am | Visual neuroscience<br>*Paul Martin, University of Sydney* |
| 11.00 – 11.30 am | Organising the laboratory project |
| 11.30 pm<br>Laboratory Session | Laboratory project |
| **Thursday 3 May** | **Project** |
| 9.00 am<br>Laboratory Session | Laboratory project |
| **Friday 4 May** | **Project wrap-up** |
| 9.00 am – 3.30 pm | Laboratory project analysis |
| 4.00 pm – 5.30 pm | Laboratory project presentations |
| | Closing Dinner |
| **Saturday 5 May** | Farewell and departure |