

## Physiology Department Annual Report 2009-2010

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**Physiology is the study of how the body works. Emphasis is on function, and considers the contribution of molecules (molecular physiology), cells (cellular physiology), tissues and organs (systems physiology) to the operation of the body. These aspects of Physiology are reflected in the research themes of the Department and informs our teaching in medical and biomedical sciences; complementing the other major disciplines in the School of Medical Sciences – Anatomy, Pharmacology and Pathology.**

The Department of Physiology has 16 academic staff, 4 Emeritus/Conjoint Professors, 1 adjunct A/Professor, 5 Research Fellows, 3 research assistants and 12 Ph.D. students, 8 Hons students, 8 ILP students, 3 summer students. Staff are organized around teaching and research themes, contributing to both. The Physiology Department teaching features prominently in the Faculty of Medicine and Faculty of Science teaching programs. Year 2 Physiology courses have the largest student cohort in the School of Medical Sciences (2009 enrollments = 464 in PHSL2101/2121/2501; 354 in PHSL2201/2221/2502). In 2009, Physiology staff led the roll-out of the undergraduate neuroscience training program. Physiology staff convened three new advanced courses in neuroscience, consolidated the introductory level 2 neuroscience course that commenced in 2008, and provided leadership in the establishment of a new model for Honours teaching (Neurosci Hons, year 4) that incorporates training modules to broaden practical and professional development competencies.

Research successes in 2009, include the publication of **52** international journal articles, **2** monograph publications, **67** conference proceedings. A total of **19 research grants were secured, worth \$3.96 million** (10 external research grants (\$2.158 million); 7 Faculty Grants (\$286,000; *incl. Gold Star, Early Career, FRG, MREIII*); 2 international collaborative grants (\$1.516 million)). 2009 saw the completion of the Translational Neuroscience Facility and recruitment of new academic appointments in the Department of Physiology to that facility (Dr. Arun Krishnan, A/Prof. Matthias Klugmann and Dr. Ann Wong). There were 3 Ph.D. completions in 2009.

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### Academic Staff Structure – Department of Physiology

**Teaching Groups** (Faculty of Medicine and Faculty of Science teaching programs)

#### Medical Teaching Program

*(Physiology primarily teaches into Phase 1 (years 1 & 2) of the Medicine Program, providing teaching content as well as leadership through convening, design groups and facilitation co-ordination).*

#### Phase 1

**Phase 1 Committee:**

Drs. Karen Gibson, Lesley Ulman, Andrew Moorhouse, Amanda Boyce

**Curriculum Development Committee:**

**Phase 1 Exam Sub-Committee**

**(Assessment Review Group):**

Members: Drs. Richard Vickery, Andrew Moorhouse

**Foundations**

Facilitators/Lecturers/Practicals/Tutorials: Drs. Richard Vickery, Andrew Moorhouse, Karen Gibson, Trevor Lewis.

**Beginnings Growth & Development** 2009 BGDB convenor: Dr Lesley Ulman; co-convenor, Dr Amanda Boyce, 2010 BGDA convenor: Dr. Amanda Boyce; co-convenor, Dr Karen Gibson. Facilitators /Lecturers/Practicals/Tutorials: Drs. Amanda Boyce, Karen Gibson, Lesley Ulman, Nicole Marden, Trevor Lewis, Prof. Gary Housley; A/Prof. Paul Bertrand.

**Health Maintenance** 2009 HMB co-convenor Dr. Andrew Moorhouse. 2010 HMA convenor Dr. Andrew Moorhouse. Facilitators / Lecturers / Practical / Tutorials: Drs. Karen Gibson, Andrew Moorhouse, Amanda Boyce, Lesley Ulman, Tim Murphy, Ann Wong, Conjoint A/Prof Michael Perry, A/Prof. Paul Bertand.

**Ageing & Endings** Design Group Members: A/Prof. Paul Bertrand, Dr. Richard Vickery; Facilitators / Lecturers / Practical / Tutorials: Drs. Stewart Head, Richard Vickery, Andrew Moorhouse.

**Society & Health** Facilitators / Lecturers / Practical / Tutorials: Drs. Karen Gibson, Richard Vickery, Trevor Lewis, Lesley Ulman, Ann Wong.

**Phase 2**

**Health Maintenance**

Lecturers: Dr Richard Vickery and Prof. Gary Housley.

**ILP program**

Program Committee Chair: Dr Karen Gibson

**Phase 3**

**Biomedical Examinations**

Examiner: Dr. Karen Gibson

**Science Teaching Programs**

*(including BMedSc (FoM); BSc, BSc(Adv), BOptom (FoS); BEn (FoE))*

**Year 2 (Introductory Physiology)**

**PHSL2101/2121/2501 – Physiology 1A** Dr Lesley Ulman, convenor. Lecturers/Tutors: Drs Trevor Lewis, Richard Vickery, Ann Wong, Arun Krishnan, Andrew Moorhouse, Stewart Head, Tim Murphy, A/Prof. Paul Bertrand.

**PHSL2201/2121/2502 Physiology 1B** Dr Lesley Ulman, convenor. Lecturers/Tutors: Drs Trevor Lewis; Richard Vickery; Amanda Boyce; Karen Gibson, Ann Wong; Nicole Marden, A/Prof. Paul Bertrand.

**Year 3 (Advanced Physiology)**

**PHSL3211 Cardiovascular Physiology and Pathophysiology** Dr. Tim Murphy, convenor. Lecturers: Drs Tim Murphy, Karen Gibson.

**PHSL3221 Endocrine, Reproductive & Developmental Physiology** Convenors: Drs. Karen Gibson, Amanda Boyce,. Lecturers /Pracs/Tutorials: Drs. Karen Gibson and Amanda Boyce.

**Year 4**

**Honours** (School of Medical Sciences) Hons. Committee: Drs. Karen Gibson and Richard Vickery. Lecturers/Workshops: Drs Richard Vickery, Andrew Moorhouse.

*Undergraduate Neuroscience Training Program* (jointly taught out of the School of Medical Sciences and School of Psychology, with contributions from other sectors of Brain Sciences UNSW).

**Year 2**

**NEUR2201 Neuroscience Fundamentals** Dr. Richard Vickery, convenor; Lecturer/Tutors: Drs. Richard Vickery, Andrew Moorhouse, Trevor Lewis, Benjamin Barry, Cindy Lin.

**Year 3**

**NEUR3121 Molecular and Cellular Neuroscience** Dr. Trevor Lewis, convenor. Lecturers/Tutors: Drs Trevor Lewis, Andrew Moorhouse, Prof G. Housley, Conjoint E/Prof Peter Barry.

**NEUR3101 Muscle and Motor Control** Drs Stewart Head, Benjamin Barry, Cindy Lin, convenors; Lecturers: Dr. Richard Vickery, Arun Krishnan, Andrew Moorhouse, A/Prof. Paul Bertrand † *integrated with the Exercise Physiology Teaching Program..*

**NEUR3221 Neurophysiology** A/Prof. Paul Bertrand, convenor. Lecturers/Tutors: A/Prof Paul Bertrand, Prof Gary Housley, Dr Richard Vickery, Benjamin Barry.

**Year 4**

**NEUR4401 Neuroscience Honours** Dr Richard Vickery, chair of academic panel.

*Exercise Physiology Teaching Program* Dr Benjamin Barry, Program Authority

**Year 1**

**HESC1501 Introductory Exercise Science** Dr Benjamin Barry, convenor; Lecturer: Cindy Lin

**Year 3**

†**NEUR3101 Muscle and Motor Control** Drs Stewart Head, Benjamin Barry, Cindy Lin, convenors; Lecturers: Drs. Richard Vickery, Arun Krishnan, Andrew Moorhouse, A/Prof. Paul Bertrand.

**HESC3592 Neuromuscular Rehabilitation** Dr Cindy Lin, convenor.

**Year 4**

**HESC4611/4622 Clinical Practicum A/B** Dr Benjamin Barry, convenor.

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## ***Physiology Department Research Groups***

### ***Exercise Physiology Research***

Staff: Dr. Benjamin Barry (group leader)

Students: Sean Kelly (ILP)

Publications:

- Barry BK, Pascoe MA, Riek S, Carson RG & Enoka RM (2009). Common input to different regions of biceps brachii long head. *Experimental Brain Research*. 193(3), 351-359.

Conference Participation:

- Australian Neuroscience Soc. (ANS), Canberra, Australia, January 27-30, 2009.
- ANS AuPS Sensorimotor Control Satellite Meeting. Sydney, January 30-31, 2010 (1 poster: Barry BK & Kelly S. Homonymous and heteronymous Ia-excitation of vastus medialis and lateralis motor units).

### ***Fetal and Developmental Research Group***

Staff: Dr. Karen Gibson (group leader); Dr. Amanda Boyce; Ms. Min Kim (RA)

Students: Ms. Beatrix Palmer (Hons).

Publications:

- Brandon AE, Boyce AC, Lumbers ER & Gibson KJ (2009). Maternal renal dysfunction in sheep is associated with salt insensitivity in female offspring. *Journal of Physiology* 587, 261-270. (IF 4.580)
- Lumbers ER, Kim M-Y, Burrell JH, Kumarasamy V, Boyce AC, Gibson KJ, Gatford KL & Owens JA (2009). Effects of intrafetal IGF-I on growth of cardiac myocytes in the late gestation fetal sheep. *American Journal of Physiology - Endocrinology and Metabolism* 296, E513-E519. (IF 4.138)

Conference Participation:

Dr. Karen Gibson: invited speaker - High Blood pressure Research Council of Australia Workshop, 1<sup>st</sup> December 2009; Fetal and Neonatal Workshop of Australia Darwin, April 2009; New Zealand and the Perinatal Society of Australia and New Zealand, 13th Annual Congress, Darwin, April 2009

Dr. Amanda Boyce: Society for Gynecological Investigation in Glasgow in March 2009

### ***Gut Neuroscience***

Staff: A/Prof. Paul Bertrand (group leader); Dr. R Bertrand (Fellow)

Students: Ms Senadheera (Ph.D. student); Ms T Zhang (Ph.D. student pending); Ms M Grealish and Mr K Tan (ILP students); Ms K Polglaze NEUR Hons; Ms P Tay and Mr H Yi (summer students).

Publications:

- Bertrand, P. P., Bertrand, R. L. Camello, P. J. and Pozo, M. J. Simultaneous measurement of serotonin and melatonin from the intestine of old mice: The effects of daily melatonin supplementation. *Journal of Pineal Research*. Accepted 13/2/10.
- Bertrand, P. P. and Bertrand R. L. (2010). Serotonin release and uptake in the gastrointestinal tract. Eds Grundy and Blackshaw. *Autonomic Neuroscience*. 153:47-57. Invited Review.

- Bertrand, P. P. Barajas-Espinosa, A., Neshat, S., Bertrand, R. L. and Lomax, A. E. (2010). Inflammation induces increases in serotonin (5 HT) release and SERT-dependent uptake in mouse colon. *American Journal of Physiology*. 298, G446-G455.
- Bertrand, P. P. (2009). The cornucopia of intestinal chemosensory transduction. *Frontiers in Enteric Neuroscience*. 1(3). Invited Review.
- Bertrand, P. P. (2009). Chemosensory transduction in the gastrointestinal tract. *ChemoSense* (ISSN 1442-9098). 11:1-9. Review. Newsletter.
- Bertrand, P. P. (2009). How inflammation changes the innervation of the intestine: Clinical and Basic observations. *Clinical and Experimental Pharmacology and Physiology*. Editorial. 36:1023-1025.

Conference Participation:

- Australian Neuroscience Soc. (ANS), Canberra, Australia, January 27-30, 2009. (1 chair symposium, 2 posters).
- International Soc. Autonomic Neuroscience (ISAN), Manly, Australia, Sep 1-4, 2009. (4 posters).
- Enteric Nervous System workshop, Adelaide, Australia, October 1 (2 orals).
- UroGIT (ASCEPT Special interest group), Melbourne, Australia, October 30 (1 chair session, 2 posters)
- Australasian Soc. Clinical and Experimental Pharmacologists and Toxicologists (ASCEPT), Sydney, Australia, Nov 29 - Dec 2 (1 invited speaker)

### ***Membrane Biophysics***

Staff: Dr. Andrew Moorhouse (group leader), Dr. Trevor Lewis, Emeritus and Conjoint Prof. Peter Barry, Dr. Jane Carland (Fellow), Dr. Jennie Cederholm (Fellow).

Students: Scott Jones (Hons); Ronald Mak (summer scholarship; Hons in 2010).

Publications:

- Carland J.E., Cooper M.A., Sugiharto S., Jeong H-J., Lewis T.M., Barry P.H., Peters J.A., Lambert J.J. and Moorhouse A.J. (2009). Characterization of the effects of charged residues in the intracellular loop on ion permeation in alpha1 glycine receptor channels. *Journal of Biological Chemistry* 284, 2023-2030. (ISSN: 0021-9258)
- Cederholm, J.M.E., Schofield, P.R. and Lewis, T.M. (2009). Gating mechanisms in Cys-loop receptors. *European Biophysics Journal* 39(1), 37-49. (ISSN: 1432-1017)
- Absalom, N.L., Schofield, P.R. and Lewis, T.M. (2009). Pore Structure of the Cys-loop Ligand-gated Ion Channels. *Neurochemical Research* 34, 1805-1815. (ISSN: 1573-6903)
- Wake, H., Moorhouse, A.J., Jinno, S., Kohsaka, S. and Nabekura, J. (2009) Resting microglia directly monitor the functional state of synapses in vivo and determine the fate of ischemic terminals. *Journal of Neuroscience*, 29: 3974-3980.
- Watanabe, M., Wake, H., Moorhouse, A.J. and Nabekura, J. (2009) Clustering of neuronal K<sup>+</sup>-Cl<sup>-</sup> cotransporters in lipid rafts by tyrosine phosphorylation. *Journal of Biological Chemistry* 284, 27980-27988.
- Barry PH (2009). Reminiscences of work with Alex Hope: the Movement of water and ions in giant algal cells, 1963-1967. *European Biophysics Journal with Biophysics Letters* 39: 179-184.
- Barry PH, Coster HGL, Chow WS. (2009). Biographical Memoir: Alexander Beaumont Hope – Australian Biophysicist 1928 – 2008. *European Biophysics Journal with Biophysics Letters* 39: 175-178.
- Adams DJ, Barry PH‡. (2009). Peter William Gage 1937-2005. *Historical Records of Australian Science*. 20 (2): 233-254. (accepted in 2009, available on line and in print in 2010):

- Peters JA, Cooper MA, Carland JE, Livesey MR, Hales TG, Lambert JJ. (2010) Novel structural determinants of single channel conductance and ion selectivity in 5-hydroxytryptamine type 3 and nicotinic acetylcholine receptors. *Journal of Physiology*, 2010 Feb 15;588(Pt 4):587-96. Epub 2009 Nov 23.
- Barry P.H., Sugiharto S., Lewis T.M. and Moorhouse A.J. (2010). Further analysis of counterion permeation through anion-selective glycine receptor channels. *Channels* 4(3) [Available at <http://www.landesbioscience.com/journals/channels/article/11020>]
- Sugiharto S., Carland J.E., Lewis T.M., Moorhouse A.J. and Barry P.H. (2010). External divalent cations increase anion-cation permeability ratio in glycine receptor channels. *Pflügers Archiv - European Journal of Physiology* [In press, DOI: 10.1007/s00424-010-0792-6] Available at: <http://dx.doi.org/10.1007/s00424-010-0792-6>
- Peters JA, Cooper MA, Livesey MR, Carland JE, Lambert JJ (2010) '5-HT<sub>3</sub> receptors' In: *The Ion Channels from Structure to Function*. (Eds. Kew J. & Davies C.), Oxford University Press, Oxford, UK, pp 231-251.

#### Conference Participation:

(11 presentations by the group), incl. Dr. Trevor Lewis: local organising committee and the programing committee for the joint Australian Neuroscience Society and Australian Physiological Society meeting held in Sydney, February 2. Dr. Andrew Moorhouse: plenary lecture at the Plasma Anion Transporters and Control of Volume Regulation annual international symposium in Okazaki, Japan in August 2009 “Molecular Determinants and Biophysical Mechanisms of Anion Selectivity in Glycine Receptor-Channels”; Convenor and lecture at the UNSW Cellular Neuroscience Symposium in May 2009 “Delineating the Glycine Receptor Selectivity Filter”. (incl. 3 international speakers; 50 registrants).

### Microvascular Group

Staff: Dr. Tim Murphy, Dr. Shaun Sandow (NHMRC CDA Fellow), Dr. Preetpal Chadha (Postdoctoral Research Officer).

Students: Nadim Naser (PhD student), Lauren Howitt (PhD student), Sevvandi Senadheera (PhD student/research assistant), Porshee Han (ILP student), Chern Chuen Lee (ILP student).

#### Publications:

- Potocnik, S.J., McSherry, I., Ding, H., Murphy, T.V., Kotecha, N., Dora, K.A., Yuill, K.H., Sandow, S.L., Triggle, C.R. & Hill, M.A. (2009). Endothelium-dependent vasodilation in myogenically-active mouse skeletal muscle arterioles: role of EDH and K<sup>+</sup>-channels. *Microcirc.* **16**, 377-390.
- Yang, Y., Murphy, T.V., Ella, S.R., Grayson, T.H., Haddock, R., Hwang, Y.T., Braun, A., Peichun, G., Korthuis, R.J., Davis, M.J. & Hill MA. (2009). Heterogeneity in function of small artery smooth muscle BK<sub>Ca</sub>: Involvement of the beta<sub>1</sub>-subunit. *J Physiol.* **587**, 3025-3044.
- Sandow SL, Haddock RE, Hill CE, Chadha PS, Kerr PM, Welsh DG, Plane F (2009). What's where and why at a vascular myoendothelial microdomain signalling complex. *Clin Exp Pharmacol Physiol.* **36**: 67-76.
- Sandow SL, Gzik DJ, Lee RM (2009). Arterial internal elastic lamina holes: relationship to function? *J Anat.* **214**: 258-66.
- Sandow SL, Grayson TH (2009). Limits of isolation and culture: intact vascular endothelium and BKCa. *Am J Physiol Heart Circ Physiol.* **297**:H1-7.

#### Conference Participation:

(6 presentations by the group): Keystone Conference ‘Complications of Diabetes and Obesity’, Vancouver, Canada (2 posters); Progress in Microcirculation Research. Proceedings of the 14th Australian and New Zealand Symposium (2 posters); 43<sup>rd</sup> Annual Scientific Meeting of the

Australasian Society of Clinical and Experimental Pharmacologists and Toxicologists; High Blood Pressure Research Council of Australia Annual Scientific Meeting.

## **Muscle Physiology research - Muscular dystrophy**

Staff: Dr. Steward Head (group leader); Dr. Stephen Chan (Fellow)

Students: Jennifer Anderson (Ph.D. awarded 2009); Stephen Chan (Ph.D. completed 2009); Sindy Keuh (Ph.D.).

Publications:

- Anderson JL, Morley JW & Head SI (2009). Enhanced homosynaptic LTD in cerebellar Purkinje cells of the dystrophic MDX mouse. *Muscle Nerve* 41, 329-334.
- Head SI (2010). Branched fibres in old dystrophic mdx muscles are associated with mechanical weakening and abnormal  $Ca^{2+}$  transients and a breakdown of  $Ca^{2+}$  homeostasis during fatigue. *Exp Physiol* 2010 Feb 5. [Epub ahead of print].
- Chan S, Seto JT, Houweling P, North KN and Head SI (2010) Properties of EDL muscle and skinned fibers from adult and aged male and female Actn3 KO mice. *Muscle Nerve*. In press.
- Antonio S J Lee, Josephine E Joya, Stewart I Head, Nalini Pather, Judy E Anderson, Anthony J Kee, Peter W Gunning and Edna C Hardeman (2010). Regeneration efficiency in aged/senescent skeletal muscle depends on the type of injury. *Aging Cell*. In press.

Conference participation:

Australian Physiological Society meeting held in Melbourne 2009:- oral & poster presentations; Invited chair:- skeletal muscle session. Australian Neuroscience Society and Australian Physiological Society meeting held in Sydney 2010. Three poster communications.

## **Neuro-Plasticity & Rehabilitation**

Staff: Dr. Cindy Lin (group leader)

Students: Hannah Pickering, Paul Minei (Hons students); Susanna Park (Ph.D.), William Huynh (Ph.D)

Publications:

- Han SE, Lin CS, Boland RA, Bilston LE, Kiernan MC. (2010) Changes in human sensory axonal excitability induced by focal nerve compression. *Journal of Physiology* (in press).
- Krishnan AV, Park SB, Payne M, Lin CS, Vucic S, Kiernan MC. (2010) Regional differences in ulnar nerve excitability may predispose to the development of entrapment neuropathy. *Clinical Neurophysiology* (E-Pub, In press)
- Park, S.B., Goldstein, D., Lin, C.S., Krishnan, A.V., Friedlander, M. & Kiernan, M.C. (2009) Acute abnormalities of sensory nerve function associated with oxaliplatin-induced neurotoxicity. *J. Clin. Oncol.* (27:1243-1249)
- Krishnan AV, Lin CS-Y, Reddel S, McGrath R, Kiernan MC. (2009) Conduction block and impaired axonal function in tick paralysis. *Muscle Nerves* 40:358-362
- Han SE, Boland RA, Krishnan AV, Vucic SV, Lin CS-Y, Kiernan MC. (2009) Ischaemic sensitivity of axons in carpal tunnel syndrome. *Journal of the Peripheral Nervous System* 14:190-200
- Park SB, Lin CS, Krishnan AV, Goldstein D, Friedlander M & Kiernan MC. (2009) Oxaliplatin-induced neurotoxicity changes in axonal excitability precede development of neuropathy. *Brain* 132:2712-2723

- Krishnan AV, Lin CS-Y, Park SB, Kiernan MC. (2009). Nerve excitability and the assessment of axonal ion channel function in-vivo: a translational perspective. *Progress in Neurobiology* 89:288-313
- Park SB, Lin CS, Krishnan AV, Goldstein D, Friedlander M & Kiernan MC. (2009) Oxaliplatin-induced Lhermitte's phenomenon as a manifestation of severe generalized axonal dysfunction. *Oncology* 77:342-348

Conference Participation:

(8 presentations): Proceedings of the Australian Neuroscience Society 30<sup>th</sup> Annual Meeting. January 2010; Biennial Peripheral Nerve Society Meeting. June 2009, Würzburg, Germany; The Australian and New Zealand Association of Neurologists Annual Scientific Meeting. May 2009, Christchurch, New Zealand; Proceedings of the Australian Neuroscience Society 29<sup>th</sup> Annual Meeting. January 2009, Canberra, ACT; Proceedings published in *J Clin Neuroscience* March 2009 16(3): 468-469.

### ***Neural Systems - Vision and Touch***

Staff: Dr. Richard Vickery (group leader)

Students: Tim Siu (Ph.D. awarded 2009); Andrew Carter (Hons); Ian Tse (ILP student)

Conference Participation:

- Leung, B.H.H., Vickery, R.M., Mahns, D.A. & Morley. J.M. (2009) Using parallel afferent channels to improve tactile spatial resolution. Proceedings of the Australian Neuroscience Society 19;
- Chen S.C., Byrnes-Preston P.J., Vickery R.M., Lovell N.H. and Morley J.W. (2010) Responses in primary and secondary somatosensory cortical regions in the cat to dual frequency vibrotactile stimuli applied to the glabrous skin of the forepaw. Proceedings of the Australian Neuroscience Society 20

### ***Physiology Teaching Research Group***

Staff: Dr. Lesley Ulman (group leader); Dr. Nicole Marden

In 2009 we implemented “online feedback quizzes” to give students more reason to engage with the material earlier in the course. The impact of these quizzes in session 1 were analysed and presented at the combined ANS and AuPS conference in Sydney in Feb 2010.

Conference Participation:

- ANS/AuPS conference 31 /2/10 – 2/2/10 poster: “Online feedback assessments in physiology: effects on learning” Ulman, L. Marden, N. and Velan, G.

### ***Translational Neuroscience Facility (School of Medical Sciences)***

#### ***TNF Sensori-Motor Group***

Staff: Prof. Gary Housley (group leader), Dr. Sherif Tadros (Facility Manager/Fellow), Dr Ann Wong (Fellow); Mr Edward Crawford (Professional - SoMS)

Students: Youngsoo Kim (Ph.D.); Meagan Barclay (Ph.D. Professional Practicum); Tze Ling Loh (ILP); Patrick Pham (Hons.); Yogeesan Sivakumaran (Med Student); Lauren Kress (Hons); Myungseo Ko (ILP pending).

Publications:

- Huang, L-C., Thorne, P.R., Vlajkovic, S.M., Housley, G.D. (2010) Differential expression of P2Y receptors in the rat cochlea during development. *Purinergic Signalling* (in press).

- Vlajkovic SM, Guo CX, Dharmawardana N, Wong ACY, Boison D, Housley GD, Thorne PR (2010) The role of adenosine kinase in cochlear development and response to noise. *Journal of Neuroscience Research* (in press).
- Barclay, M., Julien, J-P., Ryan, A.F., Housley, G.D. (2010) Type III intermediate filament peripherin inhibits neuritogenesis in type II spiral ganglion neurons in vitro. *Neuroscience Letters* (in press).
- Phan PAB, Tadros SF, Kim Y, Birnbaumer L, Housley GD (2010) Developmental regulation of TRPC3 ion channel expression in the mouse cochlea. *Histochemistry and Cell Biology* 133(4):437-48.
- O'Keeffe MG, Thorne PR, Housley GD, Robson SC, Vlajkovic SM (2010) Developmentally regulated expression of ectonucleotidases NTPDase5 and NTPDase6 and UDP-preferring P2Y receptors in the rat cochlea. *Histochemistry and Cell Biology* 133(4):425-36.
- Wong AC, Guo CX, Gupta R, Housley GD, Thorne, PR, Vlajkovic SM (2010) Post exposure administration of A(1) adenosine receptor agonists attenuates noise-induced hearing loss. *Hearing Research* 260(1-2), 81-8.
- Tadros SF, Kim Y, Phan P.A.B., Birnbaumer L, Housley GD (2010) TRPC3 ion channel subunit immunolocalization in the cochlea. *Histochemistry Cell Biology* 133(2):137-47.
- Housley, GD., Bringmann, A., Reichenbach, A. (2009) Purinergic signaling in special senses. *Trends in Neurosciences* 32(3):128-141 (IF: 12.479; *invited review*).
- Vlajkovic S.M., Housley, G.D., Thorne, P.R., Gupta, R., Cowan, P.J., Liberman, M.C., Robson, S.C. (2009). Preservation of cochlear function in CD39 deficient mice. *Hearing Research* 253(1-2), 77-82.
- Vlajkovic, SM, Housley, GD, Thorne, PR (2009) Adenosine and the auditory system. *Current Neuropharmacology* 7(3), 246-256. (*invited review*).

#### **Patents Filed:**

- New Zealand Patent no. HAW 507482NZPR, The Treatment of Hearing Loss. Inventors: Srdjan Vlajkovic, Peter Rowland Thorne, Gary David Housley. (PCT filing 11/8/09).
- Australian Provisional Patent No. 2009903320 "Method of providing agents to the cochlea". Housley, G.D. (filed July 15<sup>th</sup> 2009).

#### **Conference Participation:**

(14 Presentations; incl. Housley: 7<sup>th</sup> Australasian Auditory Neuroscience Workshop (January 30<sup>th</sup>, 2010; 75 registrants; organizing committee chair); ANS/AuPS Symposium "Auditory Neuroscience - neuronal signaling in development, repair and innovation in Bionics" (Monday Feb 1st, 2010) – Sydney Convention Centre, Darling Harbour. (Symposium chair; 3 posters).

### ***TNF Functional Genomics Group***

Staff: A/Prof. Matthias Klugmann (group leader) - under establishment

### ***TNF Clinical Neurophysiology Group***

Staff: Dr. Arun Krishnan (group leader)

Students: Ria Arnold (Ph.D.)

#### **Publications:**

- Krishnan, A. V.; Pussell, B. A.; Kiernan, M. C. *Neuromuscular disease in the dialysis patient: an update for the nephrologist* *Seminars in Dialysis* (2009) 22; 3: 267-78.

- Krishnan, A. V.; Kiernan, M. C. *Neurological complications of chronic kidney disease* Nature Reviews Neurology (2009) 5; 10: 542-51.
- Krishnan, A. V.; Lin, C. S.; Park, S. B.; Kiernan, M. C. *Axonal ion channels from Benjaminch to bedside: a translational neuroscience perspective* Progress in Neurobiology (2009) 89; 3: 288-313.
- Vucic, S.; Cheah, B. C.; Krishnan, A. V.; Burke, D.; Kiernan, M. C. *The effects of alterations in conditioning stimulus intensity on short interval intracortical inhibition* Brain Research (2009) 1273; 39-47
- Park, S. B.; Lin, C. S.; Krishnan, A. V.; Goldstein, D.; Friedlander, M. L.; Kiernan, M. C. *Oxaliplatin-induced neurotoxicity: changes in axonal excitability precede development of neuropathy* Brain (2009) 132; Pt 10: 2712-23.
- Park, S. B.; Lin, C. S.; Krishnan, A. V.; Goldstein, D.; Friedlander, M.; Kiernan, M. C. *Oxaliplatin-Induced Lhermitte's Phenomenon as a Manifestation of Severe Generalized Neurotoxicity.* Oncology (2009) 77; 6: 342-348.
- Han, S. E.; Boland, R. A.; Krishnan, A. V.; Vucic, S.; Lin, C. S.; Kiernan, M. C. *Ischaemic sensitivity of axons in carpal tunnel syndrome* Journal of the Peripheral Nervous System (2009) 14; 3: 190-200.
- Krishnan, A. V.; Lin, C. S.; Reddel, S. W.; McGrath, R.; Kiernan, M. C. *Conduction block and impaired axonal function in tick paralysis* Muscle & Nerve (2009) 40; 3: 358-62.
- Krishnan, A. V.; Fulham, M. J.; Kiernan, M. C. *Another cause of occupational entrapment neuropathy: la main du cuisinier (the chef's hand)* Journal of Clinical Neurophysiology (2009) 26; 2: 129-31.
- Park, S. B.; Goldstein, D.; Lin, C. S.; Krishnan, A. V.; Friedlander, M. L.; Kiernan, M. C. *Acute abnormalities of sensory nerve function associated with oxaliplatin-induced neurotoxicity* Journal of Clinical Oncology (2009) 27; 8: 1243-9.
- Cheeah, B.C.; Vucic, S.; Krishnan, A.V.;Kiernan, M.C. *Riluzole, neuroprotection and amyotrophic lateral sclerosis.* Current Medicinal Chemistry (2010) Apr 8. [Epub ahead of print].
- Krishnan AV. The excitement about excitability. Clinical Neurophysiology 2010 Epub Feb 22.
- Krishnan AV, Park SB, Payne MC, Lin CS, Vucic S, Kiernan MC. Regional differences in ulnar nerve excitability may predispose to the development of entrapment neuropathy. Clinical Neurophysiology 2010 (In press).

Conference Participation:

Australian Neuroscience Society; Sydney; Australia; Year: 2010; Australian and New Zealand Association of Neurologists Annual Scientific Meeting; Christchurch; New Zealand; Year: 2009;

Australian Neuroscience Society; Canberra; Australia; Year: 2009; Australian and New Zealand Association of Neurologists Annual Scientific Meeting; Melbourne; Australia; Year: 2010.

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## **Department of Physiology Staff and Student Awards, Promotions, Honours and Highlights**

- Dr Lesley Ulman: Faculty of Medicine Teaching Award, December 2009.
- Dr Rebecca Bertrand: Dean's rising star award
- Dr. Jane Carland: Dean's rising star award
- Dr. Jane Carland: UNSW School of Medical Sciences New Researcher of the Year Award
- Ms Senadheera was awarded a Dora Lush scholarship from NHMRC.
- Mr Scott Jones: McCloskey Award for best performance in Physiology Honours
- Dr. Amanda Boyce – Faculty Early Career Research Grant for 2010
- Dr Amanda Boyce – Kidney Health Australia Seeding Grant 2010
- Dr. Karen Gibson – Faculty Research Grant for 2010
- Dr. Karen Gibson - Deputy Chair NHMRC Grant Review Panel
- Dr. Andrew Moorhouse's publication in *Journal of Neuroscience*, 29: 3974-3980, made a novel discovery regarding the activity of brain microglia and was the most highly (on-line) read article in June and attracted broad interest in the National press of Japan (newspaper and television).
- Dr. Andrew Moorhouse: invited principal teacher (along with Prof Francis Edwards, UCL) at The Inaugural Patch Clamp Workshop Panjwani Center For Molecular Medicine And Drug Research, Karachi, Pakistan in December 2009.
- Dr. Andrew Moorhouse: Visiting researcher at The National Institutes for Physiological Research, Okazaki, Japan, August – September 2009; taught a patch-clamp workshop
- Dr. Jane Carland 'Structure function studies of Cys-loop receptors' Stem Cell Laboratory, School of Psychiatry, UNSW, Australia November 2009
- Dr. Jane Carland 'A novel determinant of Cys-loop receptor ion conduction' Department of Pharmacology, University of Sydney, NSW, Australia August 2009
- Dr. Jennie Cederholm 'Glycine receptor signal transduction', Prince of Wales Medical Research Institute, Randwick, NSW, Australia October 2009
- SOMS "Paper of the Month" Award in January for Carland et al., J Biol Chem, 2009
- Dr. Richard Vickery: deliver address to the aviation doctors in Canberra, Nov. 2009.
- Dr. Richard Vickery: external examiner for Sydney University Honours, Nov. 2009.
- Dr. Richard Vickery: Neuroscience Hons (NEUR4401) course run jointly by SOMS and the School of Psychology launched with 12 enrolments (Jan 2010).
- Dr. Stewart Head: single author paper on muscular dystrophy selected for a highlighted viewpoint review in *Experimental Physiology* (doi:10.1113/expphysiol.2009.052019).
- Dr. Arun Krishnan: Leonard Cox Award (and lecture): Australian and New Zealand Association of Neurologists, 2010.
- Prof. Gary Housley appointed as Assoc. Editor, Autonomic Neuroscience
- Dr. Cindy Lin, FRG / Early Career Research Grant
- Dr Cindy Lin, Paper of the Month, October, 2009, Park et al., *Brain* 132, 2172-2723.
- Dr Paul Bertrand was successful in his application for promotion to Associate Professor.
- Dr Cindy Lin was successful in her application for promotion to Senior Lecturer.
- Dr Benjamin Barry was successful in his application for promotion to Senior Lecturer.

## **Department of Physiology**

### **Research Grants**

- A/Prof. Paul Bertrand et al. Major Research Equipment and Infrastructure Initiative (MREII) Grant 2009 (\$109,000, Multi-Neuron Imaging System).
- Dr. Moorhouse (CIA), Barry, Carland. Awarded a UNSW Goldstar (\$40,000). Functional characterisation of the intracellular M3-M4 loop in anionic cys-loop LGICs.
- Dr. Krishnan: NHMRC Project Grant \$244500 (2010-2012). AUSSPRINT: Australian study of the effects of strict potassium restriction on neuropathy in chronic kidney disease.
- Dr. Krishnan: NHMRC Career Development Award \$370000 (2009-2012). Effects of pharmacological modification of ion channel activity on the excitability of normal and diabetic nerves.
- Dr. Krishnan: Ramaciotti Grant \$50000 (2010-2011). A novel strategy for preventing neurological disability due to chronic kidney disease.
- Dr. Krishnan: Royal Australasian College of Physicians GlaxoSmithKline Fellowship in Neurology \$40000. Glucose dysmetabolism and peripheral neuropathy: the development of a novel biomarker.
- Dr. Krishnan: UNSW Goldstar Award \$40000 (2010). Nerve excitability assessment: a novel biomarker for diabetic neuropathy.
- Prof Housley: National Health & Medical Research Council (NHMRC) “Hearing protection conferred by P2X2 receptor signaling in the cochlea” Gary Housley (CIA), Allen Ryan (CIB); Peter Thorne (AIA); Srdjan Vlajkovic (AIB) (2009, ref. 630618, \$559,500 over three years).
- Prof. Housley: Australian Research Council Discovery Project (ARC DP) “Physiological significance of transient receptor potential (TRPC3) ion channels in the cochlea” (2009, ref. DP1097202 2010, \$280,000).
- Prof. Housley: Australian Research Council Linkage Project Grant (ARC LP) “Gene therapy to enhance auditory prosthesis performance for cochlear implants” Linkage Partner: Cochlear Ltd. (2009; ref. LP0992098: \$554,000 ARC + industry funding over three years).
- Prof. Housley: The Ian Potter Foundation Conference Grant (\$5,000).
- A/Prof. Klugmann: UNSW Office for Science and Medical Research (OSMR) Life Sciences Research Award (\$200,000 over two years)
- Dr. Cindy Lin: FRG / Early Career Research Grant (\$30,000)
- Dr. Tim Murphy and Dr. Shaun Sandow FRG “Effect of plasma subfractions from diabetic humans on microvascular reactivity”. (\$17,000)
- Dr. Amanda Boyce – Faculty Early Career Research Grant for 2009 for work on the programming effects of perinatal vitamin D on adult kidney and heart (\$30,000).
- Dr. Karen Gibson – Faculty Research Grant for 2010 to study programming effects of intrauterine growth restriction on the kidney, blood pressure and the renin angiotensin system (\$20,000).
- Dr. Barry: UNSW Goldstar Award Neuromuscular dysfunction in osteoarthritis of the knee. (2009, \$40000).
- Dr Amanda Boyce – Kidney Health Australia Seeding Grant 2010 (\$15,000).

#### ***International Collaborative Funding***

- Prof. Housley, 2009 – Health Research Council (New Zealand) “Abnormal Ion Homeostasis in Inner Ear Disease” Peter Thorne, Srdjan Vlajkovic, Paul Donaldson, Gary Housley. 01.10.09 – 31.09.12; NZ\$1,465,888).
- A/Prof. Klugmann: European Commission Grant HEALTHF2- 2010-241622 (\$394,461 , over 3 years).