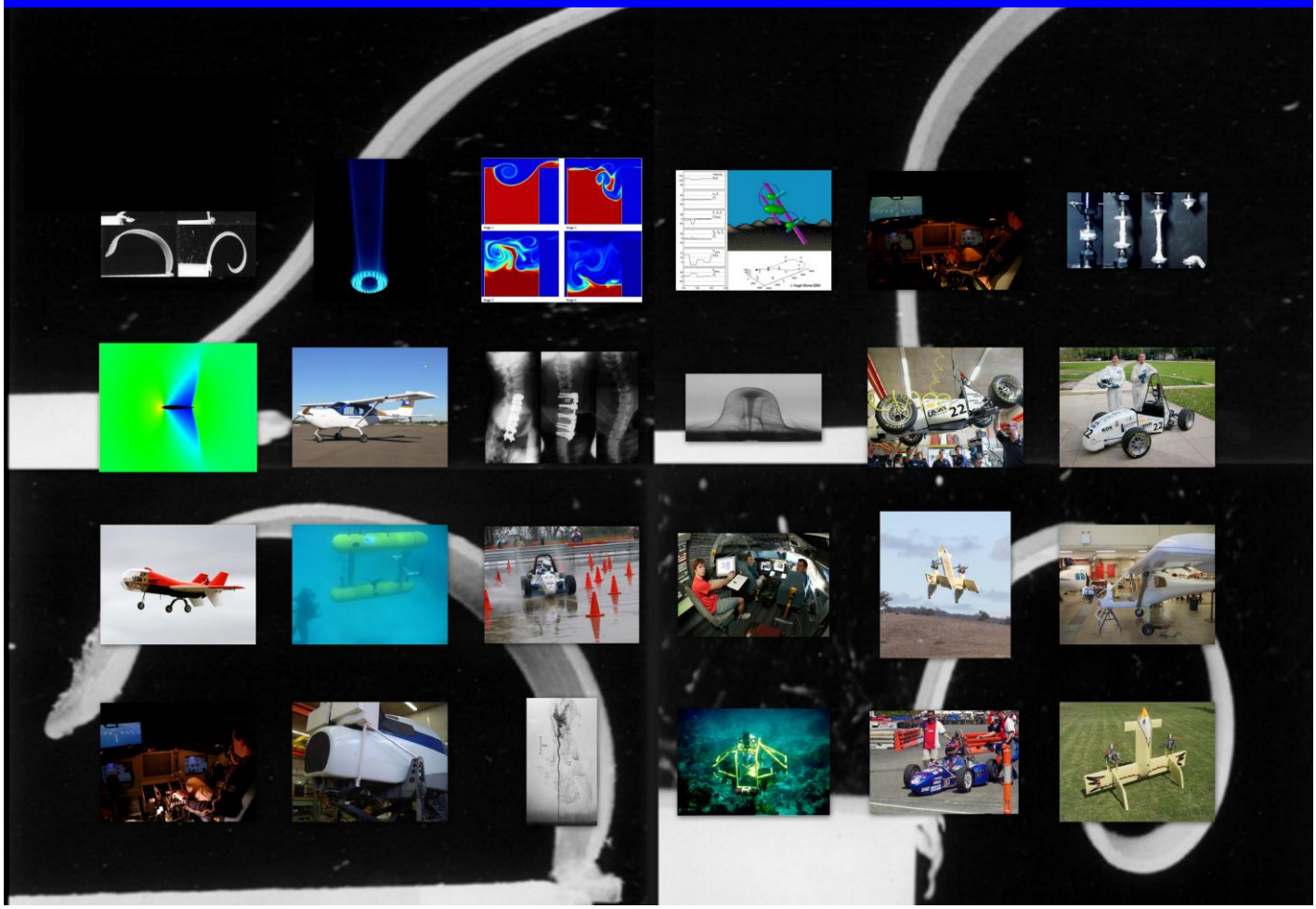
SCHOOL OF AEROSPACE, MECHANICAL & MECHATRONIC ENGINEERING

RESEARCH REPORT 2011



THE UNIVERSITY OF SYDNEY

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Designed and produced in-house by the School of Aerospace, Mechanical & Mechatronic Engineering, University of Sydney

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Foreword

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Professor Steve Armfield
Head of School

We are pleased to publish this report which reflects the research strengths and achievements in the School of Aerospace, Mechanical and Mechatronic Engineering (AMME) for 2011. The school has a number of world class research groups and has continued to maintain its position as the dominant research school in the faculty, and one of the leading engineering research schools in the country. During the year $5.5 million of new research funding was obtained, 311 research articles and books were published, 125 research students were under supervision and 16 research students completed. With 29 permanent academic staff members our performance per capita places us on a par with the top engineering schools in the world. I would like to thank all the staff whose hard work and dedication has produced this outstanding research profile, and in particular to congratulate Professor Yiu-Wing Mai on being elected an International Fellow of the Royal Academy of Engineering and Professor Roger Tanner for completing 40 years of service to the University.

Organisational Overview

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Academic Staff

Head of School

Prof Steve Armfield

Professors

Armfield, Steven
Behnia, Masud
Mai, Yiu-Wing
Masri, Assaad (ARC Australian Professorial Fellow)
Nebot, Eduardo
Tanner, Roger
Tong, Liyong
Ye, Lin

Emeritus Professors

Bilger, Robert
Bird, Graeme
Steven, Grant

Honorary Professors

Brandwood, Arthur
Carter, Paul
Henderson, Le Roy
Kent, John

Adjunct Professor

Chamitoff, Gregory

Associate Professors

Dunstan, Colin
Li, Qing
Liao, Xiaozhou (ARC Fellow QEII)
Ruys, Andrew
Rye, David
Sukkarieh, Salah
Williams, Stefan
Zreiqat, Hala (NHMRC Senior Research Fellow)

Honorary Associate Professors

Diwan, Ashish
Wong, Shing-Chung

Adjunct Associate Professors

Lowe, Allen
Parsi, Kurosh
Roger, Greg
Zheng, Rong

Senior Lecturers

Auld, Douglass (Associate Dean, Education)
Brooker, Graham
Gibbens, Peter
Karkenahalli, Srinivas (Deputy Head of School)
Jabbarzadeh, Ahmad
Kirkpatrick, Michael
McHugh, Paul
Wong, Kee Choon

Honorary Senior Lecturers

Bilston, Lynne
Tran, Giang

Lecturers

Li, Chang
Wu, Xiaofeng
Verstraete, Dries
Vio, Gareth

Honorary Lecturers

Boughton, Phillip
Stone, Hugh

Adjunct Lecturer

Bates, Peter

Associate Lecturers

Briozzo, Paul
Fiford, Rod

Honorary Associates

Clarke, Elizabeth
Fan, Xijun
Houghton, Ron
Lu, Chunsheng
Mitra, Ashish
Qin, Qing Hua
Shah, Shruti
Swain, Michael
Zhang, Xin-Ping

Research Staff

ARC Future Fellow

Liu, Hong Yuan

ARC Australian Research Fellow

Li, Wei

ARC Postdoctoral Research Fellows

Pizarro, Oscar
Wang, Yanbo
Williamson, Nicholas

ARC Postdoctoral Fellow- Industry

Nagarathinam, Srinarayana

ARC Research Associate

Tekyeh Marouf, Bahereh

Australian Postdoctoral Fellow

Lu, Ye

University of Sydney Postdoctoral Fellow

Yang, Chuncheng

CRC-ACS Postdoctoral Fellow

Islam, Saiful Mohammad

Research Fellows

Allen, Thomas
Elinas, Pantelis
Fitch, Robert
Göktoğan, Ali
Hatherly, Peter
Hill, Andrew
Johnson, David
Johnson-Roberson, Matthew
Melkumyan, Arman
Monteiro, Sildomar
Takahashi
Murphy, Richard
Nieto, Juan
Nourani-Vatani, Navid
Orchansky, David
Scheding, Steven
Underwood, James
Vasudevan, Shrihari
Velonaki, Mari
Worrall, Stewart
Zhou, Hang (Cathy)
Peynot, Thierry

Post Doctoral Fellows

Aberra, Tilek
Bailey, Tim
Baji, Avinash
Bryson, Mitchell
Chen, Yuhang
Dai, Shao Cong
Juddoo, Mrinal
Kittipoomwong, Prakorn David
Lee Wo, Duane
Luo, Quantian
Qi, Fuzhong
Starner, Sten
Tang, Youhong
Zhou, Shiwei

Postdoctoral Research Associates

Chen, Bin
Du, Xusheng
Kourmatzis, Agisilaos
Lu, ZuFu
Nakul, Vinayaka Prasad
Wang, Guocheng

Postdoctoral Researcher

Wang, Dong

Organisational Overview

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Research Staff

Research Associates

Bertevas, Erwan
Deng, Shiqiang
Douillard, Bertrand
Lawrance, Nicholas
Ramos, Fabio
Reid, Alistair
Rungsiyakull, Chaiy
Uthayakumaran, Surjani

Senior Research Engineer (CRC-AS)

Beehag, Andrew

Research Assistant

James, Barbara

Administrative Staff

Administration Personnel

Liang, Wendy (Undergraduate Studies)
Martin, Vinita (Head of School's Office)
Olip, Ruth (Admin Manager, ACFR)
Santos, Tessie
Sawtell, Olga (CEO, Operations, ACFR)
Sexton, Bronwyn (Postgraduate Studies & Marketing)

Finance Managers

Connell, Robin
Wang, Christy

Finance Officer

Joshi, Padmini

Administrative Assistants

Gonzales, Susan
Hunter-Smith, Lisa (ACFR)

Workshop Staff

Senior Technical Officers

Elder, Greg (Deputy Manager, AMME Workshop)
Stenger, Duncan (Manager, AMME Workshop)

Technical Officers

Attia, Muhammad Esa
Blekhman, Alexander
Brown, Stuart
Calleija, Mark
Chan, Victor
Chen, Quanjun (Jerry)
Crundwell, Bruce
Durrant, Andrew
Geier, Matthew
Goyal, Abhinav
Hale, Tim
Hennessy, Ross
Karkada, Stanley
Lal, Ritesh
Lees, Christian
Leung, Raymond
Lowe, Alex
Maclean, Andrew
Martinez, Javier
Massey, Alexander
McCouat, Nicholas
Merry, Laura
Miller, Tim
Nguyen, Dai Bang
O'Shannessy, Robert
Ralph, Daniel
Randle, Jeremy
Riviere, Greg
Shearing, Trevor
Sinclair, Malcolm
Todhunter, John
Vitjuk, Ivan
Vlaskine, Vsevolod
Wishart, Stuart
Wohlleber, Cedric
Wright, James
Zigman, John

Technical Assistants

Mear, Paul
Potts, John

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Visiting Professors/ Scholars

Bussiba, Arry
Fan, Jin-tu
Gong, Xiao-Jing
Hosoi, Atsushi
Lee, Jim
Nettleton, Eric
Pyrz, Ryszard
Raman, Venkatramanan
Wei, Kexiang
Wu, Jingshen
Yang, Ying-Kui
Yu, Zhong-Zhen
Zhang, Donghai
Zhou, Limin

Occupational Trainees

Cazzato, Luigi
Fu, Kunkun
Gang Yang, Miao
Hagel, Philipp
Hattori, Gabriel Da Silva
Huang, Yuan-Li
Jiang, An
Matela, Michael
Qin, Guo
Shou, Dahua
Sun, Jingli
Torkittikul, Pincha
Wang, Chao
Witt, Nikolai
Won, Dae-Yeon
Zhu, Suqin

Research Highlights

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Research and Teaching Grants Awarded in 2011

Australian Research Council (ARC) Discovery Grants

MAI and Guo $345,000
Toughening thermosets by highly ordered nanostructures

LIAO and Wang $300,000
Interactions between linear and interfacial crystalline defects and their impact on mechanical properties in nanostructured metals and alloys

Australian Research Council (ARC) Future Fellowship

LIAO $817,856
The effect of structure and size on the mechanical behaviour of III-V semiconductor nanowires

WILLIAMS $759,836
Delivering information suitable for studying spatial and temporal variability in benthic habitats using autonomous underwater vehicles

Australian Research Council (ARC) Linkage Grant

NEBOT, Nieto and Brooker $480,800
Development of fundamental perception technology and algorithms for mining safety

Australian Research Council (ARC) Linkage Infrastructure, Equipment and Facilities Grant (LIEF)

LIAO $200,000
Joint processing facility for the production of far-from-equilibrium alloy structures

Australian Research Council (ARC) Discovery Early Career Researcher Awards (DECRA)

TANG $375,000
Water-swellable rubber with nanoparticle-enabled super capacity as smart water-leakage

ZHOU $375,000
Topology optimisation for advanced engineered nanostructures

National Health and Medical Research Council Grant (NHMRC) Project Grants

LITTLE (*The Children's Hospital*),
RUYS (*et al*) $421,175
Pre-clinical validation of a novel implant for bone tissue engineering

MURRAY (*Faculty of Pharmacy*),
DUNSTAN (*et al*) $835,860
Pharmacological development of synthetic analogues of cytochrome P450-mediated omega-3 fatty acid epoxides as novel anti-metastatic agents

National Health and Medical Research Council Grant (NHMRC) Early Career Fellowship

LU $342,892
Smart synthetic biomaterial for bone tissue regeneration

University of Sydney Widening Participation Grant

AULD $30,000
2012 Indigenous Australian Engineering Summer School

Industry Funds

SUKKARIEH *et al* €195,300
European Grant - "Multi-UAV Cooperation International Research Exchange Network"
The joint exchange program over 2011-2013 will involve research organizations from Germany, Spain and Australia

SUKKARIEH $152,000
MLA Project - "New Detection and Classification Algorithms for Mapping Woody Weeds from UAV Data"

SUKKARIEH $657,000
Qantas Onshore Research: An Algorithm and Software System for Individual Aircraft Fuel Burn

SUKKARIEH $93,000
Qantas Research- Proof of Concept of New Flight Planning Algorithms

Research Highlights

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Appointments and Promotions

Professor Steve **Armfield** reappointed as Head of School for a second term

Dr Li **Chang** appointed as Lecturer in Materials Engineering, starting in 2012

Dr Matthew **Cleary** appointed as Lecturer in Mechanical Engineering starting in 2012

Dr Matthew **Dunn** appointed as Lecturer in Mechanical Engineering starting in 2012

Dr Ahmad **Jabbarzadeh** appointed as Lecturer in Mechanical Engineering, starting in 2012

Dr Xiaozhou **Liao** has been promoted to Associate Professor

Dr Ian **Manchester** appointed as Senior Lecturer in Aeronautical Engineering, starting in 2012

Dr David **Rye** has been promoted to Associate Professor

Dr Gareth **Vio** appointed as Lecturer in Aeronautical Engineering

Dr Stefan **Williams** has been promoted to Associate Professor

Awards and Honours

Professors Robert **Bilger** and Roger **Tanner** have been elected inaugural fellows of the Australasian Fluid Mechanics Society.

Dr Greg **Chamitoff** has made a second successful flight to the International Space Station on NASA's shuttle Discovery on 20th May 2011. This will be Discovery's final flight.

Drs Yuhang **Chen** and Zufu **Lu** were awarded University International Program Development Funding for further developing their international links.

Professor Yiu-Wing **Mai** was elected an International Fellow of the Royal Academy of Engineering.

Professor Assaad **Masri** and the Research Support team won the Vice Chancellor's award for Excellence.

Dr Steve **Scheding** has accepted the position of Director of the Rio Tinto Centre for Mine Automation.

Drs Surya **Singh**, Robert **Fitch** and Stefan **Williams** received the Dean's Award for Outstanding Teaching 2011 in the Faculty of Engineering & IT.

Associate Professor Salah **Sukkarieh** has taken over from Hugh Durrant-Whyte as ACFR's Research Director.

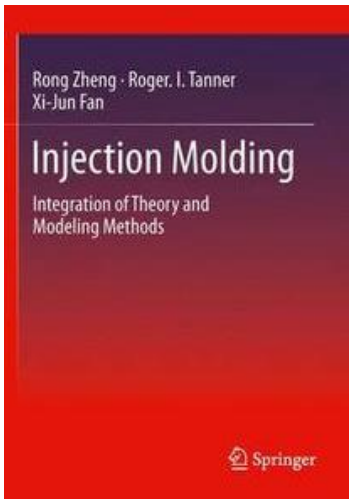
Professor Roger **Tanner** received a silver medal and certificate of recognition for 40 years service to the University.

Ms Annika **Van Hummel** received the Dean's Award and Mr Lachlan **McCalman** high commendation for Excellence in Tutoring 2011 for the School of AMME.

Drs Stefan **Williams**, Surya **Singh** and Robert **Fitch** were awarded a $35k University Teaching Support (STEPS) Grant towards a project for enhancing robotics education.

Drs KC **Wong** and Dries **Verstraete** were awarded a $35k STEPS grant for a 'Global Experiential Design Studio for International Engineering Collaboration'.

Professors Rong **Zheng**, Roger **Tanner** and Xi-Jun **Fan** published a very thorough review of Injection Molding.



Associate Professor Hala **Zreiqat's** research story was aired on Catalyst (ABC) in June 2011.

Aerospace Research

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Research Group

Aerospace Design

Dr Dries Verstraete
P: + 61 2 9351 2393
dries.verstraete@sydney.edu.au

- Aircraft design
- Unmanned aerial vehicles
- Micro gas turbines
- Green and renewable propulsion
- Unconventional aircraft configurations
- Hydrogen in aviation
- Propulsion and structures of hypersonic aircraft

Aerospace Engineering

Dr Gareth Vio
P: + 61 2 9351 2394
gareth.vio@sydney.edu.au

- Non-linear aeroelasticity
- Non-linear vibration
- Non-linear system identification
- Gust response
- Aeroelastic tailoring
- Design of composite structures
- Morphing structures
- Natural selection optimisation

Design Optimisation Research

Dr K Srinivas
P: + 61 2 9351 4289
k.srinivas@usyd.edu.au

(Also a member of the Biomedical, Fluid Dynamics Research Groups & Finite Element Analysis Research Center)

- Hierarchical Asynchronous Parallel Evolutionary Algorithms (HAPEAs)
- Robust evolutionary methods for multi-objective and Multidisciplinary Design Optimisation (MDO) in aeronautics.
- Grid free flow-solvers and evolutionary algorithms.
- Adaptive aerofoils/wings design and optimisation using evolutionary algorithms.

Flight Simulation and Control

Dr Peter Gibbens
P: +61 2 9351 7350
peter.gibbens@sydney.edu.au

The Variable Stability Flight Simulator (VSFS) is an exclusive project to the University of Sydney, a national first. In addition to the application of the VSFS to AMME flight mechanics courses, the simulator offers significant potential in other areas. For instance, current post-graduate study is being performed with the aim of producing an avionics course based on the simulator systems. Other post-graduate projects involve guidance and control (landing and flight path) using visual systems - simulated with the VSFS.

Smart Structures Research

Professor Liyong Tong
P: +61 2 9351 6949
Liyong.tong@sydney.edu.au

(Also a member of Finite Element Analysis Research Center)

Research interests are mainly concerned with modeling behaviors of composite and smart structures. Current research areas and projects include:

- Failure analysis and damage tolerance of adhesive bonded composite joints
- Modeling behavior of 3D reinforced composite materials, including transverse stitching
- Behavior of composite plates and shells
- Smart structures using PZT sensors/actuators, including damage detection and performance control of thin-walled structures

Aerospace Research

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Space Engineering Research

Dr Doug Auld
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(Also a member of the Fluid Dynamics Research Group)

The DSMC (Direct Molecular Simulation - Monte Carlo Method) gas flow simulation technique was pioneered by Emeritus Professor Graeme Bird in this School. The method was originally used for simulation of rarefied gas flow around re-entry vehicles, but has now progressed to the stage of being a useful tool for solving a large range of aerodynamic and aerospace problems such as:

1. Simulation of flow separation in near continuum region
2. Rankine-Heugonot weak/strong shock reflection solutions
3. Nano-Fluid Simulations
4. Investigation of stability of low Reynolds number flows

Associate Professor Salah Sukkarieh
P: +61 2 9351 8154
salah@acfr.usyd.edu.au

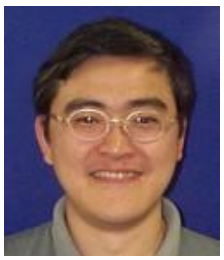
(Also a member of Australian Center for Field Robotics ACFR)

- Planetary Rover Systems
- Navigation in GPS denied environments
- Multi-robot systems for Space
- Multi-satellite navigation and control

Dr Xiaofeng Wu
P: +61 2 9036 7053
xiaofeng.wu@sydney.edu.au

- Small Satellite bus design
- Fault tolerance systems design
- Remote sensing

Unmanned Aerial Vehicle (UAV) Research



Dr KC Wong
P: +61 2 9351 2347
kc.wong@sydney.edu.au

Current UAV related research activities include the following:

- Autonomous remote sensing using UAVs;
- Decentralised navigation and control of autonomous flight vehicles;
- Simultaneous localisation and map building for autonomous flight vehicles;
- Design and development of rapid prototype UAVs;
- Wind-tunnel and flight based experimental research in aerodynamics and flight performance;
- Modelling of engine/propeller performance and aircraft stability characteristics;
- High fidelity aircraft model development for simulation based control system validation;
- Trajectory optimisation and autonomous guidance for unmanned aircraft;
- Sensor fusion strategies for state estimation using multiple redundant sensors, including Global Positioning Systems (GPS);
- Using GPS for aircraft attitude determination;
- System identification methods and neural networks for fault detection and reconfiguration;
- Robustness analysis of control laws in the presence of uncertain dynamics and wind gusts;
- Robust nonlinear high-performance manoeuvre tracking for autonomous aircraft;
- Autonomous safe recovery and landing of a UAV;
- Terrain Following for autonomous flight vehicles;
- Integration of available technologies into operational UAV systems;
- Real-time fight control software synthesis for UAVs;
- Design and fabrication of airframe components using advanced composite materials.

Aerospace Research

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Emeritus Professors

Prof Bird, Graeme
Prof Steven, Grant

Honorary/ Adjunct Staff

Dr Bates, Peter
Dr Chamitoff, Gregory
Dr Houghton, Ron
Dr Stone, Hugh

Research Fellow

Dr Bryson, Mitchell
Dr Islam, Saiful
Mohammad

Postdoctoral Fellow

Dr Luo, Quantian

Research Students

Abuhashim, Tariq
Anderson, Matthew
Armstrong, James
Awin, Layth Ali
Bai, Xueliang
Bartsch, Ronald
Brown, Sonya
Chung, Jen Jen
De Sousa, Manuel
Dumble, Steven
Gan, Seng Keat
Hemakumara, Madu Prasad
Ho, Derrick
Ho, Ken Po Lam
Hung, Calvin Kai-Yuan
Kassir, Abdallah
Lamburn, Darren
Lehmkuehler, Kai
Lui, Sin Ting Angela
Medagoda, Eran
Nguyen, Joseph
Richardson, Adam
Seiler, Konstantin Martin
Vasista, Srinivas
Williams, David
Wilson, Daniel Briggs
Xiao, Size
Xu, Zhe
Yan, Jun
Yoo, Chanyeol
Zhang, James Yinye

Research Grants*

Sponsor/ Grant Name	Chief Investigator [other AMME investigators]	Project Title	Duration	Awarded Amount ($)
CRC Advanced Composite Structures Ltd	Tong, Liyong [Ye, Lin]	Structural Repair and Rehabilitation	Jul 2010 - Jun 2015	**318,000**
CRC Advanced Composite Structures Ltd	Tong, Liyong [Ye, Lin]	Rapid Assembly Methods	Jul 2010 - Jun 2015	**430,500**
Australian Research Council/Discovery Projects	Tong, Liyong	Design of compliant structure systems with integrated actuators	Jan 2011 - Dec 2013	**290,000**
Defence Science and Technology Organisation/Research Support	Verstraete, Dries	Fuel-Cell Unmanned Aircraft System Hardware-in-the-loop Simulation	Jul 2011 - Jun 2012	**12,000**

* Figures obtained from the Research Office, University of Sydney

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2011 Publications*

Book Chapters

Bai, X, Wu, X 2011, Customized Processor Architecture for Model Predictive Control in Magnetic Actuated Small Satellites, Advanced Electrical and Electronics Engineering (Lecture Notes in Electrical Engineering), Springer, Chennai, India, 2, 71-79

Brown, S, Tong, L, Luo, Q T, Gong, X 2011, Mixed mode energy release rates for bonded composite joints, Composite joints and connections- Principles, modelling and testing, Woodhead Publishing Ltd, UK, 435-462

Tong, L, Luo, Q T 2011, Analytical Approach to Joint Design, Handbook of Adhesion Technology, Springer, Germany, 1, 597-627

Conference Papers

Gibbens, P W, Verstraete, D 2011, Learning aircraft design and flight control system design using flight simulation as a CDIO conduit, 7th International CDIO Conference 2011, Danmarks Tekniske Universitet (DTU), Denmark

Bai, X, Wu, X 2011, A Simulation and Visualization Platform for Fractionated Spacecraft Attitude Control System, 2011 IEEE International Conference on Mechatronics and Automation (IEEE ICMA 2011), IEEE, Beijing, China, 2033-2038

Brooker, G M, Randle, J A G, Attia, M E, Xu, Z, Abuhashim, T, Kassir, A, Chung, J, Sukkarieh, S, Tahir (nee Mariam), N, Dickens, J 2011, First Airborne Trial of a UAV Based Optical Locust Tracker, Australasian Conference on Robotics and Automation (ACRA 2011), ARAA: Australian Robotics & Automation Association, Melbourne, Australia, 1-9

Bryson, M T, Reid, A, Hung, C, Abuhashim, T, Sukkarieh, S 2011, Using unmanned aerial vehicles for mapping, classification and monitoring of invasive weeds, 34th International Symposium for Remote Sensing of the Environment, Unknown, unknown, 1-4

Bryson, M T, Sukkarieh, S 2011, A Comparison of Feature and Pose-Based Mapping using Vision, Inertial and GPS on a UAV, 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems, IEEE/Omnipress, USA, 4256-4262

Chen, X, Wu, X 2011, Design and implementation of model predictive control algorithms for small satellite three-axis stabilization, Information and Automation (ICIA), 2011 IEEE International Conference, IEEE, China, Article number 5949077, 666-671

Chung, J, Sukkarieh, S 2011, High level risk analysis and decision making regarding the prediction of thermal lift locations for an autonomous mars glider, 10th Australian Space Science Conference, National Space Society of Australia Ltd, Australia, 237-248

Gan, J S K, Sukkarieh, S 2011, Multi-UAV Target Search using Explicit Decentralized Gradient-Based Negotiation, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, CD, 751-756

Hemakumara, P, Sukkarieh, S 2011, Non-Parametric UAV System Identification with Dependent Gaussian Processes, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, 4435-4441

Ho, D, Wong, K C 2011, Low Thrust to Weight Ratio Manoeuvre of a Bio-inspired Bi-mode UAV, AIAC-14 Fourteenth Australian International Aerospace Congress APISAT 2011, WALDRONSMITHManagement, Melbourne, Australia

Hung, C, Bryson, M T, Sukkarieh, S 2011, Vision-based Shadow-aided Tree Crown Detection and Classification Algorithm using Imagery from an Unmanned Airborne Vehicle, 34th International Symposium for Remote Sensing of the Environment, Unknown, unknown, 1-4

* Records obtained from the Integrated Research Management Application (IRMA), University of Sydney

Khodaparast, H, Georgiou, G, Cooper, J, Travaglini, L, Ricci, S, Vio, G, Denner, P 2011, Rapid Prediction of Worst Case Gust Loads, 52nd AIAA/ASME/ASCE/AHS/ASC Structures, Structural Dynamics and Materials Conference, AIAA, USA

Koster, J, Kraemer, E, Munz, C, Verstraete, D, Wong, K C, Velazco, A 2011, Workforce Development for Global Aircraft Design, ASME 2011 International Mechanical Engineering Congress & Exposition IMECE2011, ASME International USA, USA, IMECE2011-62273-1-IMECE2011-62273-12

Koster, J, Munz, C, Wong, K C, Velazco, A, Kraemer, E, Verstraete, D 2011, HYPERION UAV: An International Collaboration, 50th AIAA Aerospace Science Meeting, AIAA American Institute of Aeronautics and Astronautics, USA, AIAA-2012-1223

Koster, J, Serani, E, Velazco, A, Wiley, T, Munz, C, Kurz, H, Kramer, E, Wong, K C, Lehmkuehler, K, Verstraete, D 2011, HYPERION: An International Collaboration, 7th International CDIO Conference 2011, Danmarks Tekniske Universitet (DTU), Denmark

Lawrance, N R J, Sukkarieh, S 2011, Autonomous soaring for atmospheric exploration of Titan, 10th Australian Space Science Conference, National Space Society of Australia Ltd, Australia, 223-236

Lawrance, N R J, Sukkarieh, S 2011, Path Planning for Autonomous Soaring Flight in Dynamic Wind Fields, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, CD, 2499-2505

Lee, C-J, Townsend, S, Srinivas, K 2011, Optimisation of Stents for Cerebral Aneurysm, Sixth International Conference on Computational Fluid Dynamics (ICCFD 2010), Springer, Germany, 377-382

Lee, D S, Periaux, J, Srinivas, K, Gonzalez, L, Qin, N, Onate, E 2011, Shock Control Bump Design Optimization on Natural Laminar Aerofoil, Sixth International Conference on Computational Fluid Dynamics (ICCFD 2010), Springer, Germany, 253-259

Lehmkuehler, K, Wong, K C 2011, Winglet Design for a Fairchild Merlin III using CFD Analysis, AIAC-14 Fourteenth Australian International Aerospace Congress APISAT 2011, WALDRONSMITHManagement, Melbourne, Australia

Lehmkuehler, K, Wong, K C, Verstraete, D 2011, Hyperion Flying Wing Aircraft Technology, 7th International CDIO Conference 2011, Danmarks Tekniske Universitet (DTU), Denmark

Reid, A, Ramos, F T, Sukkarieh, S 2011, Multi-Class Classification of Vegetation in Natural Environments Using an Unmanned Aerial System, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, 2953-2959

Srinivas, K, Lee, C-J 2011, Optimisation of Stents for Cerebral Aneurysm Application, Eighth International Conference on Flow Dynamics, GCOE Institute of Fluid Science, Tohoku University, Tohoku, Japan, 448-449

Ullrich, F, Goktogan, A H, Sukkarieh, S 2011, Design Optimization of a Mars Rover's Rocker-Bogie Mechanism using Genetic Algorithms, 10th Australian Space Science Conference, National Space Society of Australia Ltd, Australia, 1, 199-210

Verstraete, D, Gibbens, P W, Wong, K C 2011, Is a small UAV with extended altitude capabilities feasible?, AIAC-14 Fourteenth Australian International Aerospace Congress APISAT 2011, WALDRONSMITHManagement, Melbourne, Australia

Verstraete, D, Hendrick, P 2011, Improved Performance Assessment of a Precooled Turbofan for Hypersonic Vehicle Acceleration, 20th ISABE Conference 2011, International Society for Airbreathing Engines, Sweden

Verstraete, D, Ling, J C, Wong, K C, Armfield, S W 2011, Development of a micro turboprop for high altitude UAV propulsion, 20th ISABE Conference 2011, International Society for Airbreathing Engines, Sweden

Verstraete, D, Ling, J C, Wong, K C, Armfield, S W 2011, Development of a micro turboprop to extend altitude capabilities of small UAVs, AIAC-14 Fourteenth Australian International Aerospace Congress APISAT 2011, WALDRONSMITHManagement, Melbourne, Australia

Verstraete, D, Thirifay, F, Hendrick, P 2011, Definition and Optimisation of the Structure of a Hypersonic Aircraft Considering Aero-Elastic Deformations, 4th European Conference for Aerospace Sciences, Torus Press Publishing house, Russia

Vio, G, Dimitriadis, G 2011, Damping Identification in an Aeroelastic System with Structural Non-Linearities, AIAC-14 Fourteenth Australian International Aerospace Congress APISAT 2011, WALDRONSMITHManagement, Melbourne, Australia

Vio, G, Miller, S, Cooper, J 2011, Gust Alleviation Device Applied to the Sensorcraft Structure, AIAC-14 Fourteenth Australian International Aerospace Congress APISAT 2011, WALDRONSMITHManagement, Melbourne, Australia

Wong, K C, Verstraete, D, Lehmkuehler, K, Koster, J, Munz, C, Kraemer, E, Velazco, A 2011, Rapid, International Design and Test of a Hybrid-Powered, Blended-Wing Body Unmanned Aerial Vehicle, 11th AIAA Aviation Technology, Integration and Operation (ATIO) Conference, ASME International USA, USA

Wu, X, Sam, M, Xiao, S 2011, Targeted processor architecture for embedded real-time control using (delta)-operator, 6th IEEE Conference on Industrial Electronics and Applications ICIEA 2011, IEEE Xplore, United States, 2011, Article number 5975690, 773-778

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Luo, Q T, Tong, L 2011, Ultraviolet-light-induced multi-physics behaviors of 03 polarized transparent PLZT plates: II. Finite element analysis and validation, Smart Materials and Structures, 20(11), 1-12

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Yang, L, Tong, L, He, X 2011, Molecular Dynamic Simulation of Sword-Sheath Extraction Behavior in CNT Reinforced Composite, Polymers and Polymer Composites, 19(2-3), 113-118

Biomedical Engineering Research

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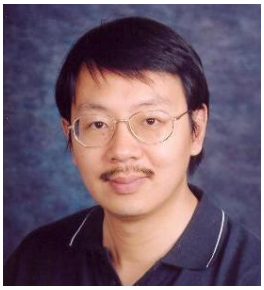

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Computational scaffold tissue engineering; Remodelling for orthopaedics; Dental biomechanics and biomaterials; Computational design for periodic microstructural materials- Optimisation of structural topology

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Van Hummel, Annika
Wong, Paul
Yu, Nicole
Zhang, Shengnan
Zhang, Zhongpu

Biomedical Engineering Research

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Research Grants*

Sponsor/ Grant Name	Chief Investigator [other AMME investigators]	Project Title	Duration	Awarded Amount ($)
Australian Research Council/Discovery Projects	Li, Qing	Topology Optimisation of Periodic Structures for Stent Design	Jan 2010 - Dec 2012	**300,000**
Australian Research Council/Discovery Projects	Li, Qing [Zhou, Shiwei]	An Engineering Approach to Design of Metamaterials	Jan 2011 - Dec 2013	**210,000**
Australian Research Council/Discovery Projects	Li, Wei [Swain, Michael]	Topography optimization of implants for enhancing osseointegration	Jan 2010 - Dec 2014	**600,000**
National Health and Medical Research Council/Project Grants	Seibel, Markus (*Concord Clinical School*) [Dunstan, Colin]	The Role of the Osteoblast in Mediating Glucocorticoid-induced Metabolic Dysfunction	Jan 2010 - Dec 2013	**788,900**
National Health and Medical Research Council/Project Grants	Zreiqat, Hala [Dunstan, Colin]	Novel coatings for orthopaedic implants	Jan 2009 - Dec 2012	**430,125**
National Health and Medical Research Council/Project Grants	Zreiqat, Hala [Dunstan, Colin]	Harnessing the physiological effects of strontium and zinc to produce novel biomaterials for orthopaedic applications	Jan 2010 - Dec 2012	**539,500**
Australian Research Council/Linkage Projects	Zreiqat, Hala	Scaffolds for bone tissue regeneration and use in orthopaedic applications	Jan 2009 - Dec 2012	**504,000**
Australian Orthopaedic Association Research Foundation	Zreiqat, Hala	Novel coatings for orthopaedic application	Jan – Dec 2011	**60,000**
National Health and Medical Research Council/Career Awards: Research Fellowships	Zreiqat, Hala	Senior Research Fellowship A	Jan 2011 - Dec 2015	**570,640**

* Figures obtained from the Research Office, University of Sydney

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2011 Publications[†]

Conference Papers

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Hou, S, Han, X, Sun, G, Long, S, Li, W, Yang, X, Li, Q 2011, Multiobjective optimization for tapered circular tubes, Thin Walled Structures, 49(7), 855-863

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Li, H, Sun, G, Li, G, Gong, Z, Liu, D, Li, Q 2011, On twist springback in advanced high-strength steels, Materials and Design, 32(6), 3272-3279

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Lu, Z., Roohani-Esfahani, S, Kwok, P C, Zreiqat, H 2011, Osteoblasts on Rod Shaped Hydroxyapatite Nanoparticles Incorporated PCL Film Provide an Optimal Osteogenic Niche for Stem Cell Differentiation, Tissue Engineering. Part A: Tissue Engineering, 17(11/12), 1651-1661

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Materials & Structures Research

Centre for Advanced Materials Technology (CAMT)

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The Centre for Advanced Materials Technology (CAMT) was established in 1989 at the University of Sydney, Australia. The aims of CAMT are to conduct high quality fundamental research in materials science and technology and to promote collaboration with industry in the design, engineering, development and manufacturing technology of advanced materials, which can give a competitive edge to new products and processes. It has a widely recognised international and national reputation for high quality research, equipped with state-of-the-art facilities of processing, characterisation and mechanical testing.

CAMT carries out investigations and R&D projects for industry. Technology transfer to industry occurs through workshops, short courses and seminars. The Centre has an international exchange program and supports postgraduate students in advanced materials technology. CAMT is one of partners of CRC-ACS (Cooperative Research Centre for Advanced Composite Structures).

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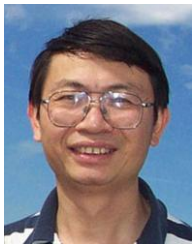
Materials science and engineering; advanced fibre composites; polymer blends; forming, joining and welding; biomimetics, biomaterials and biomechanics; failure analysis and diagnosis; mechanical behaviour of materials (metals, polymers, ceramics, composites, etc); fracture and fatigue mechanics; friction and wear; advanced thin films; eco-materials; smart materials and structures



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Dr Liu, Hong-Yuan
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Dr Beehag, Andrew
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Research Grants*

Sponsor/ Grant Name	Chief Investigator [other AMME investigators]	Project Title	Duration	Awarded Amount ($)
Group of Eight/Germany Joint Research Co-operation Scheme	Chang, Li [Ye, Lin]	Nanomechanical characterization of the ultra-thin transfer film in polymer tribology	Jan 2011 - Dec 2012	**20,000**
Australian Research Council/Linkage Projects	Liao, Xiaozhou	In-situ transmission electron microscopy nanoindentation investigation of advanced structural metallic materials	Jan 2010 - Dec 2012	**301,338**
Australian Research Council/Future Fellowships	Liu, Hong	Fatigue Life Prediction of Nano-filler Modified Composites	Nov 2009 - Dec 2013	**624,300**
Australian Research Council/Discovery Projects	Wang, Yanbo	Effects of grain size on the deformation mechanisms and mechanical properties of Gum Metals (Ti alloys)	Jan 2011 - Dec 2013	**255,000**
DVC Research/Postdoctoral Research Fellowship Scheme	Yang, Chuncheng	Development of high-efficiency thermoelectric materials by nanostructuring bulk silicon for power regeneration applications	Jan 2011 - Jan 2014	**352,789**
Australian Research Council/Discovery Projects	Ye, Lin	Fibrous fabric with directional transplanar transport properties for moisture and water	Jan 2011 - Dec 2013	**360,000**
CRC Advanced Composite Structures Ltd	Tong, Liyong [Ye, Lin]	Structural Repair and Rehabilitation	Jul 2010 - Jun 2015	**318,000**
CRC Advanced Composite Structures Ltd	Tong, Liyong [Ye, Lin]	Rapid Assembly Methods	Jul 2010 - Jun 2015	**430,500**

* Figures obtained from the Research Office, University of Sydney

Materials & Structures Research

Centre for Advanced Materials Technology (CAMT)

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2011 Publications[†]

Book Chapters

Friedrich, K, Chang, L, Haupert, F 2011, Current and future applications of polymer composites in the field of tribology, Composite Materials: A Vision for the Future, Springer, London, UK, 129-167

Xie, X, Liu, S, Du, F, Mai, Y 2011, Polymer-magnesium hydroxide nanocomposites by emulsion polymerization, Polymer Nanocomposites by Emulsion and Suspension Polymerization, RSC Publishing, Cambridge, UK, 180-197

Yang, Y, Xie, X, Mai, Y 2011, Functionalization of carbon nanotubes for polymer nanocomposites, Polymer-carbon nanotube composites (Preparation, properties and applications), Woodhead Publishing Limited, UK, 55-91

Conference Papers

Gao, C, Mai, Y 2011, Permeable Interfacial Crack in Electrostrictive Materials, IUTAM Symposium on Multiscale Modelling of Fatigue, Damage and Fracture in Smart Materials, Springer, Freiberg, Germany, IUTAM Book Series, Volume 24, 2011, 133-139

Chang, L, Friedrich, K 2011, Develop wear-resistant polymeric composites by using nanoparticles, 18th International Conference on Composite Materials (ICCM18), The Korean Society for Composite Materials, Korea, Article No. T16 AF0629, 1-6

Chang, L, Friedrich, K, Ye, L 2011, Development of the Wear Resistant Polymeric Hybrid Composites Using Nanoparticles, 6th China International Symposium on Tribology, State Key Laboratory of Solid Lubrication (Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences) , China, 94-98

Mustapha, S, Wang, D, Ye, L 2011, Debonding detection in CF/EP sandwich structures using active sensor network, 18th International Conference on Composite Materials (ICCM18), The Korean Society for Composite Materials, Korea, Article No. T07-4 AF1450

Wang, D, Lu, Y, Tang, Y, Ye, L 2011, Monitoring of delamination onset in composite laminates using lamb signals, 18th International Conference on Composite Materials (ICCM18), The Korean Society for Composite Materials, Korea, Article No. W35-2 AF1260

Journal Papers

Baji, A, Mai, Y, Du, X S, Wong, S 2011, Improved Tensile Strength and Ferroelectric Phase Content of Self-Assembled Polyvinylidene Fluoride Fiber Yarns, Macromolecular Materials & Engineering, 296, Article in Press

Baji, A, Mai, Y, Li, Q, Liu, Y 2011, Electrospinning induced ferroelectricity in poly(vinylidene fluoride) fibers, Nanoscale, 3(8), 3068-3071

Baji, A, Mai, Y, Li, Q, Liu, Y 2011, Nanoscale investigation of ferroelectric properties in electrospun barium titanate/polyvinylidene fluoride composite fibers using piezoresponse force microscopy, Composites Science and Technology, 71(11), 1435-1440

Baji, A, Mai, Y, Li, Q, Wong, S, Liu, Y, Yao, Q 2011, One-dimensional multiferroic bismuth ferrite fibers obtained by electrospinning techniques, Nanotechnology, 22(23), 235702-1-235702-6

Baji, A, Mai, Y, Wong, S 2011, Effect of fiber diameter on the deformation behavior of self-assembled carbon nanotube reinforced electrospun Polyamide 6,6 fibers, Materials Science and Engineering A: Structural Materials: Properties, Microstructures and Processing, 528(21), 6565-6572

Bal, K, Fan, J, Sarkar, M, Ye, L 2011, Differential spontaneous capillary flow through heterogeneous porous media, International Journal of Heat and Mass Transfer, 54(13-14), 3096-3099

[†]Records obtained from the Integrated Research Management Application (IRMA), University of Sydney

Ballarre, J, Seltzer, R, Mendoza, E, Orellano, J, Mai, Y, Garcia, C, Cere, S 2011, Morphologic and nanomechanical characterization of bone tissue growth around bioactive sol-gel coatings containing wollastonite particles applied on stainless steel implants, Materials Science and Engineering C: Materials for Biological Applications, 31(3), 545-552

Cao, Y, Wang, Y, Figueiredo, R, Chang, L, Liao, X, Kawasaki, M, Zheng, W, Ringer, S P, Langdon, T, Zhu, Y 2011, Three-dimensional shear-strain patterns induced by high-pressure torsion and their impact on hardness evolution, Acta Materialia, 59(10), 3903-3914

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Fu, S, Mai, Y, Du, S, Hui, D 2011, Preparation, properties and applications of nanocomposites, Composites Part B: Engineering, 42(8), 2091-2092

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Huang, Y.-L, Baji, A, Tien, H, Yang, Y.-K, Yang, S, Ma, C, Liu, H Y, Mai, Y, Wang, N 2011, Self-assembly of graphene onto electrospun polyamide 66 nanofibers as transparent conductive thin films, Nanotechnology, 22(47), 1 (Article 475603)-7

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Wang, Y, Zhou,, L, Wang, Z, Huang, H, Ye, L 2011, Analysis of internal stresses induced by strain recovery in a single SMA fibermatrix composite, Composites Part B: Engineering, 42(5), 1135-1143

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Zhang, G, Huang, C, Zhou,, L, Ye, L, Li, W, Huang, H 2011, Enhanced charge storage by the electrocatalytic effect of anodic TiO2 nanotubes, Nanoscale, 3(10), 4174-4181

Zhang, Z, Chen, H, Ye, L 2011, A Stiffened Plate Element Model for Advanced Grid Stiffened Composite Plates/Shells, Journal of Composite Materials, 45(2), 187-202

Zhao, J, Du, F, Zhou, X, Cui, W, Wang, X, Zhu, H, Xie, X, Mai, Y 2011, Thermal conductive and electrical properties of polyurethane/hyperbranched poly(urea-urethane)-grafted multi-walled carbon nanotube composites, Composites Part B: Engineering, 42(8), 2111-2116

Zhou, C, Liu, Z, Yan, Y, Du, X S, Mai, Y, Ringer, S P 2011, Electro-synthesis of novel nanostructured PEDOT films and their application as catalyst support, Nanoscale Research Letters, 6, 364-1-364-6

Zhu, Y, Wu, X, Liao, X, Narayan, J, Kecskes, L, Mathaudhu, S 2011, Dislocation-twin interactions in nanocrystalline fcc metals, Acta Materialia, 59(2), 812-821

Materials & Structures Research

Finite Element Analysis Research Center

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The Finite Element Analysis Research Center was (FEARC) has been a part of the School of Aerospace, Mechanical and Mechatronic Engineering at The University of Sydney since July 1992. The center's primary aim is to serve as a national focus for research in Finite Element Analysis.

Research Group

The academic members of the center include:

Director

Prof Tong, Liyong	(Aerospace Research Group)

Emeritus Professors

Prof Steven, Grant

Research Fellows

A/Prof Qing Li	(Biomedical Research Group)
Dr Wei Li	(Biomedical Research Group)
Dr K Srinivas	(Aerospace Research Group)

The staff and associates of FEARC are very active in a large range of topics, samples of which are given below:

- FE analysis for the draping of cloth structures for aircraft or garment.
- Error estimation in dynamic and buckling FEA analysis.
- FE Modelling of Piezo-elastodynamics for the control of very flexible structures.
- Evolutionary structural optimisation.
- FE Modelling and design optimisation of dental structures.
- FE modelling of biomechanical processes such as spinal manipulation or hip implants or prosthesis.
- Crack tracking algorithms for fracture mechanics.
- FEA modelling of acoustics and fluid/structure interaction.

Rheology Research

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Research Group

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- Rheology
- Polymer processing
- Computational mechanics

Dr Ahmad Jabbarzadeh
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- Nano-rheology and nano-tribology
- Boundary condition and wall slip at the fluid-solid interface
- Characterizing material properties by molecular level simulations
- Novel 3D nano-structures, the origin of high rigidity for ultra-thin liquid films
- Low friction states of films only a few nanometer thick
- Linking material properties and molecular architecture en route to design of customized purpose materials
- Using molecular simulations to study crystallization of polymers

Honorary/ Adjunct Staff

Prof Fan, Xijun
A/Prof Zheng, Rong

Postdoctoral Fellows

Dr Dai, Shao Cong
Dr Kittipoomwong, Prakorn David
Dr Qi, Fuzhong

Research Associates

Bertevas, Erwan
Dr Lee Wo, Duane
Dr Uthayakumaran, Surjani

Research Students

Ramin, Leyla

Research Grants*

Sponsor/ Grant Name	Chief Investigator [other AMME investigators]	Project Title	Duration	**Awarded Amount ($)**
Australian Research Council/Discovery Projects	Jabbarzadeh, Ahmad	Multiscale modelling of flexible fibrous suspensions under flow	Jan 2009 – Dec 2011	**360,000**
Australian Research Council/Discovery Projects	Tanner, Roger	Modelling soft viscoelastic solids	Jane 2010 - Dec 2012	**400,000**
Australian Research Council/Discovery Projects	Tanner, Roger [Fan, Xijun]	Rheology of suspensions with viscoelastic matrices	Jan 2011 - Dec 2013	**360,000**

* Figures obtained from the Research Office, University of Sydney

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2011 Publications[†]

Book

Zheng, R, Tanner, R I, Fan, X 2011, Injection Molding: Integration of Theory and Modeling Methods, Springer, Heidelberg Dordrecht London New York

Book Chapter

Ramin, L, Jabbarzadeh-Khoei, A 2011, Odd-Even Effect in Self Assembly and Phase Transition of Alkanethiols Monolayers (SAMs) on Au (111) Surfaces, Nanotech 2011: Technical Proceedings of the 2011 NSTI Nanotechnology Conference and Expo, CRC Press, Austin, Texas, U.S.A, 1, 476-479

Conference Papers

Jabbarzadeh-Khoei, A 2011, Detecting local molecular order and stresses in flow induced polymer crystallization, 7th International Symposium on Molecular Mobility and Order in Polymer Systems, Russian Academy of Sciences, Russia, O-70

Ramin, L, Jabbarzadeh-Khoei, A 2011, Odd-Even effects on tribology of self assembled monolayers, ASME/STLE 2011 International Joint Tribology Conference (IJTC2011), ASME, Los Angeles, USA, 61150-1-61150-3

Journal Papers

Dai, S C, Qi, F, Tanner, R I 2011, Interpreting shear creep data for bread dough using a damage function model, Applied Rheology (Fliessverhalten steuern), 21(4), 45070-1-45070-6

Housiadas, K, Tanner, R I 2011, Perturbation solution for the viscoelastic 3D flow around a rigid sphere subject to simple shear, Physics of Fluids, 23, 083101-1-083101-20

Housiadas, K, Tanner, R I 2011, The angular velocity of a freely rotating sphere in a weakly viscoelastic matrix fluid, Physics of Fluids, 23(5), 051702-1-051702-4

Jabbarzadeh-Khoei, A, Tanner, R I 2011, Thin lubricant films confined between crystalline surfaces: Gold versus mica, Tribology International, 44(6), 711-719

Kittipoomwong, P, Jabbarzadeh-Khoei, A 2011, Effect of fibre curvature on the rheology of particulate suspensions, Journal of Non-Newtonian Fluid Mechanics, 166(23-24), 1347-1355

Qi, F, Tanner, R I 2011, Random close packing and relative viscosity of multimodal suspensions, Rheologica Acta, Article in Press

Qi, F, Tanner, R I 2011, Relative viscosity of bimodal suspensions, Korea - Australia Rheology Journal, 23(2), 105-111

Ramin, L, Jabbarzadeh-Khoei, A 2011, Odd-even effects on the structure, stability, and phase transition of alkanethiol self-assembled monolayers, Langmuir, 27(16), 9748-9759

Tanner, R I, Uthayakumaran, S, Qi, F, Dai, S C 2011, A suspension model of the linear viscoelasticity of gluten doughs, Journal of Cereal Science, 54(2), 224-228

[†] Records obtained from the Integrated Research Management Application (IRMA), University of Sydney

Robotics Research

Australian Centre for Field Robotics (ACFR)

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The Australian Centre for Field Robotics (ACFR) is based in the School of Aerospace, Mechanical and Mechatronic Engineering at The University of Sydney, and is dedicated to the research, development, application and dissemination of field robotics principles.

The group has substantial experimental facilities including three laboratories and a field test site, a range of experimental and production vehicles, industry-quality mechanical and electrical design and fabrication facilities, and employs the latest in embedded computing, sensing and control technologies.

The ACFR is now the largest robotics and automation research group in Australia and is also one of the largest of its kind in the world.

Research and Industry Partnerships

- ARC Centre of Excellence for Autonomous Systems (CAS)
- CRC Mining Australia
- Rio Tinto Centre for Mine Automation
- Centre of Expertise in Defence Autonomous & Uninhabited Vehicle Systems, DSTO, Australian Government
- Centre for Autonomous Aerospace Systems
- Centre for Social Robotics
- IMOS AUV Facility
- Academic Capability Partner - BAE Systems

Key Research Areas

The Fundamental Research Program focuses on enabling technologies in four key areas. These areas draw together common themes and research priorities from the applied research program with the goal of supporting long-term developments across the whole field robotics area.

- Perception, sensing, representations of information, the modelling and management of uncertainty, data fusion and perceptual interpretation.
- Control, of individual micro and macro machines, of heterogeneous groups of platforms and sensors, and of contact and interaction with the environment and each other.
- Learning, supervised and unsupervised learning in unstructured and dynamic environments, multi-agent learning, pattern recognition and concept formation.
- Systems, design and optimisation of “systems of systems”, modelling and management of complexity, large scale systems theory, and modelling of information flow.

These themes define the science of field robotics and represent the main focus of ACFR. The projects ensure that the many threads of the fundamental research programs are brought together and that a bridge exists to further commercial development of research results.

Robotics Research

Australian Centre for Field Robotics (ACFR)

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Research Group

Professor Hugh Durrant-Whyte
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- Demonstration of non-Gaussian Decentralised Data Fusion (DDF) concepts on multiple heterogeneous autonomous systems
- To develop weed detection methodologies and weed destruction methods that can be implemented in an autonomous non-herbicidal weeding system
- High-speed on-road autonomous ground vehicle manoeuvres
- Unmanned agricultural operations

Professor Eduardo Nebot
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Perception research

Associate Professor Salah Sukkarieh
P: +61 2 9351 8154
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- UAV systems for agriculture and ecosystem management
- Decentralised navigation and control of UAVs
- Simultaneous localisation and map building for UAVs

Dr Graham Brooker
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Sensor research

Associate Professor David Rye
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Systems Research (Perception and Control)

- Fish-Bird (an interactive kinetic artwork in which two robots in the form of wheelchairs communicate with their audience, and with each other, through movement and written text)
- CAS Outdoor Research Demonstrator (generic UGV platform for testing control, perception and learning algorithms)

Dr Steve Scheding
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s.scheding@cas.edu.au

Perception Research

- Fish-Bird
- CAS Outdoor Research Demonstrator
- Investigation and development of appropriate multi-sensor systems to monitor/estimate foodstuff temperature, mass and moisture content, and foodstuff chemical/protein changes)

Associate Professor Stefan Williams
P: + 61 2 9351 8152
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- Long-term operation of a robotic ground vehicle in an outdoor environment
- Undersea vehicles
- Fish-Bird

Robotics Research

Australian Centre for Field Robotics (ACFR)

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Research Fellows/ Associates

Dr Allen, Thomas
Dr Douillard, Bertrand
Dr Elinas, Pantelis
Dr Fitch, Robert
Dr Göktoğan, Ali
Prof Hatherly, Peter
Dr Hill, Andrew
Dr Johnson, David
Dr Johnson-Roberson, Matthew
Lawrance, Nicholas
Dr Melkumyan, Arman
Dr Monteiro, Sildomar
Dr Murphy, Richard
Dr Nieto, Juan
Mr Nourani-Vatani, Navid
Mr Orchansky, David
Dr Peynot, Thierry
Dr Ramos, Fabio
Reid, Alistair
Dr Underwood, James
Dr Vasudevan, Shrihari
Dr Velonaki, Mari
Dr Worrall, Stewart
Zhou, Hang (Cathy)

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Olip, Ruth
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Wang, Christy (Finance)

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Hennessy, Ross
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Maclean, Andrew
Martinez, Javier
McCouat, Nicholas
Merry, Laura
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Nguyen, Dai Bang
Ralph, Daniel
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Vitjuk, Ivan
Vlaskine, Vsevolod
Wishart, Stuart
Wohlleber, Cedric
Wright, James
Zigman, John

Research Students

Abuhashim, Tariq
Agamennoni, Gabriel
Ahsan, Nasir
Awin, Layth
Ball, Adrian
Barkby, Stephen
Bender, Asher
Bongiorno, Daniel
Brown, Iain
Brunner, Christopher
Castro, Marcos
Chung, Jen Jen
Clarke, Bryan
Dansereau, Don
DeDeuge, Mark
Friedman, Ariell
Gan, Seng Keat (Jason)
Guizilini, Vitor
Hemakumara, Madu Prasad
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Ho, Ken
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Mikl, Joanne
Morton, Peter
Nguyen, Joseph
O'Callaghan, Simon
Quadros, Alastair
Romero, Victor Adolfo
Schneider, Sven
Seiler, Konstantin
Shan, Mao
Silvera, David
Silversides, Katie
Steinberg, Daniel
Tahir, Nazifa
Toohey, Lachlan
Valdes, Bulmaro
Van de Ven, Joop
Vial, John
Wilson, Daniel
Xu, Zhe
Yoo, Chanyeol
Zubizarreta, Jose Francisco

Robotics Research

Australian Centre for Field Robotics (ACFR)

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Research Grants*

Sponsor/ Grant Name	Chief Investigator	Project Title	Duration	Awarded Amount ($)
Australian Research Council/Discovery Projects	Douillard, Bertrand	Multi-scale recognition: generating meaning from multi-resolution data	Jun 2011 - Jun 2014	**255,000**
Australian Research Council/Federation Fellowships	Durrant-Whyte, Hugh	Data Fusion and Perception in Autonomous Networks	Oct 2007 - Oct 2012	**1,606,210**
Technological Resources P/L	Durrant-Whyte, Hugh	Rio Tinto Centre for Mine Automation	Aug 2007 - July 2014	**34,649,940**
BAE Systems	Durrant-Whyte, Hugh	Agreement for CIMS	Mar 2010 - Feb 2012	**900,000**
CRC Mining	Nebot, Eduardo	CRC	Jan - Dec 2011	**583,355**
AOARD	Peynot, Thierry	Sensor Data Integrity and Mitigation of Perceptual Failures	Oct 2010 - May 2013	**261,993**
Australian Research Council QEII	Pizarro, Oscar	Cost-effective autonomous systems for large scale monitoring of marine protected areas	Jan 2010 - Dec 2014	**798,000**
Meat & Livestock Australia Limited	Sukkarieh, Salah	New Detection and Classification Algorithms for Mapping Woody Weeds from UAV Data	Jun 2011 - Aug 2012	**152,813**
University of New South Wales/Shared Research Support	Sukkarieh, Salah	Pathways to space: Empowering the internet generation	Jun 2010 - Mar 2013	**300,196**
Qantas	Sukkarieh, Salah	Proof of Concept of New Flight Planning Algorithms	2011	**93,000**
Qantas	Sukkarieh, Salah	An algorithm and software system for individual aircraft fuel burn characterisation	Oct 2011 - Feb 2013	**656,830**
Republic of Korea Agency for Defence Development	Underwood, James	Multi-Modal Adaptive Simultaneous Localisation and Mapping (SLAM) for Unmanned Ground Vehicles (UGVs) in complex urban and unstructured environments	May 2011 - Oct 2013	**420,000**
Australian Research Council Future Science	Williams, Stefan	Machine Assisted, Multi-scale Spatial and Temporal Observation and Modeling of Marine Benthic Habitats	Jul 2010 - Jun 2013	**278,400**
Science and Industry Endowment Fund	Williams, Stefan	John Stocker Postdoctoral Fellowships	Oct 2011- Oct 2014	**276,000**
University of Western Australia administering funds from ENI Australia Ltd	Williams, Stefan	South East Asia (SEA) node of the Scientific & Environmental ROV Programme using Existing Industrial Technology (SERPENT)	Mar 2011 - Mar 2012	**13,400**
NCRIS	Williams, Stefan	Use of Autonomous Underwater Vehicle at IMOS AUV facility	Jul 2008 - Jun 2013	**1,582,499**
Australian Research Council/Linkage Projects	Williams, Stefan	Autonomous repeatable surveys for long term monitoring of marine habitats	Jan 2009 - Dec 2011	**320,000**
Australian Research Council/Linkage Projects	Williams, Stefan	Supervised autonomy for autonomous underwater vehicles (AUVs) using limited bandwidth communication channels	Jul 2011- Jun 2014	**245,538**
Thales	Williams, Stefan	Autonomous repeatable surveys for long term monitoring of marine habitats	Jan - Dec 2011	**54,545**

* Figures obtained from Finance Office, ACFR, University of Sydney

Robotics Research

Australian Centre for Field Robotics (ACFR)

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2011 Publications[†]

Conference Papers

Agamennoni, G, Nieto, J I, Nebot, E M 2011, A Bayesian approach for driving behavior inference, 2011 IEEE Intelligent Vehicles Symposium, OmniPress, Baden-Baden, Germany, 595-600

Agamennoni, G, Nieto, J I, Nebot, E M 2011, An Outlier-Robust Kalman Filter, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, 1551-1558

Allen, T L, Scheding, S J 2011, The Time-Optimal Planning and Execution Problem, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, 5608-5614

Bailey, T A, Bryson, M T, Mu, H, Vial, J, McCalman, L, Durrant-Whyte, H F 2011, Decentralised Cooperative Localisation for Heterogeneous Teams of Mobile Robots, IEEE International Conference on Robotics and Automation ICRA 2011, IEEE, USA, 2859-2865

Ball, A, Rye, D C, Ramos, F T, Velonaki, M 2011, A Comparison of Unsupervised Learning Algorithms for Gesture Clustering, 6th ACM/IEEE International Conference on Human-Robot Interaction (HRI 2011), Unknown, unknown, 111-112

Barkby, S A, Williams, S B, Pizarro, O R, Jakuba, M 2011, Bathymetric SLAM with No Map Overlap using Gaussian Processes, 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems, IEEE/Omnipress, USA, 1242-1248

Bastos, G, Souza, L, Ramos, F T, Ribeiro, C 2011, A Single-dependent Agent Approach for Stochastic Time-Dependent Truck Dispatching in Open-pit Mining, 14th International IEEE Annual Conference on Intelligent Transportation Systems (ITSC 2011), OmniPress, Washington, DC, USA, 1057-1062

Beall, C, Dellaert, F, Mahon, I J, Williams, S B 2011, Bundle adjustment in large-scale 3D reconstructions based on underwater robotic surveys, OCEANS 2011 Santander Spain, IEEE, unknown, 1-6

Brooker, G M, Randle, J A G, Attia, M E, Xu, Z, Abuhashim, T, Kassir, A, Chung, J, Sukkarieh, S, Tahir (nee Mariam), N, Dickens, J 2011, First Airborne Trial of a UAV Based Optical Locust Tracker, Australasian Conference on Robotics and Automation (ACRA 2011), ARAA: Australian Robotics & Automation Association, Melbourne, Australia, 1-9

Brunner, C J, Peynot, T, Vidal Calleja, T 2011, Combining multiple sensor modalities for a localisation robust to smoke, 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems, IEEE/Omnipress, USA, 2489-2496

Bryson, M T, Reid, A, Hung, C, Abuhashim, T, Sukkarieh, S 2011, Using unmanned aerial vehicles for mapping, classification and monitoring of invasive weeds, 34th International Symposium for Remote Sensing of the Environment, Unknown, unknown, 1-4

Bryson, M T, Sukkarieh, S 2011, A Comparison of Feature and Pose-Based Mapping using Vision, Inertial and GPS on a UAV, 2011 IEEE/RSJ International Conference on Intelligent Robots and Systems, IEEE/Omnipress, USA, 4256-4262

Cappelli, J, Goktogan, A H 2011, A 3D dynamics simulation model of CliffRider: The abseiling face inspection robot, Simulation Conference and Exhibition, SimTecT'11, Simulation Australia, Adelaide, Australia, 8-13

Cappelli, J, Goktogan, A H 2011, Analysis of control strategies and dynamic behaviour of CliffRider: The single wheeled abseiling face inspection robot, 37th Annual Conference of the IEEE Industrial Electronics Society, IEEE Industrial Electronics Society, Melbourne, Australia, 21-26

Cappelli, J, Goktogan, A H 2011, Design of a novel climbing robot - cliffrider: the abseiling face inspection robot, 14th International Conference on Climbing and Walking Robots, World Scientific Books, Paris, France, 423-430

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Thermodynamics and Fluids Research

Combustion

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Research Group

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Lifted flames;
Incineration of halons and CFC's;
Chemical inhibition of halons in flames;
Experimental investigations of methanol and ethanol flames;
PDF-Monte Carlo calculations of turbulent non-premixed flames

Honorary Associates

Prof Bilger, Robert
Prof Kent, John
A/Prof Lowe, Allen

Postdoctoral Fellows

Dr Juddoo, Mrinal
Dr Kourmatzis, Agisilaos
Dr Nakul, Vinayaka Prasad
Dr Starner, Sten

Research Students

Al-Harbi, Ahmed
Badra, Jihad
O'Loughlin, William
Meares, Shaun
Pham, Xuan Phuong
Sivapalan, Kumaresan

Research Grants*

Sponsor/ Grant Name	Chief Investigator [other AMME investigators]	Project Title	Duration	Awarded Amount ($)
Australian Research Council/Discovery Projects	Masri, Assaad [Bilger, Robert]	Strongly Transient Processes in Turbulent Combustion	Jan 2010 - Dec 2012	**653,555**
Australian Research Council/Discovery Projects	Masri, Assaad	Towards a Unified View of Clean Turbulent Combustion	Jan 2011 - Dec 2015	**1,250,000**
Australian Research Council/Linkage, Infrastructure, Equipment and Facilities (LIEF)	Masri, Assaad	Multi-dimensional, high-speed laser imaging facility for fluids and combustion	Jan – Dec 2011	**600,000**

* Figures obtained from the Research Office, University of Sydney

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Combustion

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Letty, C, Mastorakos, E, Masri, A R, Juddoo, M, O'Loughlin, W 2011, Structure of igniting ethanol and n-heptane sprayflames with and without swirl, 7th Mediterranean Combustion Symposium (MCS-7), International Centre for Heat and Mass Transfer, Sardinia, Italy

Malalasekera, W, Ibrahim, S, Masri, A R, Gubba, S, Sadasivuni, S 2011, Experience with the Large Eddy Simulation (LES) Technique for the Modelling of Premixed and Non-premixed Combustion, 8th International Conference on Heat Transfer, Fluid Mechanics and Thermodynamics (HEFAT2011), HEFAT, Mauritius, 398-407

Masri, A R, Gounder, J, O'Loughlin, W, De Fina, L-M 2011, On the boundary conditions and spatial structure of turbulent jet flames of dilute sprays, 7th Mediterranean Combustion Symposium (MCS-7), International Centre for Heat and Mass Transfer, Sardinia, Italy

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Thermodynamics and Fluids Research

Fluid Dynamics

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Research Group

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Computational Fluid Dynamics (CFD);
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Computational Fluid Dynamics (CFD);
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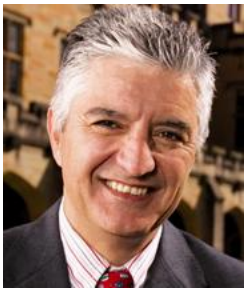
Atmospheric flows



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Electronic cooling;
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A/Prof Parsi, Kurosh

Postdoctoral Fellows

Dr Aberra, Tilek
Dr Nagarathinam, Srinarayana
Dr Williamson, Nicholas

Research Students

Aghaeimeybodi, Mehdi
Bartos, Nick
Dittko, Karl Albert
Djanali, Vivien
Fakhim, Babak
Hattori, Tae
Javadzadegan, Ashkan
Luthfi
Miles, Robert
Payami, Seyed Pezham
Tamaddon, Houman
Wong, Kaichung
Zecevic, Vanja
Zapletal, Erik

Research Grants*

Sponsor/ Grant Name	Chief Investigator [other AMME investigators]	Project Title	Duration	**Awarded Amount ($)**
Australian Research Council/Discovery Projects	Armfield, Steven [Kirkpatrick, Michael]	Investigation and optimisation of displacement ventilation and cooling systems	Jan 2009 - Dec 2012	**300,000**
Australian Research Council/Discovery Projects	Kirkpatrick, Michael [Armfield, Steven]	The Dynamics of Turbulent Entrainment in Sheared Convective Boundary Layers	Jun 2011 - Dec 2013	**350,000**
Australian Research Council/Linkage Projects	Nagarathinam, Srinarayana [Armfield, Steven; Behnia, Masud]	Design tools for optimising data centre layout to minimise energy usage	Jan 2010 - Dec 2012	**288,000**
Australian Research Council/Discovery Projects	Williamson, Nicholas	Purging and destratifying of thermal and saline pools in Australia's inland rivers	Jan 2011 - Dec 2013	**301,400**

* Figures obtained from the Research Office, University of Sydney

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2011 Publications[†]

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Graduates 2011

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Doctor of Philosophy

Aberra, Tilek
Numerical Investigation of Boundary Layer Instabilities in natural Convection

Allen, Thomas
Time-Optimal Active Decision Making

Barkby, Stephen
Featureless Approaches to Efficient Bathymetric SLAM

Bertevas, Erwan
Rheological Properties and Microstructure of Spheroidal Particle Suspensions in Newtonian Fluids

Chen, Yuhang
Topology Optimization of Cellular Materials and its Application in Tissue Engine

Gillam, Natalie
Density Stratified Mixing from Cavities on Open-Channel Bends

Gomez Escobar, Jairo
Through-wall Radar Imaging Using Non-linear Ultra-wideband Diffraction Tomograph

Juddoo, Mrinal
Experimental and Numerical study of Partially Premixed CNG-O2-N2 Flames

Karumanchi, Sisir Babu
Off-road Mobility Analysis from Proprioceptive Feedback

Kiang, Jademond
Multi-Physics Non-Linear Modelling and Testing of Magnetic Shape Memory Ni-Mn-Ga Single Crystals

Lawrance, Nicholas
Autonomous Soaring Flight for Unmanned Aerial Vehicles

Lee Wo, Duane
The Crystallization and Rheological Behaviour of Pigment-Polymer Blends in Tube Flow

Lin, Jiangzi
Topology Optimization and its Applications in Current and Future Aircraft Structure Design

Moscosco Lavagna, Luis
Computational Investigation of Wear in Centrifugal Slurry Pumps

Reid, Alistair
Gaussian Process Models for Analysis of Remotely Sensed Geo-Spatial Data

Rungsiyakull, Chaiy
Multiscale Bone Remodelling and Optimisation of Dental Implant Supported Prostheses

Tang, Chi Yan
Molecular Dynamics Simulation of Silicon Systems

Wang, Gongtao
On Fracture Toughness and Fatigue Resistance of Polymer/Nanoparticle Composites

Wood, David
Learning from Gross Motion Observations of Human-Machine Interaction

Master of Philosophy (Research)

Chen, Xi
Design and Implementation of Model Predictive Control Algorithms for Small Satellite Three-Axis Stabilization

Leslie, Angus
Broadband Noise Reduction of a Small UAV Propeller

Zeng, Ying
Fracture Toughness of Carbon Fibre Laminates with Nanoparticle Modification

Master of Engineering (Course work)

Abbad, Tasawar Syed
Cao, Tianya
Esparza, Arturo Jose
Fernandes, Fernando
Sam, Manfred Zheng
Sundararajah, Niruparaj
Tung, Man Fai
Wang, Yu
Zaman, Navid Iftekhar

Master of Professional Engineering

Barnes, Aidan
Barrand, Zoe Anne
Hossain, Musharrah
Zafaranloo, Ali

Undergraduate Research- FSEA Racing Car

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Academic Staff
Dr Lozzi, Andrei

Senior Technical Officer
Elder, Greg

Formula SAE is a student engineering competition where teams design, construct and race a small open-wheeled racing car intended for use in weekend autocross competitions. All research, design and manufacture must be completed within a period of 12 months to prepare for the annual event held by the Society of Automotive Engineers Australasia. The three-day event scores teams on their design, costing and marketing skills as well as dynamic events of skid pad, acceleration, autocross and endurance.

Dr Andrei Lozzi on this year's FSEA Competition

We are thrilled and more than a little relieved to have returned from Melbourne having placed fifth in the 2011 Formula SAE competition – an amazing result to end a big year. The field consisted of 24 local and overseas teams. Doing well in Australia has to be seen as an achievement, at least because since 2004 three local teams have at times been the world's best. These have been Wollongong, RMIT and University of WA.

This year our team has shown the attributes necessary to finally turn an inspiration that came to us in 2008 into a reliable, fast and drivable car. We have built a great deal on the imagination, hard work and progress of past teams. There have been quite a few baffling problems that have baulked our progress, but ultimately this year thanks to intelligent and persistent good work, most plans have reached fruition.

Many of the members that are graduating this year have been in the team for three years. Each 'year' really begins in the previous December and ends in the current December. In 2011 the team has met during the week before Semester I, to debrief, discuss and distribute tasks. Designs were analyzed and manufacture got under way, before the July break. The almost completely new car was on the road to be tested and developed before the end of August.

Figure 1: Our successful 2011 team with many 3rd year students preparing for the 2012 competition

Undergraduate Research- FSEA Racing Car

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There have been many junior students, technicians and academics that have been very helpful, to whom we are grateful, but here I will just mention the thesis team that will graduate, the drivers and one resident technician.

Edward Jarvie	Frame & suspension, team co-leader, inspiring, pushy & committed
Gwylim Johnstone	Shafts & engine and team co-leader, inspiring, pushy & committed
Clare Young	Human resources & management (an honorary and valued member)
Alex Chen	Electronics, data logger, ECU, wiring & potential driver, an important chap
Ted Hackney	Everything about brakes and good fun
Jonathan Stables	Lubrication & cooling system, provided a revealing piece of work
Benn Reid	Futuristic drive shafts & the reincarnation of Ben Hur on the track
Brayden Mead	Aerodynamics, lift & drag and the Pinin Farina of our styling department
Jordan McCulloch	Suspension & frame flexure properties, possessing great strength
Daniel Bartos	Air intake, the most in-depth & complete engine modeling
Shannon Beneforti	Design & manufacture of advanced practical wheel uprights
Luke Henry	Research & testing into novel, light and cheap wheel centers
Carmel Wilson	Steering system, a very difficult mechanism to perfect
Hamish Johnstone	A very quick and scary driver
Ian Salteri	A very quick and less scary driver
Greg Elder	Most excellent machinist, test driver and advisor in all things practical

Car #	Team	Skid pad	Acceleration	AutoCross	Endurance/Econ	Cost	Presentation	Design	Total	Final Rank
		(/75)	(/50)	(/100)	(/425)	(/100)	(/50)	(/200)		
66	Monash University	75.00	31.26	90.92	378.87	82.90	44.93	160.00	**863.87**	**1**
2	University of Western Australia	55.46	50.00	100.00	390.16	47.47	45.15	99.00	**787.24**	**2**
7	Edith Cowan University	23.66	47.47	76.15	323.28	64.97	36.76	200.00	**772.30**	**3**
47	The University of Auckland	33.43	8.50	63.32	273.87	72.59	50.00	175.00	**676.71**	**4**
22	University of Sydney	51.75	32.80	48.37	288.91	59.52	47.71	143.00	**672.06**	**5**
12	RMIT University	5.51	32.27	65.55	180.20	67.59	46.99	185.00	**583.11**	**6**
10	University of Wollongong	36.42	35.96	56.10	232.19	80.02	46.91	95.00	**582.60**	**7**
6	Osaka University	39.32	40.92	15.12	218.46	75.75	37.41	134.00	**560.98**	**8**
14	Curtin University	3.50	49.35	28.47	247.97	57.80	39.75	105.00	**531.83**	**9**
67	Nippon Institute of Technology	48.77	31.78	19.61	224.81	73.22	30.92	97.00	**526.10**	**10**
46	Queensland University of Technology	35.41	34.87	47.27	247.50	37.63	43.90	76.00	**522.56**	**11**
101	University of Melbourne	47.23	47.47	29.38	162.96	62.28	49.02	120.00	**518.34**	**12**
8	University of Adelaide	28.90	40.38	37.41	178.76	62.94	45.29	94.00	**487.68**	**13**
3	University of Newcastle	6.81	39.22	6.31	202.31	55.36	41.18	92.00	**443.19**	**14**
41	University of Queensland	37.48	37.59	7.48	148.15	53.73	48.49	98.00	**430.92**	**15**
63	University of New South Wales	28.38	42.66	32.00	32.00	60.21	47.84	138.00	**381.09**	**16**
59	University of Technology , Sydney	35.75	43.26	55.04	32.00	60.13	38.91	116.00	**381.08**	**17**
15	University of NSW - ADFA	42.86	45.67	5.00	1.00	77.22	45.74	150.00	**367.48**	**18**
88	RMIT University - EV	0.00	0.00	5.00	32.00	92.50	49.58	146.00	**325.08**	**19**
21	Toyko Denki University	0.00	0.00	5.00	5.00	80.71	34.29	126.00	**250.99**	**20**
17	Swinburne University - EV	3.50	24.49	5.00	0.00	70.70	41.85	101.00	**246.54**	**21**
5	Deakin University	0.00	22.66	5.00	14.00	59.52	42.65	101.00	**244.83**	**22**
9	Indian Institute of Technology Roorkee	0.00	0.00	0.00	32.00	73.50	38.60	74.00	**218.10**	**23**
4	Bangalore Institute of Technology	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**24**
18	NED University, Pakistan	0.00	0.00	0.00	0.00	0.00	0.00	0.00	**0.00**	**24**

Figure 2: Formula SAE Australasia 2011 Overall Results

Student Research Showcase

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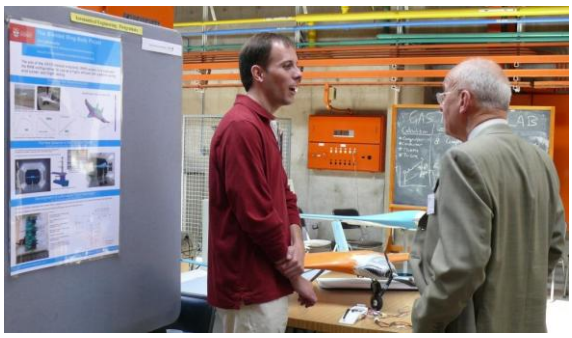
Engineering Sydney hosted its annual Research Conversazione on Friday 28 October 2011. Heading into its 23rd year, Research Conversazione has become the premier research event within our faculty. Held annually in October, this event allows the faculty to showcase high calibre research and projects undertaken by undergraduate and postgraduate students with a focus on innovative, applied research that responds to national and international needs, as well as engaging with various new approaches and applications.

There were 42 posters presented from the School of Aeronautical, Mechanical & Mechatronic Engineering which were judged by the relevant industry representatives and academics from the Faculty for the following prizes generously sponsored by Shelston IP and Watermark Patent Attorneys.



Shelston IP Best Poster Awards - Undergraduates

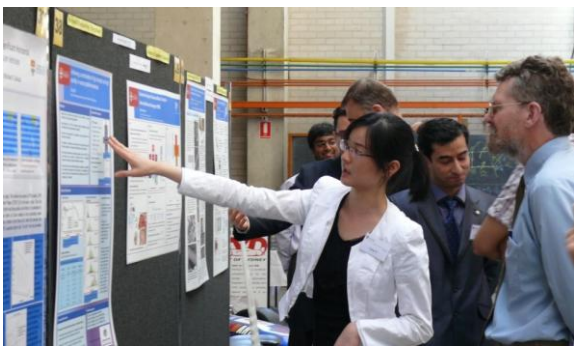
Henry Langston (Aeronautical)
Alisa Pham (Biomedical)
Zichao Wu (Mechanical)
Sarah McDonald (Mechatronics)
Rishi Verma & Jiro Funamoto (Space)

Shelston IP Best Poster Awards - Postgraduates

Srinivas Vasista (Aeronautical)
Sayediman Roohaniesfahani (Biomedical)
Song Ni (Mechanical)
Lashika Medagoda (Mechatronics)
Calvin Hung (Space)

Watermark Best Poster Awards in Biomedical Engineering

Ben Davies (Undergraduate)
Ashkan Javadzadegan (Postgraduate)



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Research Income Awarded in 2011 for Projects Commencing in 2012*

ARC Grants	$3,606,797
NHMRC Grants	$746,067
Industry/ Private Funds	$ 1,154,676
Total	**$5,507,540**

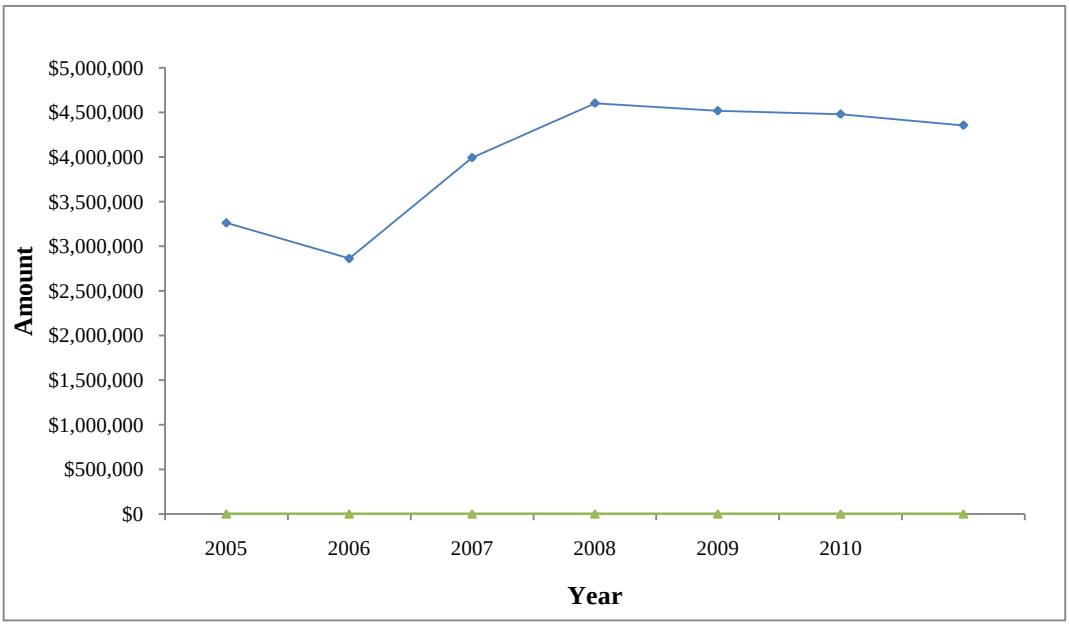

Figure 1: Successful ARC and NHMRC Funding/ Year (2005 – 2011)

* Figures obtained from the Research Office, University of Sydney

Performance Overview

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Research Output

The publications reported and approved for the University's **Higher Education Research Data Collection** (HERDC) are reported below.

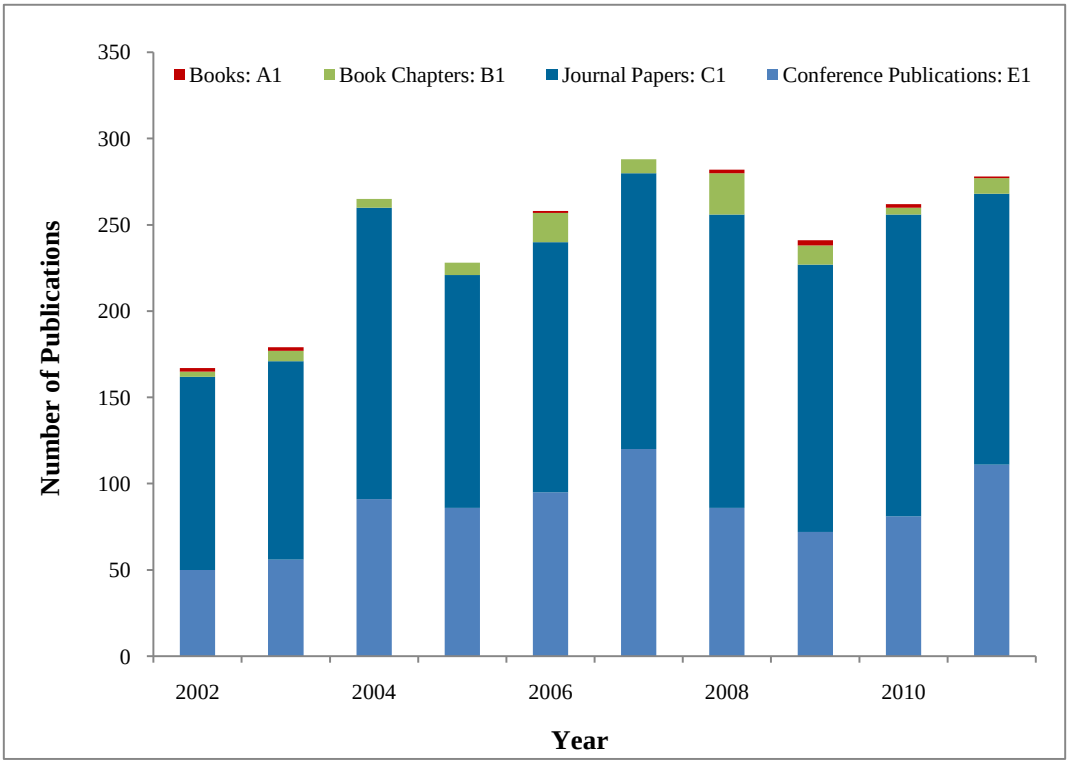

Figure 2: Research Publications 2002- 2011
A1: Authored research books published by commercial publisher
B1: Authored research chapters in commercially published books
C1: Refereed articles in peer reviewed journals
E1: Full length peer reviewed papers published in conference proceedings

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Postgraduate Supervision and Completions

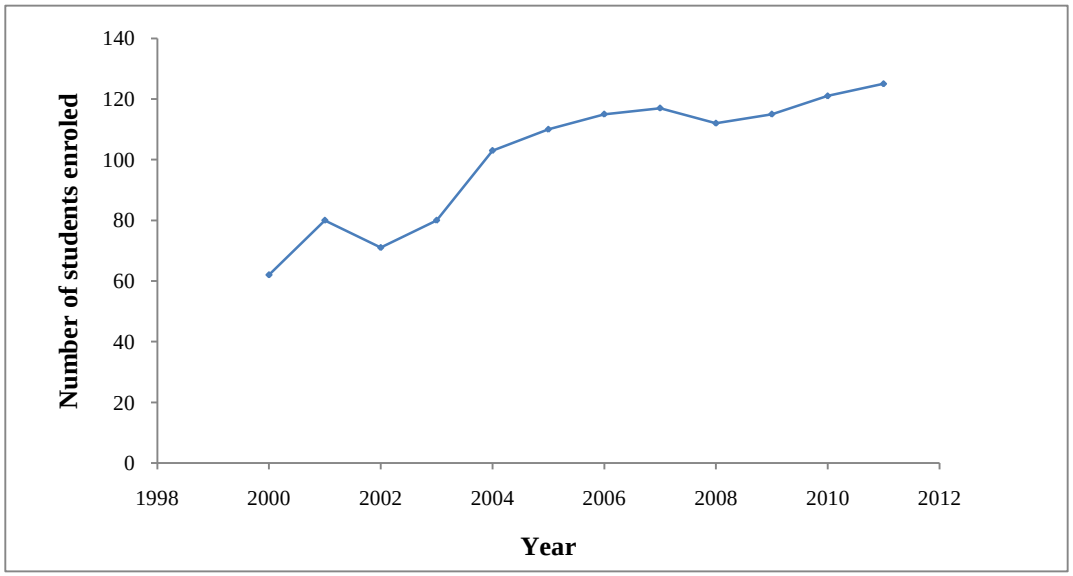

Figure 3: Total number of enroled Master of Philosophy and PhD students (2000- 2011)

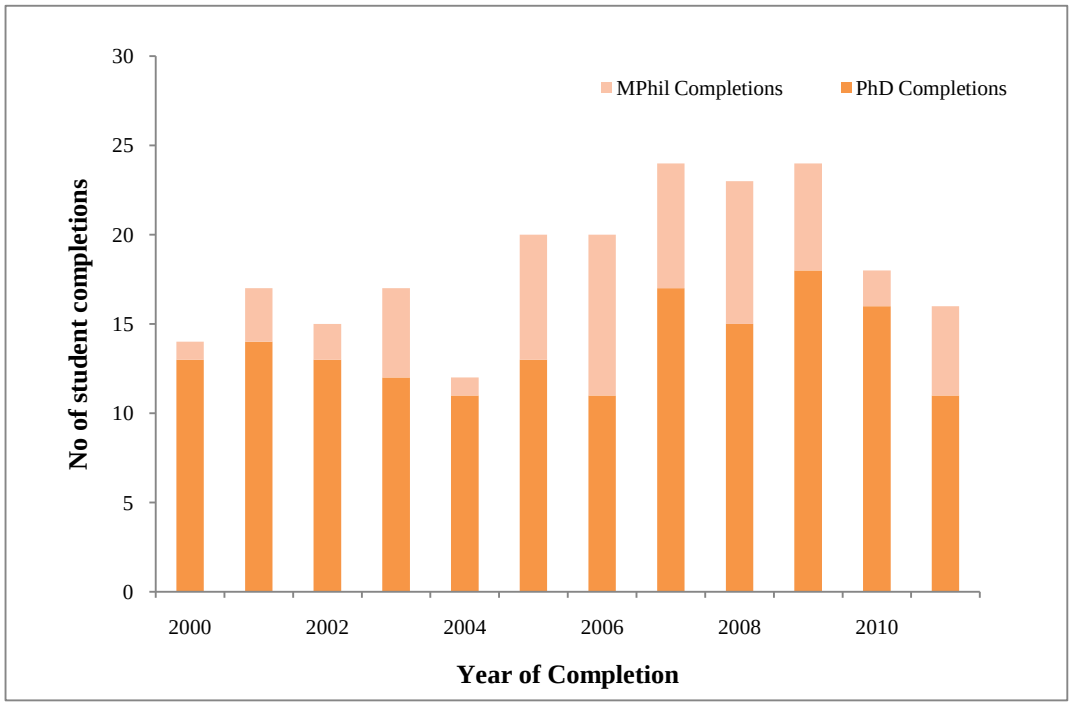

Figure 4: PhD and MPhil completions. (2000 – 2011)