

# Centre for Research in Mathematics Newsletter

## University of Western Sydney

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### Latest Happenings

The Centre hosted an AMSI Workshop on “Graph  $C^*$ -algebras, Leavitt path algebras and symbolic dynamics”. It was organized by Roozbeh Hazrat from CRM and A. Sims from University of Wollongong. The aim of the workshop was to bring together Australian and international experts to develop the emerging connections between the traditionally disparate fields of abstract algebra and  $C^*$ -algebras and symbolic dynamics. Out of the 25 participants, 10 were overseas participants from China, New Zealand, Spain and USA.

### Seminars & Colloquia

- Prof. Er-Wei Bai from University of Iowa, USA presented a seminar on “Big Data: the Curse of Dimensionality” at UWS on 25<sup>th</sup> March 2013.
- Prof. Le Yi Wang from Wayne State University, USA presented a seminar on “State and Event Estimation of LTI Systems under Irregular and Random Sampling” at UWS on 11<sup>th</sup> June 2013.
- As part of the CRM Colloquium series, Eric Beh from the University of Newcastle gave a talk about “Association and aggregation for contingency table analysis”.
- Talks from following speakers are planned for the remainder of the year.
  - James Mitchell from University of St Andrews,
  - Amnon Neeman Australian National University,
  - Georg Gottwald from University of Sydney,
  - Murray Elder from University of Newcastle.

### Visitors to the Centre

- Prof. Er-Wei Bai from Department of Electrical and Computer Engineering, University of Iowa, USA visited Prof. Wei Xing Zheng from 18<sup>th</sup> March to 30<sup>th</sup> March, 2013.

- Prof. Le Yi Wang from Department of Electrical and Computer Engineering, Wayne State University, USA has been visiting Prof. Wei Xing Zheng and will be at UWS till 22<sup>nd</sup> June 2013.

### Recent activities of members

- **Andrew Francis** visited Perth in March to work with Cheryl Praeger and Alice Niemeyer from University of Western Australia on using computational group theory to answer questions related to evolution of bacterial genomes.
- **Wei Xing Zheng** was appointed as a member of the Editorial Board of IET Control Theory and Applications in April.
- **Wei Xing Zheng** attended the 46<sup>th</sup> IEEE International Symposium on Circuits and Systems (ISCAS’2013), Beijing, China in May and presented three papers.
- **Sangeeta Bhatia** won the Best Presentation by first year HDR student at the SCEM & IIE Joint Research Futures Postgraduate Forum in June.

### Recent papers accepted

- **Ahlip R.** and Rutkowski M., “Forward start foreign exchange options under Heston’s stochastic volatility and the CIR interest rates.” to appear in *Advances in Financial Mathematics*.
- **Attila Egri-Nagy, Volker Gebhardt**, Mark M Tanaka and **Andrew R Francis**, “Group-theoretic models of the inversion process in bacterial genomes” to appear in *Journal of Mathematical Biology*.
- **James East**, James Mitchell and Yann Peresse “Maximal subsemigroups of the semigroup of all mappings on an infinite set” to appear in *Transactions of the American Mathematical Society*.
- **James East** “Partition monoids and embeddings in 2-generator regular  $*$ -semigroups” to appear in *Periodica Mathematica Hungarica*.

- L. Y. Wang, G. Yin, C. Li and **W. X. Zheng** “Feedback systems with communications: Integrated study of signal estimation, sampling, quantization, and feedback robustness” to appear in *International Journal of Adaptive Control and Signal Processing*.
- **Roozbeh Hazrat**, Nikolai Vavilov and Zuhong Zhang “Relative commutator calculus in Chevalley groups”, to appear in *Journal Of Algebra*.
- T. Soderstrom, Y. Irshad, M. Mossberg and **W. X. Zheng** “On the accuracy of a covariance matching method for continuous-time errors-in-variables identification” to appear in *Automatica*.
- Y. Xia, Z. Deng and **W. X. Zheng** “Analysis and application of a novel fast algorithm for 2-D ARMA model parameter estimation” to appear in *Automatica*.
- Z. G. Zeng and **W. X. Zheng** “Multistability of two kinds of recurrent neural networks with activation functions symmetrical about the origin on the phase plane” to appear in *IEEE Transactions on Neural Networks and Learning Systems*.

## Looking further ahead

- Dr James Mitchell, University of St Andrews, will have a research visit from 30<sup>th</sup> June to 22<sup>nd</sup> of July. Dr Mitchell has threads of ongoing research collaboration with James East (on partition monoids and combinatorial problems of infinite transformation semigroups). Similarly but independently there is a research collaboration between him and Attila Egri-Nagy. Dr. Mitchell will give talks on topics in computational algebra and semigroup theory. Beyond the two hosts, the Dr. Mitchell’s research area is interesting for all algebraists in CRM.
- Wei Xing Zheng is on the organizing committee and serves as Special Sessions Co-Chair of the 47<sup>th</sup> *IEEE International Symposium on Circuits and Systems (ISCAS’2014)* which will take place in June in Melbourne.

## Announcements

- *International Postgraduate Research Scholarship Scheme* is now open. Potential Phd students or

honours student in Algebraic Biology are welcome to contact Dr. Andrew Francis to discuss enrolment and scholarship options. Visit [http://www.uws.edu.au/research/future\\_research\\_students/apply](http://www.uws.edu.au/research/future_research_students/apply) for more details.

- A Post-doctoral Fellowship in Computational Statistics is available with the Center. The focus of research will be in one or more of the following areas:
  - Sparsity promoting methods in hyperspectral signals and images,
  - Models (incl. mixture models) for complex sets of flow cytometry experiments,
  - Bioinformatics.

Please visit <http://careers.uws.edu.au/Current-Vacancies> for details or contact Associate Prof Glenn Stone if this interests you.

- The Center is seeking to appoint a for a Professor or Associate Professor in Applied Mathematics to join University of Western Sydney’s School of Computing, Engineering and Mathematics. Please visit <http://careers.uws.edu.au/Current-Vacancies> for job description and details on how to apply. You can also contact Prof Andrew Francis for enquiries.

## CRM Researchers

### Core members:

- Dr James East
- Prof Andrew Francis
- Dr Volker Gebhardt
- Dr Roozbeh Hazrat
- A/Prof Glenn Stone
- Prof Wei Xing Zheng.

### Associated researchers:

- Dr Rehez Ahlip
- Sangeeta Bhatia
- Dr Attila Egri-Nagy
- A/Prof Leanne Rylands
- Stuart Serdoz
- Dr Stephen Tawn

## Staff Profile – Stephen Tawn



Stephen is a Post-doctoral research fellow with CRM working with Dr. Volker Gebhardt. He received his Phd from University of Warwick. His research interests include braid groups, geometric group theory, low dimensional topology and knot theory. He also dabbled in the world of coding as a software engineer at Delcam PLC. Outside of mathematical interests, he describes himself as a “lapsed trombonist”. He used to play trombone with a brass band, but doing maths and playing with his 3 year old son William are keeping him plenty busy now.

## Staff Profile – Andrew Francis

Dr Andrew Francis is a Professor and ARC Future Fellow. His research training is in pure mathematics, his algebra interests being in the structure of Hecke algebras that arise in the representation theory of finite groups. He does not however subscribe to the labels “applied” and “pure” mathematics. In line with this, he has been using algebra to understand the evolutionary processes behind the structure of bacterial genomes. He spends his spare time hanging around his kids, looking after his home brew, singing with a comedic barbershop quartet “The Four Pops”, playing soccer, reading novels and popular science and wishing he could write philosophy.

