RESEARCH UNITS, CENTRES AND INSTITUTES

Annual Report

Please refer to the University of Auckland Policy on Research Units, Centres and Institutes for more information on reporting and accountability requirements (clause 2.5). A copy of this policy is available from the University Policy Register.

Section 1a - IDENTIFICATION INFORMATION:

Title of Unit, Centre or Institute:	Centre for Mathematical Social Sciences
Name of Director:	Arkadii Slinko
Name of Deputy Director:	Mark Wilson

Section 1b – ENDORSEMENT OF REPORT:

Signatures:	*Please sign in appropriate space below*
Director (Required for all Units/Centres/Institutes)	
Head of Department (Required only for Department/School Units)	
Dean (Required for Faculty/University Centres/Institutes)	

Section 2 – ADVISORY BOARDS AND MEETING DATES:

Names of Oversight Advisory Board members (for Faculty and University Centres that have Oversight Boards)	
Names of Expert Advisory Board members (for Faculty and University Centres that have Expert Advisory Boards)	Peter Davis (Auckland University) Jack Vowles (Victoria University) Toby Walsh (University of NSW)
Names of Management Committee Members (for University and Faculty Centres)	
Dates of advisory board and management committee meetings that took place during the year	December 2014 via Skype (all members of board present, plus 2014 and 2015 Directors)

Section 3 – PARTICIPATING MEMBERS AND EMPLOYEES/STUDENTS:

Names and Departments of participating members	Arkadii Slinko (Mathematics), Mark Wilson and Jiamou Liu (Computer Science), Patrick Girard and Jeremy Seligman (Philosophy), John Hillas, Steffen Lippert and Alexandre Dmitriev (Economics), Geoffrey Pritchard (Statistics), Valery Pavlov (ISOM), Quentin Atkinson (Psychology), Dion O'Neale (Physics), External: Matthew Ryan (AUT, Economics), Simona Fabrizi (Massey-Albany, Economics)
List names, positions, and FTEs of all staff employed and postgraduate students involved in the Unit or Centre	PhD students: Nina Anchugina, Sergey Ozernikov, Samin Aref, Neda Sakhaee, Shaun White, Kerry Manson, Faezeh Frouzesh, Anastasia Moskvina, Ziheng Wei, Rachel Liu, Addison Pan.

Section 4 – INTRODUCTION:

Provide here a brief introduction to the report (maximum of 300 words)	2015 was a fruitful year for its members. Our seminar worked steadily, we supervised a number of PhD students on a number of interdisciplinary topics, we have had a stream of high quality visitors and at the end of the year organised our

	traditional three-day international workshop (The 7th Summer Workshop of the CMSS). The highlight of the year is the established connection with leading political scientists which was one of our long-term goals. Several members have joined the Centre, most notably Alexandre Dmitriev. Having members from four different faculties we are committed to distributed leadership with directors playing a coordinating role in the activities of the Centre.

Section 5 – AIMS, GOALS AND FUTURE PLANS:

a. General Aims: Briefly describe the general aims (plans and objectives/goals) of the unit or centre. Identify how they address the University and Faculty Strategic Plan.	We are a group of researchers interested in applying mathematical and computational modelling to social sciences (particularly politics and economics), with the base at the University of Auckland but with active participation of academics from other universities. We aim to be a centre of expertise in this area, recognized as a leader in academic and non-academic circles throughout Australasia. We aim to provide an environment for supervision of graduate students in interdisciplinary subjects like computational social choice, algorithmic game theory etc. not available anywhere in Australasia. This relates closely to Objectives 5,6,7,8 9,10 of the University Strategic Plan, and points 2,3,6,10 of the Faculty Strategic Plan.
b. Goals for Reporting Year: Describe the specific goals for the reporting year.	This year was to be the year of Political Science. We will run an international workshop on multi-winner voting rules where, in particular, we will discuss the electoral system in NZ. Run regular seminar. Continue to explore external linkages, with help of new advisory board, especially contacts in Wellington of Jack Vowles and in Australasia of Peter Davis. Increase research outreach activities.
c. Plans for Upcoming Year: Outline the plans for the next year. Identify any resource implications.	Run regular interdisciplinary seminar. Encourage and develop interdisciplinary supervision of graduate students. Have a substantial visitors program. Run the traditional international summer workshop (8th Summer Workshop of the CMSS).

Section 6 –MAJOR ACHIEVEMENTS AND OTHER NOTABLE ACTIVITIES:

Report against the specific goals listed in 5b above	Mark Wilson visited University of California Irvine in February 2015 and gave a talk in the Center for the Study of Democracy seminar. He also visited California Institute of Technology in February 2015, conferred with several colleagues in economics/political science. He attended American Political Science Association annual meeting in San Francisco September 2015, conferred with Prof Simon Hix (London School of Economics), Prof Anthony McGann (University of Strathclyde), Prof John Carey (Dartmouth College), Prof Matthew Shugart (University of California Davis) and others on the plans for building on work of Carey and Hix in electoral system optimisation. Mark Wilson also attended workshop in Laguna Beach organized by Bernard Grofman. Mark managed to get Grofman to visit New Zealand. Grofman is the former president of American Political Science Association. Arkadii Slinko contacted Jean-Francois Laslier (Paris School of Economics) and managed to persuade him to come to New Zealand. These developments significantly clarified our program in Mathematical Politics. Our research visitors program this year was more extensive than usual. We have got two distinguished visitor awards from the University of Auckland for Charles Plott (Caltech, USA) and Jean-Francois Laslier (Paris School of Economics). Other distinguished visitors financed from other sources include Bernard Grofman, (University of California), Marc Kilgour (University of Toronto), Damon Centola (University of Pennsylvania), Simon Grant (Australian National University), Nimrod Talmon (Weitzman Institute, Israel), Piotr Faliszewski (Krakow), Piotr Skowron (Oxford), Konstantin Sorokin (Higher School of Economics, Moscow). The last but not the least on February 2016 we organized a three day 7th Summer Workshop of the Centre with topics: Mathematical Politics, Mathematical Psychology, mathematical Economics. It was well-attended and was very successful.
Summary of major developments and achievements. Identify how these activities contribute to the research capability of the department or faculty (beyond what would be achieved through the activities of the individual members). Please provide greater detail for anything noteworthy that may give useful publicity to the University	The Centre continues to plays a coordinating role in interdisciplinary research on various quantitative aspects of Economics and Political Science within the University of Auckland and in Australasia. The interface between political science, microeconomics, mathematics and computer science is a very active area worldwide, but standard UoA structures fail to reflect this emerging trend. However, CMSS does. In fact UoA political/economic departments are relatively weak in the quantitative area, and our Centre secures that UoA have a decent international profile in those areas and contributes to UoA's profile as a public university of global standing. Public lectures by Charles Plott (Caltech) and Jean-Francois Laslier (Paris School of Economics) created a good deal of publicity for the UoA.

Comment on any co-operative commercial activities, research with other University or Government laboratories or research groups	
Comment on any courses given or workshops and seminars held	We actively practice joint supervision of PhD students. Numerous seminars were help and the 7th Summer Workshop of the CMSS.

Section 7 - Reviews

Date of last review	Dec 2014 (reviewers P. Bardsley, M. Gahegan)
Review Recommendations List the recommendations of the review and give an update of progress on addressing the recommendations.	It is recommended that: • The CMSS continue in existence in some form. • Members of CMSS, along with their Advisory Board, urgently decide on a path forward and commit to it. This might be as an informal research group, or as a Departmental or Faculty Centre. If a path of growth is chosen, then a Faculty Centre might be most appropriate in the longer term, given the interdisciplinary nature of the Centre. However the spread of disciplines across Faculties might make this awkward. • A stable, annual funding base be negotiated, to be contributed by participating Departments. The amount required will obviously vary on the outcome of #2 above. As a bare minimum, to continue to offer their excellent summer school activities, an operating budget of $15k-20k needs to be secured annually, and ideally in advance. Given there are several departments involved, this amount does not seem onerous. • Continued establishment and funding should be conditional on preparation of a satisfactory strategic plan, and the achievement of incremental steps towards an expansion of the scope and influence of the Centre. This would be evidenced by external funding and relationships, to contribute towards future growth. • A strategic plan is urgently needed, to specifically address the increase the range of scholarly and policy related partners and stake holders, and to restructure the Advisory Board. We would suggest a three year horizon. • The success and viability of the Centre be assessed not only in financial terms but also through scholarly impact (using metrics appropriate to the relevant disciplines) and through its contribution to public policy

	and public debate on policy issues on which it has expertise.

Section 7' – Comments on Reviews

A characteristic feature of our centre is that it is a facilitator of a wide range of interdisciplinary research activities that have recently emerged in modern science and are not reflected within the traditional university structure. As a result we have a fuzzy membership and distributed leadership. The centre proved its usefulness and generates a good deal of international publicity for the university. It is naturally growing since people are attracted to it as a place where exchange of ideas takes place. An ad hoc funding that we get is barely sufficient for running summer workshops but we would not accept any funding that would distract members of the centre from its primary purpose.

Section 8 – FINANCIAL REPORT

State whether the Unit or Centre has its own Activity Centre/s and list the Activity Centre/s being used	No.
State sources of funding, for example, from research funds from outside bodies, from the Department or Faculty, or other	Ad hoc grants from Departments of Mathematics, Computer Science, Philosophy, Economics. Distinguished Visitor Awards from The University of Auckland were instrumental in getting important people here.
List any significant resource allocation decisions taken by the Oversight Board during this reporting year (if applicable)	N/A
Include a statement of financial performance (contact Faculty Accountant for assistance), or give a clear explanation of the reasons if there has been no financial activity	

Section 9 – RESEARCH OUTPUTS

Include a list of	

publications and other research outputs	

Books - Authored

1. Slinko, A. M. (2015). *Algebra for Applications: Cryptography, Secret Sharing, Error-Correcting, Fingerprinting. Compression*. Springer.

Chapters

2. Elkind, E., and **Slinko, A. M.** (2015). Rationalizations of Voting Rules. F. Brandt, V. Conitzer, U. Endriss, J. Lang, and A. Procaccia (Eds.), *Handbook of Computational Social Choice*. Cambridge. Cambridge University Press.

3. Girard, P. (2015) "Logic of Promotion and Demotion". In Herzig, A., & Lorini, E. The Cognitive Foundations of Group Attitudes and Social Interaction for the Springer, volume 5 of the Springer series "Studies in the Philosophy of Sociality", pp 107-120.

Journal - Research Articles

4. Hillas, J. and Liu, M.. (2015). "Correlated Equilibria of Two Person Repeated Games with Random Signals." International Journal of Game Theory, 45(1), 137-153.

5. Hameed, A., and **Slinko, A. M.** (2015). A Characterization of Ideal Weighted Secret Sharing Schemes. *Journal of Mathematical Cryptology*, *Online first*. doi:10.1515/jmc-2015-0002.

6. Elkind, E., Faliszewski, P., and **Slinko, A.** (2015). Distance rationalization of voting rules. *Social Choice and Welfare*, *45* (2), 345-377.

7. Agastya, M., and **Slinko, A.** (2015). Dynamic choice in a complex world. *Journal of Economic Theory*, *158*, 232-258.

8. Skowron, P., Faliszewski, P., and **Slinko, A.** (2015). Achieving fully proportional representation: Approximability results. *Artificial Intelligence*, *222*, 67-103.

9. Searles, D., and **Slinko, A.** (2015). Noncoherent initial ideals in exterior algebras. *Beiträge zur Algebra und Geometrie / Contributions to Algebra and Geometry*, *56* (2), 759-762.

10. Hameed, A., and **Slinko, A. M.** (2015). Roughly weighted hierarchical simple games. *International Journal of Game Theory*, *44* (2), 295-319.

11. Puppe, C., and **Slinko, A.** (2015). Condorcet Domains. Median Graphs and the Single Crossing Property. CoRR abs/1507.08219.

12. Clearwater, A., Puppe, C., and **Slinko. A.** (2015). Generalizing the Single-Crossing Property on Lines and Trees to Intermediate Preferences on Median Graphs. CoRR abs/1505.06982.

13. Elkind E, Faliszewski P, Skowron P and **Slinko A.** (2015) Properties of multi-winner voting rules. CoRR abs/1506.02891.

14. Badia, G, **Girard, P.** and Z. Weber (2015) "What is an Inconsistent Truth Table", Australasian Journal of Philosophy, pp 1-16.

15. Girard, P. and Z. Weber (2015) "Bad Worlds", Thought: A Journal of Philosophy 4(2), pp 93-101.

16. Girard, P. and K. Tanaka (2015) "Paraconsistent Dynamics", Synthese, pp.1-14.

17. Wilson, M. Diagonal asymptotics for products of combinatorial classes Combinatorics, Probability and Computing 24 (2015), 354-372.

18. F. Bloch, **S. Fabrizi** and **S. Lippert** Learning and collusion in new markets with uncertain entry costs, *Economic Theory* 58(2), 2015, 273-303.

19. Ryan, M. "A Strict Stochastic Utility Theorem" Economics Bulletin 35(4): 2664-2672.

20. Menezes, F. and **M. Ryan.** "Default and Renegotiation in PPP Auctions" Journal of Public Economic Theory 17(1): 49-77.

21. Ryan, M. and F. Menezes. "Public-Private Partnerships for Transport Infrastructure: Some Efficiency Risks" New Zealand Economic Papers 49(3): 276-295.

22. Ryan, M. and R. Vaithianathan. "The Regulation of Direct-to-Consumer Advertising of Pharmaceuticals in a Managed Care Setting" Journal of Public Economic Theory 17(6): 986-1021.

Conference – Proceedings

23. Clearwater, A., Puppe, C., and **Slinko, A. M.** (2015). Generalizing the single-crossing property on lines and trees to intermediate preferences on median graphs. Proceedings of The Twenty-Fourth International Joint Conference on Artificial Intelligence, (32-38). Buenos Aires, Argentina.

24. Elkind, E., Grandi, U., Rossi, F., and **Slinko, A. M.** (2015). Gibbard-Satterthwaite Games. Proceedings of The Twenty-Fourth International Joint Conference on Artificial Intelligence, (533-539). Buenos Aires, Argentina.

25. Girard, P. and M.A. Triplett (2015) "Ceteris Paribus Logic in Counterfactual Reasoning". In: Proceedings of the 15 Conference on Theoretical Aspects of Rationality and Knowledge.

Please forward your report to your Head of Department or Faculty Office for endorsement (Section 1B above). Note: Annual Reports to be submitted to Research Committee must reach the Research Office by 28 February.