

MATHEMATICAL SCIENCES

The School of Mathematical Sciences encompasses the disciplines of Applied Mathematics, Pure Mathematics and Statistics. Staff in the School facilitate teaching and research in the disciplines of mathematics and statistics and are Australian leaders in postgraduate research training in these areas. The School is highly respected internationally as a centre for research in bioinformatics, differential and finite geometry, fluid mechanics, mathematical modelling, medical statistics and in selected areas of telecommunications.

Many other areas of the mathematical sciences are actively researched within the School and the exceptional quality of the staff has been recognised by awards and medals from the Australian Academy of Science and the Australian Mathematical Society. Research groups in the School are supported by a variety of sources including external competitive grants from major funding bodies and commercial and industrial consultancies. Facilities of special note affiliated with the Schools include:

- Centre for the Quantification and Management of Risk
- Fluid Mechanics Group
- Institute for Geometry and its Applications
- TRC Mathematical Modelling.

APPLIED MATHEMATICS

Phone: 61 8 8303 5407 **Fax:** 61 8 8303 3696
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Applied mathematics has an active research program with substantial funding from external organisations including the Australian Research Council, the Defence Science and Technology Organisation (DSTO) and Telstra. Active research groups in the areas are listed below:

- Applied probability
- Computational mathematics
- Financial mathematics
- Fluid mechanics
- Operations research
- Stochastic modelling
- Telecommunications network modelling and performance analysis.

PURE MATHEMATICS

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Pure Mathematics has an active research program in the areas of mathematics listed below, and members of the School are in receipt of numerous grants from external bodies such as the Australian Research

Council. The School houses the Institute for Geometry and its Applications, which coordinates and promotes research in this sub-discipline, forming an internationally recognised Centre.

Research Interests

- Differential geometry, algebraic geometry, gauge theory and analysis on manifolds
- Finite geometry and combinatorics, and applications to information security
- Finite group theory including applications to finite geometries and combinatorics
- Integral geometry, Lie group representation theory, several complex variables and twistor theory
- K-theory, index-theory and non-commutative geometry
- Mathematical physics in particular string theory, conformal field theory, (fractional) quantum Hall effect and gauge theories
- Number theory and applications to cryptography

STATISTICS

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Statistics research activities are at the cutting edge of theoretical and applied statistics, biostatistics, bioinformatics and statistical computing.

Research Interests

- Bayesian statistics of estimation
- Bioinformatics
- Biostatistics focusing on clinical trials, survival analysis, statistical aspects of AIDS, quantitative epidemiology and quantitative genetics
- Design and analysis of microarray experiments
- Longitudinal data analysis
- Random effects modelling
- Statistical modelling focusing on the development and fitting of statistical models, together with the ensuing problems
- Survival analysis.





Alys Clark B.A. (Hons) Math.Sc, M.Math.Sc, PhD Applied Mathematics



Alys has enjoyed learning about possible applications of her mathematical skills.

Alys' main research interest is the application of mathematics to biological problems. Her PhD project involves collaboration with scientists from Adelaide's Research Centre for Reproductive Health, who study the development of mammalian eggs. The main aim of this research is to improve understanding of how nutrients are transported to the developing egg within the ovary. This has application to fertility treatments where eggs are matured in laboratory environments, which aim to replicate conditions in the body.

ALYS DEVELOPS MATHEMATICAL MODELS THAT INCORPORATE CURRENT BIOLOGICAL KNOWLEDGE TO DESCRIBE THE TRANSPORT OF KEY NUTRIENTS TO THE EGG.

These models can be validated against experimental results, and have the potential to be used as tests of biological hypotheses and as predictive tools. The collaborative nature of

research in this field has allowed Alys to develop many skills beyond those of her undergraduate maths training. Through developing mathematical models of biological systems, Alys has found herself asking questions about those systems that need to be experimentally investigated. This has enabled her to learn about experimental design and statistical analysis, fields that she had little experience of as an undergraduate.

Throughout her studies Alys has enjoyed learning about possible applications of her mathematical skills, as well as new techniques. Undertaking research in mathematics has given her the opportunity to meet other scientists and to present her research at both national and international conferences. The opportunities to learn from others at Adelaide and internationally have allowed Alys to develop skills both as a mathematician and as a collaborative scientist.