



## POSITION DESCRIPTION

School of Mathematics and Statistics  
Faculty of Science

# MACSYS Research Fellow in Modelling and Analysis of Chemical Reaction Networks

**POSITION NO** 0062933

**CLASSIFICATION** Level A

**SALARY** \$83,468 – \$113,262 per annum (pro rata for part-time)  
(PhD entry level \$105,518 p.a)

**SUPERANNUATION** Employer contribution of 17%

**WORKING HOURS** Full-time (1.0 FTE)

**BASIS OF EMPLOYMENT** Fixed-term for 3 years

### **FLEXIBLE EMPLOYMENT**

The University of Melbourne is strongly committed to supporting diversity and flexibility in the workplace. Applications for part-time or other flexible working arrangements will be welcomed and will be fully considered subject to meeting the inherent requirements of the position.

**OTHER BENEFITS** <https://about.unimelb.edu.au/careers/staff-benefits>

**HOW TO APPLY** Online applications are preferred. Go to <http://about.unimelb.edu.au/careers>, select the relevant option ('Current Staff' or 'Prospective Staff'), then find the position by title or number.

**CONTACT FOR ENQUIRIES ONLY** Associate Professor Robyn Araujo  
[robyn.araujo@unimelb.edu.au](mailto:robyn.araujo@unimelb.edu.au)

*Please do not send your application to this contact*

For information about working for the University of Melbourne, visit our website:  
[about.unimelb.edu.au/careers](http://about.unimelb.edu.au/careers)

## Acknowledgement of Country

The University of Melbourne acknowledges the Traditional Owners of country throughout Australia. The University recognises the unique place held by Aboriginal and Torres Strait Islander peoples as the original custodians of country and their continued connection to the land, waterways, songlines and culture. The University respects all Aboriginal and Torres Strait Islander People and warmly embrace those students, staff, Elders and collaborators who identify as First Nations.

## Position Summary

We are looking to recruit a highly motivated post-doctoral fellow to join the Australian Research Council Centre of Excellence for the Mathematical Analysis of Cellular Systems (MACSYS); the world's largest focused research initiative in mathematical biology. MACSYS brings together mathematical, computational, and biological scientists to generate the mathematics, computational and experimental technologies required to make biology predictive; establish mathematical whole cell models (WCMs) for *in silico* biology as a powerful complement to traditional *in vivo* and *in vitro* approaches; tackle fundamental biological problems; and establish a world-leading research and biotechnology translation environment. MACSYS will have a strong emphasis on equity and diversity in research, training, and outreach.

In this role, you will employ advanced mathematical and computational techniques, which may include graph theory, computational algebraic geometry, chemical reaction network theory, and computational topology (including topological data analysis) to: (i) understand the structure and function of cellular chemical reaction networks (CRNs), (ii) identify fundamental design principles of complex CRNs, and/or (iii) compute informative topological invariants on CRNs, to inform and support the automated generation and *in silico* evolution of WCMs. By applying your expertise, you will play a pivotal role in advancing our understanding of cellular signal processing and decision-making, and the mathematical basis for cellular cognition, in the context of whole cell modelling.

You will be required to:

- ▶ Undertake original research in formulating, analysing and testing mathematical models of complex cellular networks, using a variety of advanced mathematical approaches, such as graph theory, algebraic methods, chemical reaction network theory, and nonlinear dynamical systems.
- ▶ Apply your mathematical expertise to the comprehensive exploration, modelling and analysis of a range of cellular networks, including signal transduction pathways, gene regulatory networks, and metabolic pathways, to identify network structures that are compatible with experimentally-observed network responses.
- ▶ Develop and apply mathematical methods to investigate both steady-state responses and temporal dynamics of cellular processes, to reconcile the predicted behaviour of cellular systems under different conditions with experimental data.
- ▶ Develop and apply mathematical methods to identify parameters, or parameter groups, that are of greatest relevance to the network's responses and functions.

We encourage applicants from under-represented groups, including Aboriginal and Torres Strait Islander people. To allow us to consider performance relative to opportunity, we also invite applicants to provide a brief statement (up to 1 page) that describes circumstances that may have affected their career development or progression, including career interruptions or delays, periods of part time work, or forms of bias they have experienced.

## 1. Key Responsibilities

As with all positions, career achievements will be interpreted relative to opportunity, including career disruptions due to caring responsibilities, time in industry, illness etc.

The position description should be read alongside [Academic Career Benchmarks and Indicators](#). A level A academic is acquiring skills and building academic achievements (oriented towards the benchmarks).

### 1.1 RESEARCH AND TRAINING

You are expected to significantly contribute towards the research effort of the team and to develop your research expertise with an increasing degree of autonomy.

- ▶ Under the guidance and support of Senior Academic staff conduct internationally competitive research, resulting in publications in high impact journals
- ▶ Contribute to and publish academic papers and other scholarly outputs to a high academic standard in accordance with the research expectations of the University of Melbourne
- ▶ Actively participate in research seminars and conferences to disseminate research findings as opportunities arise
- ▶ Contribute to the preparation, or where appropriate individual preparation of research proposal submissions to internal or external funding bodies as relevant
- ▶ Undertake administrative functions and obligations primarily connected with the staff member's area of research
- ▶ Contribute to, and assist in, the co-supervision and training of research students primarily at undergraduate level
- ▶ Engage with relevant professional and industry bodies and stakeholders to foster collaborative partnerships

### 1.2 TEACHING AND LEARNING

- ▶ Contribute to teaching, training, scientific mentoring and supervision of students
- ▶ Contribute to the effective supervision of junior research staff in the appointee's area of expertise

### 1.3 LEADERSHIP AND SERVICE

- ▶ Actively participate at School meetings and with guidance, contribute to planning activities or committee work to support capacity building in the School/discipline
- ▶ Actively participate in activities within the School and Faculty to support Diversity and Inclusion
- ▶ Contribute to, or present research to the public to elevate public awareness of educational and scientific developments, and promote critical enquiry and public debate within the community where appropriate
- ▶ Effective demonstration and promotion of University values including diversity and inclusion and high standards of ethics and integrity
- ▶ Actively contribute to School activities such as Open day to promote student engagement

### 1.4 OTHER DUTIES

- ▶ Perform other tasks as requested by the supervisor or the Head of School

- ▶ Actively participate in the University Professional Development Framework
- ▶ Ensure an up-to-date record of University compliance courses, such as, but not limited to, Appropriate Workplace Behaviour, PDF for Staff and Supervisors, OH&S training courses
- ▶ Occupational Health and Safety responsibilities as outlined in section 4

## ***2. Selection Criteria***

### **2.1 ESSENTIAL**

- ▶ Completion (or near completion) of a PhD in mathematics, applied mathematics, statistics, mathematical or computational biology, theoretical physics, or a related discipline.
- ▶ Knowledge in dynamical systems and algebraic methods for mathematical modelling (e.g. graph theory and linear algebra methods).
- ▶ Experience in the modelling and analysis of chemical reaction networks.
- ▶ Demonstrated interest in cellular signalling (e.g. signal transduction, or gene regulatory networks, or metabolic networks).
- ▶ High level of proficiency with a general-purpose programming language (e.g. Matlab, Python or Julia).
- ▶ A demonstrated aptitude for research, with a sound publication record in relevant areas, commensurate with experience and opportunities.
- ▶ Demonstrated ability to prepare research reports and manuscripts for publication.
- ▶ Strong evidence of ability and desire to build an academic research career trajectory.
- ▶ Demonstrated ability to engage with relevant professional and industry bodies and stakeholders to foster collaborative partnerships.
- ▶ Excellent interpersonal and both written and oral communication skills in English.
- ▶ Excellent ability to work co-operatively and positively in a multi-disciplinary research based team environment and liaise with people from diverse backgrounds.
- ▶ Demonstrated excellent organisational skills to meet deadlines and bring projects to a timely completion.
- ▶ Demonstrated ability to develop, administer and see through to completion appropriately designed research projects with limited supervision.

### **2.2 DESIRABLE**

- ▶ Experience with chemical reaction network theory (CRNT)
- ▶ Experience with biological data analysis and interpretation
- ▶ Expertise in either computational algebra (e.g. Groebner basis methods) or computational topology (e.g. topological data analysis algorithms, such as Mapper)
- ▶ Experience in assisting with supervision of students undertaking undergraduate or higher degree research projects

## ***3. Equal Opportunity, Diversity and Inclusion***

The University is an equal opportunity employer and is committed to providing a workplace free from all forms of unlawful discrimination, harassment, bullying, vilification

and victimisation. The University makes decisions on employment, promotion, and reward on the basis of merit.

The University is committed to all aspects of equal opportunity, diversity and inclusion in the workplace and to providing all staff, students, contractors, honorary appointees, volunteers and visitors with a safe, respectful and rewarding environment free from all forms of unlawful discrimination, harassment, vilification and victimisation. This commitment is set out in the Advancing Melbourne strategy that addresses diversity and inclusion, equal employment opportunity, discrimination, sexual harassment, bullying and appropriate workplace behaviour. All staff are required to comply with all University policies.

The University values diversity because we recognise that the differences in our people's age, race, ethnicity, culture, gender, nationality, sexual orientation, physical ability and background bring richness to our work environment. Consequently, the People Strategy sets out the strategic aim to drive diversity and inclusion across the University to create an environment where the compounding benefits of a diverse workforce are recognised as vital in our continuous desire to strive for excellence and reach the targets of Advancing Melbourne.

## ***4. Occupational Health and Safety (OHS)***

All staff are required to take reasonable care for their own health and safety and that of other personnel who may be affected by their conduct.

OHS responsibilities applicable to positions are published at:

<https://safety.unimelb.edu.au/people/community/responsibilities-of-personnel>

These include general staff responsibilities and those additional responsibilities that apply for Managers and Supervisors and other Personnel.

## ***5. Other Information***

### **5.1 SCHOOL OF MATHEMATICS AND STATISTICS**

<http://www.ms.unimelb.edu.au>

The University of Melbourne's School of Mathematics and Statistics is one of Australia's leading mathematics and statistics schools. It has achieved this status through the high quality of its research and teaching programs. The School offers a wide range of subjects to undergraduate and postgraduate students and is involved in aspects of community life that impact on the interests of the School and the discipline.

The School of Mathematics and Statistics has a total of 70 continuing teaching and/or research staff; 34 research only staff and consultants; 16 academic specialists and 16 support staff. In 2020, there were 90 Research Higher Degree and 278 Coursework Master of Science students. Five members of the School staff and one Emeritus Professor are members of the Australian Academy of Science. The school currently hosts two ARC Centres of Excellence, and has hosted four ARC Laureate Fellows, ten ARC Future Fellows and fourteen DECRA Fellows.

## 5.2 FACULTY OF SCIENCE

<http://www.science.unimelb.edu.au>

Science at Melbourne is a global leader across fundamental and impactful scientific research and education. Science begins with curiosity, and we are dedicated to understanding the universe from the level of sub-atomic particles to the solar system. We aim to be leaders who positively impact the community locally and globally, addressing major societal issues from climate change to disease. Our discoveries help build an understanding of the world around us.

Our strength is our breadth of expertise. We are the second largest faculty in the University comprising seven schools: Agriculture, Food & Ecosystem Sciences, BioSciences, Chemistry, Geography, Earth & Atmospheric Sciences, Mathematics & Statistics, Physics and Veterinary Science.

This depth of knowledge positions the faculty to better understand, explore and impact our world and humanity, within a truly comprehensive Faculty of Science.

We have more than 150 years of experience in pioneering scientific thinking and analysis, leading to outstanding teaching and learning and offer a curriculum based on highly relevant research. We aim to train students with the knowledge and intellectual flexibility to drive the industries of tomorrow and lead across all levels of society.

We offer a range of undergraduate, honours, graduate and research degrees, enrolling more than 11,500 undergraduate and 3,750 graduate students.

We are dedicated to delivering leading transformative educational outcomes, underpinned by research, and an inclusive and inspiring student experience.

Excellence comes in many forms and diversity of thought, perspective and disciplines is essential to deliver globally leading science. At the core of our success is our focus on an inclusive environment for all in our community. Our Faculty's focus on equity, inclusion and belonging is grounded in our endeavour to ensure we are best placed to advance research, teaching and serve diverse national and global communities.

As a Science community we sit across five of the University's campuses – Parkville, Dookie, Burnley, Creswick and Werribee. This reach provides us with a unique perspective that is beneficial to our teaching and research. It also means we can offer our students a greater variety of learning experiences and internships to engage with industry partners to solve real-world issues.

The Faculty is custodian of the Bio21 Molecular Science and Biotechnology Institute, Melbourne Energy Institute, Melbourne Biodiversity Institute, Office for Environmental Programs, Australian Mathematical Sciences Institute (AMSI) and the Indigenous Knowledge Institute and home to numerous Centres.

## 5.3 THE UNIVERSITY OF MELBOURNE

Established in 1853, the University of Melbourne is a leading international university with a tradition of excellence in teaching and research. The main campus in Parkville is recognised as the hub of Australia's premier knowledge precinct comprising eight hospitals, many leading research institutes and a wide-range of knowledge-based industries. With outstanding performance in international rankings, the University is at the forefront of higher education in the Asia-Pacific region and the world.

The University employs people of outstanding calibre and offers a unique environment where staff are valued and rewarded.

Further information about working at The University of Melbourne is available at <http://about.unimelb.edu.au/careers>.

## 5.4 ADVANCING MELBOURNE

The University's strategic direction is grounded in its purpose. While its expression may change, our purpose is enduring: to benefit society through the transformative impact of education and research. Together, the vision and purpose inform the focus and scale of our aspirations for the coming decade.

Advancing Melbourne reflects the University's commitment to its people, its place, and its partners. Our aspiration for 2030 is to be known as a world-leading and globally connected Australian university, with our students at the heart of everything we do.

- We will offer students a distinctive and outstanding education and experience, preparing them for success as leaders, change agents and global citizens.
- We will be recognised locally and globally for our leadership on matters of national and global importance, through outstanding research and scholarship and a commitment to collaboration.
- We will be empowered by our sense of place and connections with communities. We will take opportunities to advance both the University and the City of Melbourne in close collaboration and synergy.
- We will deliver this through building a brilliant, diverse and vibrant University community, with strong connections to those we serve.

The means for achieving these goals include the development of the University of Melbourne's academic and professional staff and the capabilities needed to support a modern, world-class university. Those means require a commitment to ongoing financial sustainability and an ambitious infrastructure program which will reshape the campus and our contribution to the communities we engage with. This strategy, and the priorities proposed, is centred around five intersecting themes: place, community, education, discovery and global.

## 5.5 GOVERNANCE

The Vice Chancellor is the Chief Executive Officer of the University and responsible to Council for the good management of the University.

Comprehensive information about the University of Melbourne and its governance structure is available at <https://about.unimelb.edu.au/strategy/governance>