



Job title	Senior Research Fellow	Job family and level	Research and Teaching Level 5
School/ Department	School of Mathematical Sciences	Location	University Park Campus

Purpose of role

This senior postdoctoral research fellow position will have responsibility for their own research, co-supervision of researchers, developing research objectives, and developing research proposals whilst working with Prof. Gary Mirams on his Wellcome funded £2M Senior Research Fellowship “*Developing cardiac electrophysiology models for drug safety studies*”.

	Main responsibilities (Primary accountabilities and responsibilities expected to fulfil the role)	% time per year
1	<p>Research</p> <ul style="list-style-type: none"> ▪ Acquire, analyse, interpret and evaluate research findings using approaches, techniques, models and methods selected or developed for the purpose. ▪ Plan and deliver research as part of a collaborative team and contribute to the achievement of specific research objectives. ▪ Identify opportunities and assist in writing bids for research grant applications. 	50%
2	<p>Engagement, Communication and Dissemination</p> <ul style="list-style-type: none"> ▪ Assist in the co-ordination of the research and related administrative tasks, including liaising with external project collaborators in academia and industry. ▪ Publish results of research in internationally leading peer-reviewed journals. ▪ Establish your reputation nationally, by writing up research work for publication and contributing to the dissemination of findings at national/international conferences. ▪ Build relationships and collaborate actively with internal and external contacts, nationally and internationally, to complete research projects to advance the discipline and increase knowledge exchange. 	25%
3	<p>Administration and Supervision</p> <ul style="list-style-type: none"> ▪ Provide support, guidance and supervision to other staff within the research team, where appropriate within own area of expertise. ▪ Supervise undergraduate and/or postgraduate students projects and placements, as appropriate. ▪ Participate in co-supervision of projects at the Masters and PhD level. 	20%
4	Any other duties appropriate to the grade and role of the post holder	5%

Background: Mathematical models of cardiac electrophysiology are beginning to be used for safety testing of new pharmaceutical compounds, to identify potential for increased pro-arrhythmic risk as a drug side effect [1]. There are substantial challenges in identifying the most appropriate models, parameterising them whilst considering uncertainty and variability, and designing experiments to do these tasks efficiently [2-5].

Aims: The grant will be developing and refining mathematical cardiac electrophysiology models for ion channels and cardiac cells for use in predicting pharmaceutical drug-induced changes to cardiac activity and subsequent risk in the clinic.

Team: You will be joining a team working on the project based in the School of Mathematical Sciences in Nottingham: the principal investigator Prof. Mirams; a senior postdoctoral research associate/fellow; three postdoctoral research associate/fellows; a dedicated research software engineer; and a number of PhD students based in Nottingham and in partnership with industry. We are a strongly collaborative team with shared open-source code development working jointly on a shared research programme – we work closely with other computational groups, experimental laboratories, industrial partners and international drug regulators. Post holders will undertake research visits to conduct their own experiments and collaborate with experimental electrophysiology groups: particularly in UMC Utrecht in the Netherlands; and the Victor Chang Cardiac Research Institute in Sydney, Australia. As a result of the unique collaborative opportunities described above, applicants should have a very strong interest in interdisciplinary and team-based research. You will be responsible for writing up your work for publication and can use your initiative and creativity to identify areas for research, work collaboratively in interdisciplinary teams, develop research methods, and extend your research portfolio.

Your particular focus (depending on the strengths and interests of the successful candidate) could include:

- Use of dynamic-clamp (real time simulation/experiment interaction) in model building.
- Cell-specific electrophysiology model construction.
- Working on methods for experimental design, to optimise parameter identifiability, but also to perform model selection and to minimise the effect of experimental artefacts.
- Building on the Cardiac Electrophysiology Web Lab (<https://scrambler.cs.ox.ac.uk/>) to record and reproduce the process of fitting a model to data and testing it.

We are looking for extensive experience in **any one of**:

- Mathematical modelling involving numerical simulations, e.g. ODE, PDE or agent-based modelling, ideally for the dynamics of a biological system
- Statistics/data science – for instance, fitting mechanistic models to real experimental data and performing uncertainty quantification/inference in a frequentist or Bayesian framework.
- Experimental electrophysiology (e.g. manual patch clamp) – for instance, using voltage-clamp protocols to characterise an ion channel current. In this case you will have a desire to combine extended overseas visits to collaborators' labs to undertake your own experiments with learning to do your own experimental design and computational ion channel modelling here in Nottingham.

Relevant Publications

1. G. R. Mirams *et al.*, "Simulation of the effect of compounds on multiple ion channels provides improved early prediction of their clinical torsadogenic risk," *Cardiovasc. Res.*, **91**(1):53–61, (2011).
2. Mirams, G.R., Pathmanathan, P., Gray, R.A., Challenor, P. & Clayton, R.H. Uncertainty and variability in computational and mathematical models of cardiac physiology. *J. Physiol.* **594**, (2016).
3. Beattie, K.A., Hill, A.P., Bardenet, R., Cui, Y., Vandenberg, J.I., Gavaghan, D.J., de Boer, T.P. & Mirams, G.R. Sinusoidal voltage protocols for rapid characterisation of ion channel kinetics. *J. Physiol.* **596**, 1813–1828 (2018).
4. CL Lei, M Clerx, D.J. Gavaghan, L. Polonchuk, GR Mirams, K Wang (2019). Rapid characterisation of hERG channel kinetics I: using an automated high-throughput system. *Biophysical Journal* **117**(12):2438-2454 (2019) doi:10.1016/j.bpj.2019.07.029.

5. CL Lei, M Clerx, DG Whittaker, DJ Gavaghan, TP de Boer, GR Mirams (2020) Accounting for variability in ion current recordings using a mathematical model of artefacts in voltage-clamp experiments. *Philosophical Transactions of the Royal Society A* **378**:20190348. doi:[10.1098/rsta.2019.0348](https://doi.org/10.1098/rsta.2019.0348)

Person specification

	Essential	Desirable
Skills	<ul style="list-style-type: none"> ▪ Excellent oral and written communication skills, including the ability to convey complex information clearly and accurately. ▪ Ability to devise, advise on and manage a research programme. ▪ Ability to work both independently and collaboratively as part of a multidisciplinary and multicultural team. 	<ul style="list-style-type: none"> ▪ Previous success in gaining support for externally funded research projects.
Knowledge and experience	<ul style="list-style-type: none"> ▪ Consistent track-record in developing, performing and publishing peer-reviewed research of international quality in: <ul style="list-style-type: none"> ○ EITHER mechanistic biological modelling; ○ OR statistical inference for mechanistic modelling. ○ OR experimental electrophysiology (e.g. patch clamp). ▪ Excellent programming skills, including use or development of scientific computing software (for example one/some of Matlab, R, Python, Stan, C++, etc.). Including experience writing code for <ul style="list-style-type: none"> ○ EITHER numerical solution of differential equations; ○ OR optimisation/inference. ○ OR post-processing experimental traces 	<ul style="list-style-type: none"> ▪ Experience of <ul style="list-style-type: none"> ○ EITHER developing electrophysiology models ○ OR model selection, experimental design, uncertainty quantification ○ OR experimental work on cardiac cells or cardiac ion channels ▪ Experience of working in interdisciplinary teams. ▪ Experience of supervision of junior colleagues.
Qualifications, certification and training	<ul style="list-style-type: none"> ▪ PhD or equivalent in a relevant branch of mathematics, statistics, physics, control engineering, or a closely related discipline. 	



The University of Nottingham is focused on embedding equality, diversity and inclusion in all that we do. As part of this, we welcome a diverse population to join our work force and therefore encourage applicants from all communities, particularly those with protected characteristics under the Equality Act 2010.

Expectations and behaviours

The University has developed a clear set of core expectations and behaviours that our people should be demonstrating in their work, and as ambassadors of the University's strategy, vision and values. The following are essential to the role:

- Valuing people** Is always equitable and fair and works with integrity. Proactively looks for ways to develop the team and is comfortable providing clarity by explaining the rationale behind decisions.
- Taking ownership** Is highly self-aware, looking for ways to improve, both taking on board and offering constructive feedback. Inspires others to take accountability for their own areas.
- Forward thinking** Driven to question the status quo and explore new ideas, supporting the team to “lead the way” in terms of know-how and learning.
- Professional pride** Sets the bar high with quality systems and control measures in place. Demands high standards of others identifying and addressing any gaps to enhance the overall performance.
- Always inclusive** Ensures accessibility to the wider community, actively encouraging inclusion and seeking to involve others. Ensures others always consider the wider context when sharing information making full use of networks and connections.

Key relationships with others

