

About the project:

This project (funded by the John Templeton Foundation) investigates the evolutionary transitions in individuality, such as the transition from unicellular life to multicellular organisms. The approach will build on recent developments unifying evolutionary theory with learning theory (Watson & Szathmary, 2016, *TREE*, 31(2), 147-157). This work converts (connectionist) models of distributed learning and cognition, already well-developed in computer science/neural networks/machine learning, to deepen and expand our understanding of natural evolution. The candidate will use computational modelling to explore the evolution of network structure and its effect on ecological/developmental organisation and evolutionary capabilities. This will characterise the type of relationships and organisation that is needed to convert a collection of (previously) independent evolutionary individuals into a new level of organisation that functions and evolves at a new, higher level of individuality. In particular, we will explore the hypothesis that the conditions that enable evolution to exhibit a transition in individuality are predicted by the conditions that enable learning systems to induce and exploit deep models, a.k.a. deep learning.

The successful candidate, based in Southampton, will also work with co-investigators Chris Buckley (University of Sussex, UK.) and Mike Levin (Tufts University, USA). As a part of this team, the candidate will also work closely with PhDs and another post-doc dedicated to this project and on related projects.

The candidate:

Appropriate skill sets include computational modelling of gene-regulation networks, ecological dynamics/community network modelling, theoretical population genetics, mathematical modelling of biological evolution, social evolution theory, adaptive dynamics, evolutionary game theory, computational individual-based modelling, complex adaptive systems, algorithmic/functional modelling of evolutionary adaptation.

Applicants must be capable of building bridges that link between evolutionary biology and computer science and have a PhD or equivalent professional qualifications and experience in either evolutionary theory (e.g. adaptation, selection, evolutionary systems biology, mathematical biology, social evolution theory), with strong mathematical skills and experience in simulation modelling/programming, OR a PhD in computer science/maths/physics (e.g. algorithms, machine learning, complex systems/dynamical systems modelling, optimisation) with strong knowledge/experience of working on applications in theoretical evolutionary biology.

Applications must include a CV, publications list, the names of three referees and a covering letter explaining your current interests and relevant background.

Equality, diversity and Inclusion is central to the ethos in the School of Electronics and Computer Science. We particularly encourage women, Black, Asian and minority ethnic, LGBT

and disabled applicants to apply for this position. We are committed to improving equality for women in science and have been successful in achieving an Athena SWAN bronze award in April 2020. We give full consideration to applicants that wish to work flexibly including part-time and due consideration will be given to applicants who have taken a career break. The University has a generous maternity policy\*, onsite childcare facilities

The University of Southampton is in the top 1% of world universities and in the top 10 of the UK's research-intensive universities. The University of Southampton is committed to sustainability and being a globally responsible university and has recently been awarded the Platinum EcoAward. Our vision is to embed the principles of sustainability into all aspects of our individual and collective work, integrating sustainable development into our business planning, policy-making, and professional activities. This commits all of our staff and students to take responsibility for managing their activities to minimise harm to the environment, whether this through switching off non-essential electrical equipment or using the recycling facilities.

\*subject to qualifying criteria

Links:

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