Editorial/Introduction to the Artificial Life 2015 Conference Special Issue

Simon Hickinbotham**
Susan Stepney*,**
University of York

1 Introduction

The 13th European Conference on Artificial Life (ECAL 2015) was held in York, United Kingdom, July 20–24, 2015, hosted by the York Centre for Complex Systems Analysis at the The University of York. ECAL 2015 showcased a wide range of topics in Artificial Life, bringing together world-leading researchers to discuss the latest advances. Artificial Life is an interdisciplinary field, and as such submissions from across the spectrum of scientific and humanities disciplines were presented, that considered the main conference themes of *Embodiment, Interaction, Conversation*.

The full conference proceedings of the contributed peer reviewed papers [1] were published by MIT Press. This issue of the Artificial Life Journal brings together five of the best papers from the conference, as determined by the original review process. The authors were invited to extend their original contributions for this special issue.

2 The Papers

Ackley and Ackley

Our special issue opens with an introduction to the ***ulam*** programming language for Artifical Life, eschewing the 'robust attractor' of conventional models of computing. ***ulam*** is designed to perform computation in a more life-like manner, and the paper presents a set of design principles that emerge from abandoning deterministic execution and serial programs for a 'best effort', asynchronous execution model that is inherently more robust and scalable.

Williams

Williams develops an object-oriented combinator chemistry, within which a self-replicating program is able to reproduce via asynchronous spatial processes. The themes are similar to Ackley and Ackley, but here the focus is on the implementation of self-replication rather than the underlying computational model. The paper is a welcome example of using modern programming techniques to reveal new features of self-replicating systems.

LaBar, Hintze, and Adami

Theory of self-replication has a long history in Artificial Life. Self-replicating programs are typically designed by hand in parallel with the design of the language in which they are implemented. LaBar et al. use the Avida system to investigate the characteristics of randomly-assembled programs. This gives an opportunity to explore the concepts of replication and evolvability independently, since optimization in replication is related to length, but optimization in terms of evolvability may be due to other factors.

* Contact author.
** University of York. E-mail: susan.stepney@york.ac.uk

 Artificial Life 22: 429–430 (2016) doi:10.1162/ARTL_e_00218

Agmon, Gates, and Beer

The issue of adaptation vs. replication is also touched upon in the paper by Agmon, Gates, and Beer. Here, a network of sequential perturbations is used to reveal trends in how a model protocell can move between configurations in a changing environment. This analysis reveals contrasting roles for local vs. global adaptivity that complements the observations of LaBar et al.

Brodsky

Perturbations in the environment are a well-known issue in Artificial Life. Less commonly studied are externally-driven perturbations to the ontongeny of a developing organism. Our final paper in this special issue is by Micah Brodsky, and uses a physics-based model of embryonic epithelial tissue, arguing that such models require independent, overlapping development mechanisms in order to be robust to both genetic change and environmental variation.

Acknowledgments

Our thanks go to all the contributors for their hard work in getting their papers prepared and revised. All submissions received multiple reviews from external reviewers, and we thank them for their timely and in-depth reviews.

References

[1]. Andrews, P., Caves, L., Doursat, R., Hickinbotham, S., Polack, F., Stepney, S., Taylor, T., & Timmis, J. (Eds.). (2015). *Proceedings of the European Conference on Artificial Life 2015*. Cambridge, MA: MIT Press.