

SCBCS Proposal: Planning a Review Paper on Open-Ended Evolution

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1 Introduction

The main outcome of the first Workshop on Open-Ended Evolution (OEE1), held during ECAL 2015, was a report that summarised the participants' individual and group thinking on OEE (Taylor et al., 2016). The report covered OEE concepts, definitions, hallmarks, mechanisms, measures and results. While we believe that the report is an important contribution to the field, it does not claim to be a comprehensive review of the history and state-of-the-art in ideas relating to OEE across the subject's full interdisciplinary breadth.

Another new paper on the topic, co-written by some of the participants of OEE1 and others, is currently in press in *Theory of Biosciences* (Banzhaf et al., 2016).¹

While both of these publications have a large number of co-authors, there remain various potentially relevant fields that are not represented (see Section 3 below). The plain fact is that, to date, there has been no comprehensive interdisciplinary review of the concepts, history and state-of-the-art of OEE.

We would like to use the SCBCS workshop as a launchpad to organize the writing of such a review. We envisage assembling a core team of authors who will write the bulk of the review, together with a larger team of advisors from who will provide feedback, offer suggestions for further references, etc. However, we would like to spend some time at the workshop discussing how best to organize the effort.

We aim to consider at least the fields listed below (Section 3), and will invite colleagues from all of these fields to be involved in the effort (some in the core writing team and more in the larger advisory team). We have listed some potential participants and contacts in Section 4.

¹Other developments after OEE1 include the elaboration of ideas presented at the workshop by Emily Dolson, in an online article by Dolson and colleagues <http://devosoft.org/whats-holding-artificial-life-back-from-open-ended-evolution/>.

At the OEE1 workshop, several participants claimed that biologists don't often talk about OEE. One of the outcomes of a comprehensive interdisciplinary review paper would be to demonstrate that OEE-related topics have been and are discussed in the biological literature, albeit not generally using the term OEE. Overall, we would like to highlight the similarities in concepts across the various fields listed in Section 3, and also identify the differences when similar concepts are applied in different areas. In doing so, we believe the review will be of interest and use to researchers in all of the fields, and may also suggest areas for new interdisciplinary collaborations.

2 Topics to be addressed

- For each field:
 - OEE history
 - OEE current concepts
 - OEE hallmarks
 - Hypothesized OEE requirements/mechanisms
 - OEE measures
 - OEE examples, results, demonstrations
- Synthesis across fields: commonalities and differences

3 What fields will the review bring together?

- ALife (in all varieties, soft, wet, hard)
- Evolutionary biology (theoretic and practical [LTEE])
- Ecology
- Archaeology / anthropology (cumulative cultural evolution)
- Animal behaviour (cumulative cultural evolution)
- Philosophy
- Biosemiotics
- Evolution of Technology
- Astrobiology

4 People

- Tim Taylor
- Mark Bedau
- Alastair Channon

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- Nick Barton (evo biology)²
 - Hywel Williams (ecology)³
 - W. Brian Arthur (technology)
 - Richard Lenski
 - Mike Wiser
 - Larry Yaeger
 - Andreas Wagner
 - Wolfgang Banzhaf
 - Peter Cariani (biosemiotics)
 - Barry McMullin
 - Charles Ofria
 - Emily Dolson
 - Paul Rainey (evo biology)⁴
 - Richard Watson
 - Andrew Whiten (animal behaviour)⁵
 - Colin Renfrew (anthropology)
 - John Stewart
 - Steen Rasmussen
 - Dave Ackley
 - Sara Imari Walker (astrobiology)
 - Peter R. Wills
 - Lee Spector
 - Ken Stanley
 - Joel Lehman
 - Brian Calcott (philosophy)
 - Nigel Goldenfeld
 - Nicholas Guttenberg
 - Normal Packard
 - Chrisantha Fernando
 - George Kampis

References

Banzhaf, W., Baumgaertner, B., Beslon, G., Doursat, R., Foster, J. A., McMullin, B., de Melo, V. V., Miconi, T., Spector, L., Stepney, S., and White, R. (2016). Defining and simulating open-ended novelty: Requirements, guidelines, and challenges. *Theory in Biosciences*. (in press).

²<https://ist.ac.at/research/research-groups/barton-group/>

³http://biosciences.exeter.ac.uk/staff/index.php?web_id=Hywel_Williams

⁴<http://evolution.massey.ac.nz/paul.html>

⁵<http://biology.st-andrews.ac.uk/contact/staffprofile.aspx?sunid=aw2>

Taylor, T., Bedau, M., Channon, A., Ackley, D., Banzhaf, W., Beslon, G., Dolson, E., Froese, T., Hickinbotham, S., Ikegami, T., McMullin, B., Packard, N., Rasmussen, S., Virgo, N., Agmon, E., Clark, E., McGregor, S., Ofria, C., Ropella, G., Spector, L., Stanley, K. O., Stanton, A., Timperley, C., Vostinar, A., and Wiser, M. (2016). Open-ended evolution: Perspectives from the OEE1 workshop in York. *Artificial Life*. (in press).