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Conference Report

Report of the 2015 British Society for Protist Biology Spring Meeting

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The 2015 British Society for Protist Biology annual Spring Meeting was held at the University of Huddersfield on the 15-17th April. The meeting comprised two symposia and two sessions of contributed papers. The symposium on *Experimental Evolution in Protists* was organized by Ewan Minter (University of York) and *The Origins of Multicellularity* session was organized by Martin Carr (University of Huddersfield). The two symposia covered a variety of topics, with highlights including the use of protists to study the potential future effects of climate change, as well as the genetic changes that occurred in the genomes of the unicellular ancestors of animals. The programme included 13 invited speakers and seven contributed papers.

Will Ratcliff (Georgia Tech) opened the conference with a plenary talk which spanned the themes of both meeting symposia. Through the use of a simple, but elegant, selective pressure, Will showed that unicellular *Saccharomyces cerevisiae* could be forced to evolve a multicellular, 'snowflake', form. The snowflake yeast are the result of mutations in a single gene and, once formed, evolve divisions of labour between the cells in the colony.

The main *Experimental Evolution in Protists* session commenced on the morning of the second day with an introductory talk by Michael Brockhurst (University of York), explaining how the rapid life cycle of unicellular organisms can facilitate experimental evolution studies on clinical and environmental research questions. Ville Friman (Imperial College, London & University of York) followed the opening talk by discussing the role of prey-predator interactions in protistan evolution. Ville's work showed that as a result of protist and bacterial interactions, microbial communities rapidly develop greater complexity; the implication of this is that simple, lab-based, pairwise interactive studies are likely to be poor indicators of natural communities.

Experimental evolution studies require a broad range of techniques in order to link both genetic variation and adaptation with the ecological drivers of natural selection. Chris Lowe (University of Exeter), Jo Marrison (University of York) and Duncan Cameron (University of Sheffield) provided a combined, multi-disciplinary talk on a diverse range of techniques employed in experimental evolution studies. Their talks concentrated on next-generation DNA sequencing, imaging and cytometry, as well as chromatographic technologies. The final two talks in the Experimental Evolution symposium were concerned with the potential impact of climate change on protistan communities. Oliver Katz (Université Montpellier 2) discussed the effect of temperature change on *Paramecium*, showing that selection for high temperature can utilise standing genetic variation. Oliver's theoretical work however showed that *de novo* mutations are required in order for populations to undergo long-term adaptation to higher temperatures. Kai Lohbeck (Helmholtz-Zentrum für Ozeanforschung, Kiel) discussed his studies on the effect of CO_2 levels and ocean acidification on the coccolithophorid *Emiliana huxleyi*. Within the laboratory, this globally important component of phytoplankton shows rapid adaptation to increased CO_2 levels, indicating that natural populations may be able to adapt at climate change relevant timescales.

The contributed paper sessions had an emphasis on talks related to the two symposia and covered taxa from a wide range of eukaryotic diversity. The first session began with a talk by Emanuel Fronhofer (Universität Zürich) on experimental studies on range expansion and life history strategies. There then followed two talks on amoebozoan evolution. Christina Schilde (University of Dundee) examined *Dictyostelium* multicellularity and body plans in light of a 98 species phylogeny. Gareth Bloomfield (University of Cambridge) presented the second amoebozoan talk and detailed the use of selection lines in *Dictyostelium* feeding modes. The first session of contributed papers closed with a talk by Sonja Rueckert (Edinburgh Napier University), who gave an enlightening presentation on gregarines. This major group of parasitic apicomplexans are relatives

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of the malarial and toxoplasma parasites, but are only known to have invertebrate hosts. Sonja presented phylogenetic analyses to show how traits such as nutrition and locomotion have evolved within the group.

The contributed paper session resumed with talks on yeast evolution and the impact of climate change on green algae. Martin Carr (University of Huddersfield) presented a comparative genomics study, performed along with undergraduate project student Laura Wainman (now a Ph.D. student at the University of Western Australia), showing that LTR retrotransposons frequently undergo horizontal transfer between yeast species. Martin showed that many of the transfer events identified were the result of hybridisation between species, followed by introgression. The final talk in the contributed paper session was given by Ph.D. student Georgina Brennan (University of Edinburgh). Georgina remarked that many experimental evolution studies on climate change failed to accommodate the large number of environmental drivers faced by genuine ecological communities. Georgina's research therefore used as many as eight variable environmental conditions in order to study adaptation in *Chlamydomonas reinhardtii*.

The final morning of the meeting held the *Origins of Multicellularity* symposium, which covered three of the major eukaryotic supergroups in Amoebozoa, Opisthokonta and the stramenopiles. The talks highlighted the different 'genetic toolboxes' used by eukaryotes to evolve multicellular forms, but also showed that similar mechanisms have been employed independently in different groups to evolve multicellular bodies. It was clear from the symposium that the study of eukaryotic multicellularity is a highly dynamic field, with new model organisms being established in a broad range of taxonomic groups.

Iñaki Ruiz-Trillo (Institut of Evolutionary Biology, Barcelona) gave a highly informative, and entertaining, plenary talk on genome evolution within the close unicellular relatives of animals. Much recent research in this field has centred on the choanoflagellates, however Iñaki discussed the work currently undertaken in his lab on two other holozoan groups – Filasterea and Ichthysporea. Iñaki showed that many close relatives of animals possess genes once thought to be unique to animals and that the unicellular ancestor of animals must have had complex genomes. Daniel Richter (Station Biologique de Roscoff) gave the first of two talks on choanoflagellates. Daniel showed through the use of transcriptomics that the last common ancestor of choanoflagellates and animals was a genetically complex organism and that gene loss had occurred in both the animal and choanoflagellate lineages. This gene loss does not appear to have been stochastic, with animals predominantly losing metabolic genes and choanoflagellates losing complexity in genetic regulation. Frank Nitsche (Universität zu Köln) followed up Daniel's talk with a more generalized overview of choanoflagellate biology, including a report on the use of cell penetrating peptides for choanoflagellate genetic manipulation in his laboratory.

The final two talks in the symposium moved away from holozoans. Mark J. Cock (Station Biologique de Roscoff) discussed the evolution of multicellularity and sex in the brown algae, using *Ectocarpus siliculosus* as a model organism. Mark showed that, unlike its relatives, *Ectocarpus* has a large repertoire of microRNAs involved in gene regulation; in addition, Mark showed that there is a correlation between multicellular complexity and miRNA content within eukaryotes. The *Origins of Multicellularity* symposium was drawn to a close by Pauline Schaap (University of Dundee) who presented a wide-ranging talk on aggregate multicellularity in social amoebae. Pauline showed that the group showed considerable morphological diversity and that the model organism, *Dictyostelium discoideum*, was a member of a clade that had evolved larger fruiting bodies than those present in other clades, as well as a novel chemoattractant for the aggregation of multicellular 'slugs'.

The meeting closed with concluding remarks on the synergy shown between the two symposia and the announcement that the 2016 BSPB meeting would be hosted by Genoveva Esteban at the University of Bournemouth.