

Microbial Symbiosis Meeting: Future Meetings and Brainstorming Points

Dear all,

I hope you have all had a good break. I want to thank you all again for your participation in the MSM workshop in London in December. I found it very useful, enjoyable and made a lot of good contacts, and many of you have echoed this experience also which is great.

On the strength of the success of our workshop, Protistology UK has proposed to hold a follow-up session on Microbial Symbiosis at the 2021 Microbiology Society Annual Meeting. We see this as a good opportunity to consolidate the interactions and new collaborations from the 2019 meeting and continue to contribute to propelling this field. Keep an eye out for this either through Protistology UK or the MicroSoc.

Further to this, Protistology UK will be organising further workshops in the Autumn/Winter window this year and going forward. Many of you identified possible themes for workshops that would be useful at the MSM (e.g. cryopreservation methods), and we think these would be great ways to further build this community. If you would like to be part of these workshops or get involved nominating and even contributing to their running then you know how to do this ([how to join P-UK](#))!

Finally, below is a summary digest from the group notes on our brainstorming session on Unanswered Questions in microbial symbiosis, and tools and interactions that might help facilitate addressing these questions. Hopefully, these will continue to stimulate your thoughts, ideas and strategies for research in this field, and promote collaborative engagement with others. I also reattach the meeting Program that has a list of all participants and their contact details at the end.

Best wishes for 2020, and we hope to see you all again soon,
Ross (on behalf of the organising team)

Questions in Symbiosis:

What are the boundaries of symbiosis (what is the most useful definition of symbiosis)?

What processes/mechanisms define host-symbiont specificity?

What are the evolutionary drivers towards symbiotic interactions?

What is the full range of communication mechanisms that exist between symbionts?

Do we have representative knowledge of host-symbiont interactions, or is our knowledge biased/skewed? What symbioses might be being systematically ignoring (viruses, bacteria) or understudied (fungi, algae)? What tools/strategies could best assess this?

Is the often-made assumption of mutualism (mutual benefit) in symbioses appropriate? How often is it not appropriate?

Does the concept of 'evolutionary end-points' or 'goals' of symbiosis adversely influence how the field thinks about symbiosis (e.g. endosymbiont -> organelle)?

Does language inappropriately bias our thinking about symbiosis (e.g. symbiotic 'breakdown' suggests a failure or negative outcome, but it could equally be a mechanism of adaptability)?

How relevant are conclusions based on lab studies to biology in the environment, and how is this best tested?

Can symbiont transmission be experimentally manipulated, and its mechanisms defined?

How is host health and disease influenced by symbiotic relationships and what are the mechanisms for this (e.g. cell division, immune systems, limitations of nutrients, bottlenecks to recovery, interactions between partners)?

What are the strengths/weaknesses of focusing effort on select good models of symbiosis rather than trying to capture and study great diversity of these systems?

What are the eco evolutionary mechanisms and processes that drive symbiosis in communities?

Are the longer-term evolutionary processes and outcomes of symbiosis being well aligned with understanding of shorter-term processes?

Tools:

Culturing methodologies (identifying what the organism needs) — there might be good potential to collaborate with zoos and aquaria for organisms that require more complex environments that haven't been recapitulated in laboratory culture conditions.

Cryopreservation methods are very important for culture preservation including time-points of experiments for future analysis (a workshop on this could be useful)

Single-cell Omics (genomics, transcriptomics, proteomics, metabolomics)

nanoSIMS, microfluidics (Roman Stocker a possible contact),

Expanded experimental genetic systems in diverse taxa (greatly needed)

Field-accessible/deployable equipment

Employment of standardised methods for genetic construct development (e.g.

Golden Gate platforms or similar)

Better metadata with sampling

Real-time in situ monitoring equipment (e.g. for algae: Biorad TC20, Millipore Countessa)

More accessible imaging facilities including tools for quantitative analysis (Euro bio imaging network could be one option to explore)

A multi-disciplinary tool-development workshop would be useful bringing together diverse fields (physics, bioinformatics, chemists)

Development of further ecological models.

People:

More modelers, theoreticians

Mix different people together working on different systems

Physicists

Chemists: measure and synthesis relevant molecules (e.g. signaling molecules)

More use of the QMM (Questions, Models, Methods) introductions at meetings and workshops to facilitate interactions.

Links with medical researchers to combine tools and different perspectives

In cross-discipline collaborations it is often important to identify questions relevant and interesting to both/all parties rather than hoping to use another as a 'service'.

While the latter can work well in select short-term instances, it has the potential to discourage further collaboration if the engagement and reward is not well shared