AMERICAN SOCIETY FOR MICROBIOLOGY

Microbial Ecology and Evolution Retreat Final Report

ASM Headquarters, Rooms 101AB
December 19-20, 2017

The Microbial Ecology and Evolution (MEE) community met for a retreat 12/19-20/2017 at ASM headquarters. Four COMS members were in attendance (Vic DiRita, Siobain Duffy, Morgan Langille, and Jay Lennon), three ASM officers (Stefano Bertuzzi, Timothy Donohue, Marylynn Yates), the ASM Journals Chair (Patrick Schloss), and a mix of invited MEE researchers, ranging from postdocs to senior scientists (Maria Bautista, Vaughn Cooper, Melissa Duhaime, Will Harcombe, Kostas Konstantinidis, Sam Diaz Muñoz, Elizabeth Ostrowski, Matthew Shrenk, Thea Whitman).

The purpose of the retreat was to:

- Define the mission of our community within COMS and ASM
- Identify the horizons of MEE research
- Identify opportunities for ASM to play a greater role in promoting MEE research
- Prioritize steps to increase MEE researcher engagements with ASM and the annual Microbe meeting.

Mission of Our Community

The group suggests that this best reflects the breadth and focus of our science within the COMS is "Ecology, Evolution, and Biodiversity (EEB)." We recommend that the corresponding Microbe track be renamed to this as well.

Discussion at the retreat surrounding the name led us to draft the following vision statement, which highlights both research and education goals.

> **Ecology, Evolution, and Biodiversity (EEB) Vision Statement**
> *We study processes underlying variation at molecular, individual, population, community, and ecosystem scales to understand patterns in microbial diversity and function. Our research encompasses laboratory, clinical, engineered, and natural settings. We aim to advance ecological and evolutionary theory in microbes and other organisms in basic and applied research, and to promote microbial ecology, evolution, and biodiversity in biological education.*

Horizons of Microbial Ecology and Evolution Research

Breakout discussions that focused on where microbial ecology and microbial evolution research is heading in the next five years led to productive discussion about the following topics:

New horizons in microbial ecology include:

- Improved tools including quantitative methods, culturing strategies, and bioinformatic tools
- Understanding factors controlling community assembly
- Predicting ecological processes using phylogenetic and traits-based approaches
- Applying ecological theory to novel environments and in microbiome research
- Integration of microbial information into Earth system models
- Developing a unified theory to understand diversity of macroscopic and microscopic organisms.

New horizons in microbial evolution include:

- Experimental evolution and genomics of single lineages using single-cell approaches, intensive temporal or latitudinal sampling

- Testing quantitative predictions from theory and models
- Moving from descriptive approaches for microbiomes to quantitative measurement, e.g., population genetics of microbiomes
- Integration of microbial evolution into K-16 classrooms, medical and nursing curricula; evolution as a part of all microbiology courses, microbes as a standard component within general evolution courses
- Advances in taxonomy: uncultured lineages, functional genes
- How microbial evolution results apply to macroscopic organisms and vice versa

We also spent time discussing: i) how do ecology and evolution research bridge to other subdisciplines in microbiology? and ii) how do our methods move into research areas within other COMS communities? For example, the strengthening links between experimental evolution and synthetic biology were mentioned, and it was agreed that the Microbe meeting provides a great forum for mixing EEB research with host-microbe interactions, epidemiology, environmental microbiology, and clinical applications.

Opportunities for ASM

Throughout the retreat, we identified areas unclaimed by any professional society or journal (to our knowledge) that could be topics for ASM to tackle.

Microbial systematics has traditionally been a slowly moving field, but there is a need for leadership in taxonomy of uncultured phyla. As these make up the majority of prokaryotic diversity, ASM would be well served by helping to formalize these groups. Perhaps ASM could attract the leading researchers to a single meeting or retreat and ensure that there is concordance in naming and methods for grouping.

As the unit under consideration moves from the individual lineage to the community (microbiome) there is a need to examine whether existing theory (e.g., population genetics) needs modifications or additions to accommodate the experiments and analyses of tomorrow. This would be a fantastic topic for a working group or small meeting, and the resulting models (or validation of existing models) would be of use to a wide range of microbiologists working to analyze change in microbiomes over time.

As NSF is a common, and often primary, source of funding for microbial EEB research, ASM could provide resources and guidance on developing strong Broader Impact activities for NSF grants. This has been undertaken by some other research areas (e.g., oceanography: www.cosee.net). ASM has already made progress in this area through its aggregation of K-16 microbiology lesson plans. Perhaps the development of such resources only requires repackaging of information rather than content generation.

Perhaps the Microbe meeting could annually alternate foci between microbial ecology and microbial evolution (for instance, in selection of symposia). The premier meeting in microbial ecology (International Society for Microbial Ecology) meets in even years often outside of North America, and the GRC on Microbial Population Biology (the cradle of microbial experimental evolution) meets in odd years, so Microbe should consider highlighting ecology in odd years and evolution in even years.

Should the Experimental Microbial Evolution meeting not be reconstituted, ASM should explore having it biennially as a "meeting within the meeting" at Microbe.

Steps to Increase EEB Researcher Engagement

Microbe Meeting

Our group had some suggestions for how to improve abstract submission for EEB-related topics. **We propose that the subtracks be simplified into the three areas highlighted in our suggested name change.** This inclusive approach was deemed more inviting than the current subtracks.

We consider this our highest priority suggestion.

Proposed EEB Subtracks

- Microbial Ecology
- Microbial Evolution
- Microbial Biodiversity

We propose to award best student/postdoc EEB poster and/or EEB talk awards. While we would like to identify a source of funds for a few awards (<$500 total), we believe this will increase junior scientist engagement at Microbe, and be an encouragement to submit to the simplified EEB subtracks. Poster and/or talk awards serve an important role for developing scientists and this recognition can have an outsized impact on their CVs. A similar suggestion that is decoupled from the Microbe meeting would be an annual award for best student-led paper in EEB in an ASM journal.

Other Meetings

ASM should consider taking a booth at microbial ecology and evolution meetings (ISME, ESA) to recruit members and for the Microbe meeting.

Encourage branches to host meetings with an ecology and evolution focus to bring in researchers who don't currently consider ASM home—have a speaker or poster session that could appeal to EEB researchers of macroscopic organisms as well.

ASM Journals

Ensure ASM journals have sufficient EEB expertise in Editors, Associate Editors, and on the editorial board. Perhaps there can be a COMS-inspired reappraisal of the journal editing rosters with an eye to making sure there is expertise to support the eight communities.

Consider thematic issues or sections of issues of ASM journals to attract submissions. This is a more universal suggestion than just for EEB research, but we considered this a way to bring papers that might be submitted to newer, online-only journals that thrive on 'special issues' back to the ASM journal portfolio. We discussed potential festschrifts for retirements that can't be too far off.

For the Website

More front-facing material on diverse microorganisms or microbial biodiversity. We first thought of this as web content, but there is also the need for more K-16 lesson and lab plans to tackle these topics. As this involves content generation, we want to be active in finding interested junior and senior researchers who would want to contribute. Creating this content could be part of the "Broader Impact" outreach we suggested in opportunities, above.

Assessing Success

We agreed on a few areas we felt we could improve in the upcoming years, where we could measure the success of our efforts. We focused on both the Microbe meeting and year-round engagement.

We will hold an EEB social event at Microbe 2018 (and at each future Microbe meeting). We will start without funding, holding either an informal event (happy hour at a nearby bar) or will try to organize something at the EEB track hub at the meeting itself. This is a successful event for community cohesion for some divisions at ASM, such as the Division M mixer. We aim to increase networking opportunities and increase value for EEB researchers attending Microbe. If other COMS communities feel similarly, this would be a good pitch from COMS to the ASM leadership for support.

We will beat the bushes on social media and in our networks to increase the EEB-related symposium applications from the current low numbers (≤5 to ≥10/year) starting with submissions for Microbe 2019. This

not only can bring more EEB researchers to the Microbe meeting, but may increase the exposure of all attendees to our research.

We will work with the ASM social media team to develop either a Twitter account (our preference) or a hashtag to promote and aggregate ASM EEB information. We will aim for at least 25 tweets a year. One use of the account will be to poll the community to better understand its needs (e.g., why do you or don't you publish in ASM journals?). In an email complement to this, we will work with ASM membership to develop a listserv with members affiliated with Divisions N and R.

The EEB members of COMS will make ourselves available to the Journals Board Chair to assist with review of editors and editorial boards and suggestions of potential EEB researcher additions if he chooses.

Overall, the retreat was quite productive and enjoyable. Attendees greatly appreciated the facilities at ASM headquarters, and the organization and hospitality of many members of the ASM staff. In particular, the retreat could not have been as successful without the efforts of Cheryl Lehr! We thank ASM for the opportunity to brainstorm and plan as a community.