

BII: Evolving Meta Ecosystems (EVOME) Institute

Broadening Participation Plan

Feb 10, 2025 Update

Aug 4, 2025 Update

Overview:

The EVOME Institute seeks to develop a new paradigm for understanding how environmental changes play out across large and connected landscapes, or meta-ecosystems, in which the movements, interactions, and evolution of organisms fosters interconnectedness. The mechanisms that drive these rearrangements occur across scales from genes to meta-ecosystems in landscapes. This goal is fundamentally integrative across biological disciplines and requires a broad array of expertise and perspectives. EVOME will partner geneticists, evolutionary biologists, physiologists, population biologists, community ecologists, ecosystem ecologists, quantitative biologists, and modelers.

The EvoME Institute will benefit society by creating a highly trained workforce of biologists who think across disciplines, improve science communication, and enhance participation in specific disciplines. Our goal is that these trained biologists will promulgate EvoME principles in their careers and carry forward these principles into their careers. Our participation plans are designed to overcome barriers to communication among people and disciplines through deliberative team research. It will expand opportunities for undergraduate and graduate study, train postgraduates, and create structured opportunities for cross-disciplinary research and leadership by bringing together interdisciplinary teams of faculty and students. EvoME will broaden scientific literacy for the public by partnering researchers, students, and journalists both in the field in Alaska and in a cutting-edge genomics laboratory.

Identifying Gaps

EVOME is in its first year, therefore we focus on the initial data of the composition of our Institute and its initial strategies. Our research team represents a broad array of disciplines including: (1) bioinformatics, (2) biogeochemistry, (3) animal behavior, (4) ecosystem ecology, (5) evolutionary biology, (6) genetics and genomics (including quantitative genetics and population and landscape genomics), (7) physiology, (8) population and community ecology, and (9) quantitative biology. Complementary disciplines include Earth science, communications, and team science. The proposal team is also demographically broad, including: career stage (9 Full, 3 Associate, 5 Assistant), three who were the first in their family to attend college; and university designations (3 EPSCoR, one Primarily Undergraduate Institution, one Minority Serving Institution).

A gap analysis of participants and interactions suggests that our initial goals to enhance human capital and workforce impact of EVOME should focus on: 1) recruiting expertise in

additional biological disciplines; 2) increasing the participation and retention of early-career scientists, 3) the development of leadership skills, 4) training in interdisciplinary research, 5) training in Team Science.

To achieve these goals, we include multiple mechanisms that foster participation and integration of biological disciplines including: concentration of interactive fieldwork focused in a single location on a shared experimental design with parallel measures on multiple organisms, academic year colloquia that feature speakers who then have the opportunity to become EVOME Fellows with funds for research, in-person or remote annual meetings that rotate among institutions, cross-cutting working groups with early-career scientists in leadership positions, hosting of national symposia, annual *Team Science Retreats*, and an online program management dashboard to track progress.

Actions and Timelines to achieve Goals.

1) *The inclusion of additional expertise in diverse biological disciplines.*

Actions: We will use multiple approaches to expand our *scientist team* by inviting scientists in different biological disciplines to our meetings, and providing seed funding and fellowships. To encourage interactions among a broad range of scientists, we will host a *Colloquium* that features invited speakers with different backgrounds in biology. These scientists will be selected and hosted by students and postdocs, providing them with opportunities to interact and meet new colleagues. Third, we will provide an EVOME Fellowship Award to a new participant to participate in research.

Timeline: Engagement by new participants in the Science Symposia will begin in Year 3, with the Colloquia established as part of the Integrated Biology course in Year 3. The EVOME Fellowship to early-career scientists or researchers from different disciplines will begin in Year 2.

2) *Increasing the participation and retention of early-career scientists.*

We will support early-career scientists by offering ongoing opportunities for problem-solving, career development, and mentoring. This approach enhances participation and retention through real-world challenges, collaborative learning, and peer mentoring. We created an intentional sequence among connected early undergraduate opportunities with options that build from shorter (3-5 week) ongoing programs to a longer *Eyes on the Arctic REU* (7 week) program and then potentially to recruitment as EVOME graduate students. The research-intensive REU experience (*Eyes on the Arctic*) will take place at Toolik Field Station each summer at the time of maximum field research activity, thus increasing interactions with other researchers in diverse disciplines at the field station.

Graduate students and postdocs will be expected to participate in other Biology Integration Institutes through specifically identified networking events, such as BII RCN hosted annual and monthly meetings and workshops. These activities create leadership opportunities and enable participants to share challenges and solutions and oversee the implementation of best practices.

Graduate students and postdocs will be encouraged and supported to present and lead workshop sessions at national meetings and will be leaders in identifying new scientists to invite to Colloquia and the Annual meeting to broaden the scientific disciplines of EVOME.

Graduate students and postdocs also have the opportunity to join together and write a proposal for the EVOME Integration Incentive Research Award. Team Science research has shown that including a grant reward structure can facilitate team goals and that graduate students or postdocs with their own funding are associated with higher levels of breakthrough publications. These teams can include outside graduate students to expand EVOME's reach.

Timeline: Starting in Year 2, the REU program will recruit three undergraduates each year, who will conduct team-centered, inquiry-based research. Undergraduates will partner with EvoME participants, including postdocs and graduate students to develop scientific questions, design experiments, and learn data analysis, how to write papers, and present talks. This will engage early career participants and provide leadership opportunities for graduate students and postdocs.

3) Development of leadership skills.

We have been intentional about building opportunities in leadership. We have defined in our Governance Plan the turnover of members of the Executive Committee and Working Group leaders to allow for workforce progression through the leadership structures and the inclusion of an early career researcher on the Executive Committee to gain experience with high-level institute organization and function. Leadership training will occur in the Team Science workshops and through mentored experiences in mentoring undergraduates.

Timeline: To provide leadership opportunities, we plan: (1) a director transition from Deegan to Urban after Y3; (2) early career leadership mentoring of five Assistant Professors and five postdocs as Working Group co-leaders paired with more experienced participants, with co-leaders transitioning to leaders after Y3; (3) Formal leadership training as part of the Annual Team Science Workshop; (4) Informal leadership training in mentoring students through interactions with more senior team members.

4) Training in interdisciplinary research.

We will create: (1) a new cross-institution *Integrating Biology* graduate course; (2) a field *Eyes on the Arctic* REU program; and (3) an Integration Incentive Fund (IIF) that will provide competitive grants to teams of two to three graduate students/postdocs whose research fuses three biological disciplines.

i) We will develop a graduate course, *Integrating Biology and Biologists*, led by Urban and Wegryzn will be co-taught by co-PIs. The *Integrating* curriculum will provide content-based foundations across the disciplines of genomics, traits, ecology, and ecosystems. The course will cover cross-cutting questions, research methods, data stewardship and analysis, and navigating integrated careers. This year-long, in-classroom, and online multi-institutional course will build an understanding of the shared goals of integrated biology and provide biology integration skills for the next generation of biologists. Class size will be kept small to facilitate the personal interactions that build trust among individuals with different backgrounds. Every year, 15-20 students, including non-EvoME funded students, will meet weekly for two hours (in-person at UConn with online participants from other institutions)

followed by post-class online breakout group discussions based on "blended learning" that suggests that learning during in-class and students' own time increases comprehension.

ii) *Our Eyes on the Arctic* REU program, described above, will initiate interdisciplinary training in the first research opportunity most students experience. Early immersion will illustrate the power of integrative research, and increase retention of students across biological disciplines. The REU program will be based at Toolik Field Station, Alaska, which each summer hosts a supportive community of over 100 international researchers from across the globe and across scientific disciplines. Toolik has weekly 'Talking Shop' seminars that REUs will be expected to attend. REU students will be supervised and mentored by EVOME researchers and will participate in all aspects of EVOME fieldwork. The students will develop, conduct, and present their own unique research projects that support the goals of the EVOME institute.

Timeline: Starting in Year 2, Golden will coordinate with the Science Team to facilitate selection and hiring of REU students. Prior to entering the field, REU students will meet online for field training, to ask questions, and to get to know each other and the EVOME science team. They will receive further training in-person on site. After the field season and completion of the program, REU students will partake in a survey aimed to successively improve upon EVOME's REU experience each year.

iii) Integration Incentive Fund (IIF). Team Science research has shown that including a grant reward structure can facilitate team goals and that graduate students or postdocs with their own funding are associated with higher levels of breakthrough publications. These teams can include outside graduate students to expand EVOME's reach. The IIF adopts the best features of the NSF Doctoral Dissertation Improvement Grant Program in which modest funding enables student-initiated research. All student teams will submit proposals, and each proposal will include budget justifications and a two-minute pitch video thus providing experience in developing research proposals.

Timelines: Urban and Wegrzyn will facilitate the development of the new course in Year 2, with the initial offering in Year 3 and continuing through Year 6. Because of the timing of the grant award which limited field work in Year 1, the REU program will have its first cohort of three students in Year 2 and continue throughout the life of the grant. The Integration Incentive Fund (IIF) will start after Year 2 when students will have had their first immersion in integrated field work.

5) Training in Team Science.

We will conduct Team Science training for team members at all levels (students, postdocs, and faculty) that will focus on methods to create a highly interactive, safe, and inclusive work environment in the lab and the field. EvoME's focus on one Arctic meta-ecosystem and the concentration of interactive fieldwork at Toolik in the summer will foster strong team interactions. Team Science training will improve trainees' capacity to work with peers, as well as with other future, complex teams. Weathers and Olex, both of whom are pioneers in the Science of Team Science, will lead and facilitate discussions. Weathers will lead training on data sharing, authorship, ethics, plagiarism, peer review, and authorship. We will discuss aspects of team science including legacy structures of academia, sources of support, rewards and incentives, success metrics, motivations for collaboration, and differences in credit practices among disciplines. Olex will lead discussions and interactive role-playing on intangibles like

communication, difficult conversations, giving feedback, power and personal relationships (including harassment), accountability, emotional intelligence, and trust. The workshop will provide formal training in the Responsible Conduct of Research that identifies the challenges of working at remote field sites, establishes roles and responsibilities, creates regular mechanisms for communication and check-ins, and defines organizational mechanisms for reporting and responding to issues of harassment. Each participant will commit to an EvoME Code of Conduct. Participants will also receive additional harassment training from Toolik via online tutorials that are required before working at the field station. Participants will also have lab and field safety training.

Timeline: Team science training will begin at the inception of EvoME in Year 1 and continue throughout the grant. Training will be annual at the annual All-Team Science Meeting, with online and virtually training held periodically throughout the year.

How progress will be measured and continuously improved

The EvoME Institute will regularly review and update this plan to reflect best practices and evolving legal requirements and will track success through a project Dashboard which is visible to everyone on our EvoME shared drive. Our executive committee is responsible for ensuring compliance and fostering a productive and safe culture. Employees are encouraged to report any concerns regarding discrimination or workplace inequities, with assurance of protection from retaliation. By upholding these principles, EvoME Institute aims to build a workplace that enables all employees to thrive and to create a new generation of integrative scientists.

We will track success through a project Dashboard that documents individual, team and Institute goals. This Dashboard is managed by the Project Manager. The dashboard will capture narratives about mitigating circumstances and contingency plans to help manage risks and guide plan modifications. Risks, such as site relocation, weather, and lagging field, lab, or data analysis, will be reduced by discussing challenges in open sessions at the *Science Meeting* before each year's fieldwork. Contingencies that require resource re-allocations (e.g., relocating sites) will be openly discussed, and a consensus decision will be developed based on separating people from the problem, using objective criteria, and focusing on a shared research agenda. The external advisory board will also provide guidance on reducing risks.

Programs will be assessed by an external evaluator, Garrett of DelMarva Associates, who will assess progress toward the Institute goals and will share progress with the entire team at annual *Science Meetings* to identify pathways to improvements. To assess and improve Institute outcomes, the evaluator will annually conduct formative (pre-activity) and summative (post activity) interviews and surveys with trainees (students, postdocs) and mentors in the REU program, Team Science Retreat, Biology Behind the By-lines and the Science Symposium.

These assessments will be based on a logic model of self-efficacy, which determines how individuals think, motivate, and perform, which is linked to success and persistence. Garrett will conduct interviews and surveys based on her prior work and utilize metrics and instruments (Table 1) developed with the ExCom. This will assess participants' understanding of integrated biology and best practices of team science (cognitive gains) and will ask participants to reflect on how their participation has changed their perceptions and whether we have achieved a supportive climate. Mentors will be asked how their participation has impacted their own

actions or beliefs. Fellows who receive grant funding will be interviewed to understand if the grant funding achieves our goal, and how the outcomes of their projects align with our mission. Garrett will do longitudinal interviews to identify factors that enhance interdisciplinarity and retention.

Timeline: In the first year, Garrett will collaborate with EVOME to develop a logic model that outlines the project's theory of action. This model will guide evaluation, ensure a shared understanding among staff, and define program goals, activities, progress indicators, expected outcomes, and evaluation methods. In the second year, after onboarding new graduate students and REUs, a formative evaluation will gather baseline data. This data, along with periodic assessments, will help measure the project’s progress toward key goals. At the end of the grant period, a summative evaluation will determine how well the project met its goals and achieved the expected outcomes, including broader impacts and intellectual merit. Garrett will meet twice each year with the ExCom and annually with the whole team to discuss findings. This information will be used to inform decisions about how to improve.

The EvoME Institute is an equal opportunity employer and in our workforce development plan we will follow all applicable laws. We will leverage our network of colleagues in different biological disciplines, and use typical advertising venues, including online resources and scientific society and University Bulletin boards. We are committed to: Recruiting, hiring, and promoting employees based on qualifications, and research needs; Ensuring fair treatment in all aspects of employment, including compensation, benefits, training, and advancement; Providing reasonable accommodations for qualified individuals with disabilities as required by law; Preventing and addressing any form of workplace harassment, discrimination, or retaliation. To achieve this, EvoME Institute strictly adheres to all applicable U.S. laws and regulations regarding hiring, employment, and workplace discrimination, including but not limited to: Title VII of the Civil Rights Act of 1964, which prohibits employment discrimination based on race, color, religion, sex, or national origin; Americans with Disabilities Act (ADA), which ensures equal employment opportunities for individuals with disabilities; Age Discrimination in Employment Act (ADEA), which protects employees and applicants from age-based discrimination; Equal Pay Act (EPA), which mandates equal pay for equal work regardless of gender.

Table 1. Evaluation metrics and instruments. Description of the metrics by which we will evaluate EvoME’s interdisciplinarity and diversity of biological science perspectives.

Education, training, and diversifying evaluation metrics and instruments.
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Metrics-Interdisciplinarity

Productivity and papers
Discipline-bridging projects
Integrative papers
Integrative student grant proposals
Project cooperativity

Metrics-Team Science and Diversity

Self-efficacy gains
Team diversity in disciplines
Personnel awareness of Institute goals
Sense of community
Expectations for contributions

Instruments

Documentation of papers, presentations
Pre and post activity evaluative surveys
Pre and post activity interviews
Network analysis
Assessment of social media posts
