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Collaborative consortia can boost postdoctoral workforce development

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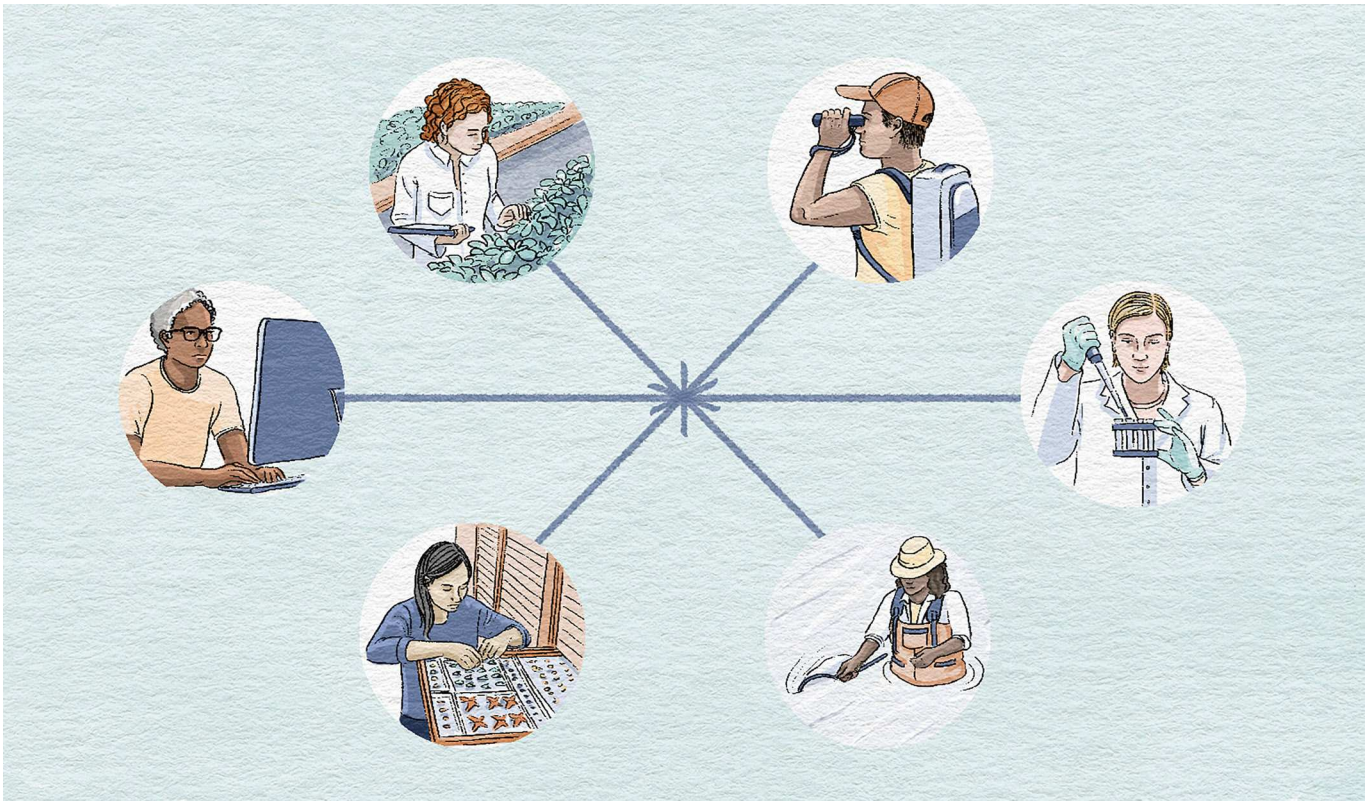

Postdoctoral consortia can help alleviate many of the training and career challenges that postdocs face. Image credit: Alex Boersma (artist).

Postdoctoral training serves as a valuable bridge between doctoral research and future career opportunities. The postdoc experience reinforces many of the skills learned in graduate school, such as technical writing and project management, while polishing expertise in a field of study or advancing cross-disciplinary connections. Often, postdoctoral research marks a defined transition from more individual, dissertation-focused projects to larger, multidisciplinary projects in which postdoctoral researchers collaborate with their peers in both leadership and supporting roles.

However, many postdocs do not receive adequate training in the skills necessary to perform collaborative research (1) or to make the transition to nonacademic positions (2). Furthermore, postdocs face intense pressure to be at their most productive during a brief, transitory, and often-isolating professional stage (3–5).

We believe postdoctoral consortia can help alleviate these challenges. These consortia—distributed collections of faculty researchers and postdoctoral scholars who prioritize professional development, career mentorship, and job placement while conducting research united in a common theme—can help to maximize the benefits of postdoc training periods while mitigating challenges, barriers to diversity, and disenchantment (6). Here, we present recommendations based on our experiences as part of a large, collaborative consortium, and we argue that more such arrangements are necessary. Federal funding agencies (e.g., NSF, NIH) would be wise to invest in,

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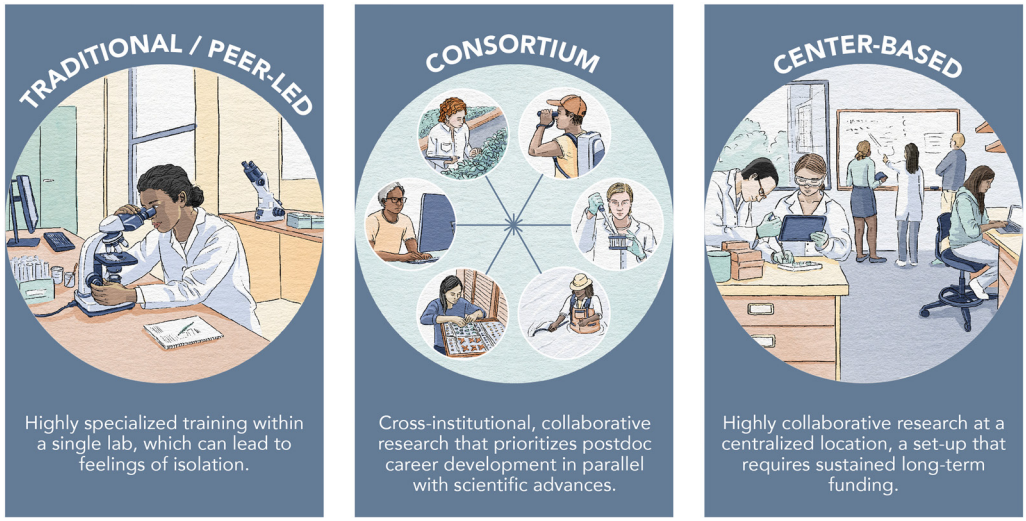

Fig. 1. The three collaborative models of postdoctoral scholarship: the traditional/peer-led, the consortium, and the center-based models. In every position, participants have the opportunity to conduct cutting-edge research and further their scientific training, though different opportunities will better meet individual career and training goals. Image credit: Alex Boersma (artist).

and institutional logistical support would allow for, the development of more interdisciplinary, cohort-based postdoctoral research programs moving forward.

Training Models

Postdoc consortia occupy a middle ground between the traditional and center-based postdoctoral training programs (Fig. 1). Traditional postdoc positions tend to be within a single lab, provide specialized training centered on a specific topic, and are often closely associated with a funded project. While these positions are very useful for providing highly specialized training, they can often lead to feelings of isolation, due to moving to new institutions for a relatively short position, lack of a cohort at the same career stage, lack of integration within university communities, and largely independent research projects (5, 7). As such, at institutions with many postdocs distributed across labs, postdocs have developed grassroots, peer-led programs that provide a sense of community while still holding traditional postdoc positions (8). Another common type of postdoctoral training is the scientific center model (e.g., National Center for Ecological Analysis and Synthesis, Max Planck Institutes), which can increase the productivity of postdoctoral members (9), but often requires large, sustained financial support.

The third model, the consortium, is organized by faculty; distributed amongst one or more institutions, nonprofit groups, or agencies; and occupies a middle ground between the center and peer-led approaches. Consortia are united by common, broad scientific themes (e.g., model development for the life sciences; resilient communities under climate change; or the food, water, and energy nexus), rather than highly specific research questions. A consortium requires less funding than a center, as it does not require a physical home and tends to be a smaller group of researchers, but still has concrete, centralized resources that a peer-led program may not be able to access. Consortia can span fields from computational to empirical, capitalizing on a diversity of expertise in combination with shared data, methods, and potentially equipment, thereby decreasing overall costs in comparison to multiple traditional research grants spread across labs. Furthermore, a consortium emphasizes postdoc training outcomes to be as important as, if not more so than, research outcomes, thus supporting postdocs who opt to pursue positions in not only academia, but government and the private sector as well.

Essential Aims

The primary goal of a postdoctoral consortium is to provide job training and facilitate job placement for early career scientists. Each consortium will choose to establish its own particular set of group-specific research and career development goals. Regardless of discipline, each consortium should define metrics of success and offer an evaluation strategy. Those metrics should include scientific outputs, along with postdoc career development and job placement. Consortia partner with an external evaluator to regularly assess their success as a training program.

For example, we are all members of the Modelscapes Consortium, a group sharing a central mission of advancing a shared set of computational and modeling approaches across life science domains. Our consortium consists of scholars with diverse backgrounds and career goals spanning the life sciences, statistics, and computational research, and is affiliated with three US universities. The Modelscapes Consortium was funded by a $6 million Established Program to Stimulate Competitive Research (EPSCoR) RII Track 2 grant from the National Science Foundation, with our a priori goals spanning novel genomic, terrestrial, and aquatic data collection, publication of open-access statistical tools and corresponding manuscripts, training in interdisciplinary collaborative research, and career development for postdocs and early career faculty. In its first three years, the Modelscapes Consortium has included 8 faculty, 25 postdocs (24 paid from the grant and 1 affiliated), and 4 affiliated doctoral students. We have successfully recruited postdocs from diverse backgrounds and geographical locations, in large part due to our actively embracing remote work as a way to harness global talent and increase equity for individuals with relocation constraints.

With a diversity of expertise and backgrounds ranging from ecology to hydrology to computational biology, members of our group have worked to create a safe community where we learn from one another, challenge each other's disciplinary knowledge, and seek common ground in methods and approaches. Postdocs are encouraged to join multiple cross-disciplinary projects that serve as the main research umbrella of the grant, while also maintaining both empirical and computational independent research projects within their respective laboratory groups. Critically, a primary objective of the consortium is to support postdocs in their quest to obtain their ideal job, whether in academia, government, or the private sector.

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The consortium model of postdoc training reshapes the research landscape, making it more inclusive, flexible, and conducive to collaborative discoveries. Consortia formalize peer-to-peer learning with institutional and financial support, without putting the burden on postdocs to form such a group. Being part of a team with multiple faculty and other postdocs also lessens the postdoc's dependency on their formal advisor as a primary source of support, guidance, and advocacy. Faculty labs benefit from participation in the consortium, as they gain access to a broad network of postdoctoral expertise for collaboration and interaction with students. Furthermore, faculty can draw on resources from, and collaborations within, the consortium to mentor postdocs in projects outside of their core area of expertise and during times when they are less available, such as during prolonged sampling campaigns, family and medical leave, or job transitions.

Consortia also benefit from offering remote opportunities, making positions accessible to postdocs with relocation constraints (e.g., caregivers and parents), thereby harnessing global talent and supporting the work–life balance critical for researchers' well-being. Finally, the consortium model encourages a strong sense of community and social cohesion for postdocs, who may traditionally be one of very few in their department or an overlooked class on university campuses, being neither students nor faculty.

Training through a consortium model can overcome many commonly reported challenges, including adequate training for positions both within and outside of academia. Training in a consortium makes for more well-rounded postdocs who are better equipped for a wide variety of future careers. Regardless of whether postdocs continue on to academic, government, nonprofit, or private-sector positions, they often report having insufficient training, particularly with regard to working as part of a team, conducting collaborative research, managing multiple people and projects, and demonstrating entrepreneurial skills (2, 7, 10). Collaborative work is a defining feature of the consortium model of postdoc development.

Because of this collaborative and cross-disciplinary focus, consortia, by default, encourage open science practices, including iterative and reproducible workflows, which readily transfer to academia, nonprofits, and the private sector. In addition, consortia offer ample opportunities for postdocs to act as project managers and team members, as consortia support a distributed model of leadership that promotes synergy across universities in scientific advances. Following their eventual departure from such a consortium, postdocs will have developed a large professional network that will continue to promote their career success, greater understanding of collaborative workflows, adaptability in projects with larger teams, and flexibility when faced with turnover in project leadership. These skills are increasingly critical for success across positions, but less likely to be acquired under traditional and center-based postdoc training models.

Confronting the Challenges

The consortium model of postdoc training is not without its challenges. A notable one, which we have experienced with the Modelscapes Consortium, is rapid turnover that occurs as postdocs secure permanent jobs. While such turnover is a sign of success as early career scientists secure longer-term positions, it does strain the consortium in some respects, such as recruitment and hiring. To overcome recruitment challenges, we have found that joint advertisements for multiple positions, advertising widely across forums, and evaluating and interviewing applicants jointly among multiple principal investigators ensure a diverse and talented applicant pool.

Nonetheless, hiring takes time, and rapid turnover makes it more difficult to budget accordingly. For example, in our original NSF grant proposal, we budgeted for 12 postdocs, but because so many individuals have secured permanent jobs, we have hired 24 postdocs in three years in order to stay on budget and maintain research productivity. Hiring challenges can be addressed by working with human resources for flexibility, such as through maintaining open lines for postdoctoral positions to minimize administrative approvals for each new hire.

Second, the turnover of postdocs yields a cascading turnover of project leaders, especially for highly collaborative projects. Contingency plans for attrition and succession are therefore critical for finishing large collaborative projects. In the Modelscapes Consortium, several consortium-wide projects have successfully been co-led by multiple postdocs, but this coordination requires communicating clear transition timelines and iterative, open discussions regarding authorship, contributions, and priorities. Third, in a consortium, it can be difficult for postdocs to balance time spent on collaborative versus individual projects, especially during field seasons or times of intense data collection. Given that visible work products (e.g., software, publications, patents, teaching materials) are critical at this career stage, achieving the right balance between projects is necessary and requires adaptability, as the right balance will not be the same for each postdoc participant and depends on their future career goals.

A final key challenge in cross-institutional consortia is building cohesion and a sense of community among group members. To overcome this hurdle for the Modelscapes Consortium, we hold Zoom meetings that are more social and career development-focused, in addition to regular research meetings. We also plan and financially support annual meetings at rotating institutions, allowing participants to meet face-to-face and build a sense of community while working on research projects and socializing (e.g., barbecues, rafting trips). In our experience, the most effective strategies for maintaining group cohesion and overcoming hurdles have arisen from 1) postdocs sharing their experiences during project meetings and suggesting improvements regarding the mechanics of working as a collaborative team; 2) faculty sharing the reasoning behind research priority and financial decisions; 3) maintaining a collaborative and open dialogue where alternative opinions can be voiced; and 4) regular internal and yearly external formal evaluations of the consortium (i.e., from an external, hired assessor). Overcoming these challenges allows consortia to support postdocs across a wide breadth of career goals through in-person and fully remote positions, promoting career development, equity, and work–life balance (11, 12).

Increased funding for postdoctoral consortia can provide excellent training opportunities, while simultaneously creating more inclusive, financially stable, and family-friendly opportunities at this critical career stage (13, 14). By creating postdoctoral consortium grant programs, federal funding agencies would be augmenting current, similarly structured graduate training programs (e.g., the NSF's Integrative Graduate Education and Research Traineeship and Research Traineeship programs) with parallel calls focused on hugely important postdoc training and career development. Such funding calls would advance workforce development and could potentially leverage current data collection priorities, for example, by partnering with ongoing data collection infrastructure (e.g., the Long Term Ecological Research Network or National Ecological Observatory Network). Academic institutions and research offices can further advance this call by fostering the infrastructure necessary to support postdoctoral consortia and by working with their human resources division to overcome key logistical hurdles. Together, these changes will aid in building collaborative postdoc consortia, facilitating better access to and training for permanent career opportunities for participants and, ultimately, advancing scientific workforce development.

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