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Megan Fork

Elsa C. Anderson

Adrian A. Castellanos

Ilya R. Fischhoff

A. Marissa Matsler

See next page for additional authors

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Authors

Megan Fork, Elsa C. Anderson, Adrian A. Castellanos, Ilya R. Fischhoff, A. Marissa Matsler, Chelsey L. Nieman, Isabella A. Oleksy, and Michelle Y. Wong

Creating community: a peer-led, adaptable postdoc program to build transferable career skills and overcome isolation

MEGAN L. FORK^{1,†}, ELSA C. ANDERSON¹, ADRIAN A. CASTELLANOS, ILYA R. FISCHHOFF, A. MARISSA MATSLER², CHELSEY L. NIEMAN, ISABELLA A. OLEKSY³, AND MICHELLE Y. WONG

Cary Institute of Ecosystem Studies, 2801 Sharon Turnpike AB, Millbrook, New York 12545 USA

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Abstract. Postdoctoral positions provide critical opportunities for early-career ecologists to build transferable skills, knowledge, and networks that will prepare them for professional success. However, these positions often come with personal and professional challenges such as stress, isolation, and lack of agency. Here, we describe a peer-led postdoc program we created to maximize benefits and minimize challenges while preparing ourselves for a wide range of possible future careers using our training and expertise in ecology. We also give recommendations for other postdocs and early-career scientists in ecology and across science, technology, engineering, and mathematics fields seeking to build a similar program.

Key words: adjunctification; non-academic careers; peer mentoring; remote work.

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¹ Present address: Department of Biology, West Chester University, West Chester, Pennsylvania 19383 USA.

² Present address: Department of Environmental Science and Technology, University of Maryland, College Park, Maryland 20742 USA.

³ Present address: Department of Zoology and Physiology, University of Wyoming, Laramie, Wyoming 82701 USA.

† E-mail: mfork@wcupa.edu

INTRODUCTION

Postdoctoral positions are a critical transition from student to professional: They launch careers by providing opportunities for independent research, skill development, and further professional training (Sauermann and Roach 2016). However, those employed as postdoctoral researchers (hereafter “postdocs”) in ecology often find a mismatch between their training, expectations, and the available positions for early-career ecologists: While more than three-quarters of ecology PhD graduates expect to pursue careers in academia, less than half end up in tenure-track academic positions (Hampton and

Labou 2017). Early-career scientists use postdoc positions to expand on the skills and knowledge gained in graduate school, to become more competitive for tenure-track positions, and may build bridges to careers outside the academy (Powell 2014, Sauermann and Roach 2016). Despite the professional benefits, personal and professional isolation is common among postdocs, resulting from relocation away from support networks or from remote work (Arnold 2014, Burgio et al. 2020). These challenges can interfere with opportunities for development of skills and collaborations, introduce personal logistical constraints (e.g., childcare, inflexibility in job location of partners/family, low wages), and negatively

affect productivity and mental health (Arnold 2014, Marnett 2020, Woolston 2020). Postdocs may also experience limited agency, for example, due to the short duration of their positions and policies that prevent postdocs from applying for grants as principal investigators.

Postdocs in ecology feel unease about employment and the future of their careers (Shaw et al. 2015). As in other science, technology, engineering, and mathematics disciplines, positions in academia are highly sought after (by 78% of survey respondents, Woolston 2015). Ongoing “adjunctification” (i.e., an increase in the proportion of contingent, non-benefited appointments vs. tenure-track positions) decreases the number of stable jobs (Jenkins 2014, Carey 2020). The growing number of PhD graduates further imbalances supply and demand in the job market (Dawson 2007, Larson et al. 2014, Milojević et al. 2018). These trends mean that a shrinking proportion of ecology PhD holders go on to tenure-track positions, instead finding rewarding and important ways to use their skills in non-academic careers (Hansen et al. 2014). However, because graduate students are typically trained and surrounded by academics, it may be difficult to learn about non-academic careers during graduate school. Postdoc positions offer an opportunity to learn about non-academic career paths, whether by positioning early-career scientists in non-academic institutions (e.g., positions in government agencies) or by allowing for new networking and professional development opportunities that facilitate this learning (Davidson 2013, Yassin 2019).

We are a group of current and former early-career PhD-level employees at a relatively small ecological research institution (12 full-time permanent staff scientists [tenure-track equivalent] and 10 postdocs, at the time of publication). The institution does not train graduate students but does periodically host undergraduate and graduate students for research opportunities (e.g., Research Experience for Undergraduates program), workshops, and an annual Fundamentals of Ecosystem Ecology course. The institution further offers K-12 environmental education programs. Our postdoc group (which includes all authors, though not all members of the group authored this paper) includes parents, caregivers, and people in long-distance relationships. At the time of writing, we are spatially dispersed over

three time zones in the United States. While the majority of our postdoc group until recently lived and worked in person at our institution, some have worked remotely for the entirety of their positions. Our research interests are diverse, spanning biogeochemistry, plant ecology, behavior, disease ecology, fisheries, sociology, and community ecology. We have a diverse set of professional goals that range from academia to government scientist positions to non-profit conservation and advocacy organizations to industry.

To address the stresses of the postdoc years, we initiated a formal postdoc program that is bottom-up and peer-led. This structure has allowed us to adapt to our changing needs. Our goals are to (1) expand and refine our visions of our future careers; (2) develop new skills and knowledge to become more well-rounded, resilient, and adaptable scientists; and (3) build and maintain a robust community with remotely based peer colleagues.

We outline below the structure of the program and actions we have designed and implemented, connect them to benefits for individuals, our group, and the field of ecology at large, and give recommendations to other postdocs interested in developing a similar program (Fig. 1). While we describe the structure and content of a program that was designed specifically for our situation and needs, we hope they will have value for early-career ecologists at other types of institutions and for postdocs in fields outside ecology. Our goal is to encourage early-career scientists to work collaboratively with one another and their institutions to build skills, knowledge, and relationships that help them grow and thrive in the face of current and future barriers and opportunities.

Postdocs during a pandemic

The COVID-19 pandemic has exacerbated the aforementioned challenges while simultaneously reducing the availability of academic and other jobs. Pandemic-related hiring freezes (including a 65% reduction in ecology and evolution jobs as compared to recent years; Langin 2020), and permanent closures or mergers of colleges and universities means decreased availability of full-time, benefited academic jobs are likely to persist (Korn et al. 2020). Pandemic-related disruptions to laboratory, field, and in-person work exacerbate the loss of opportunities and amplify

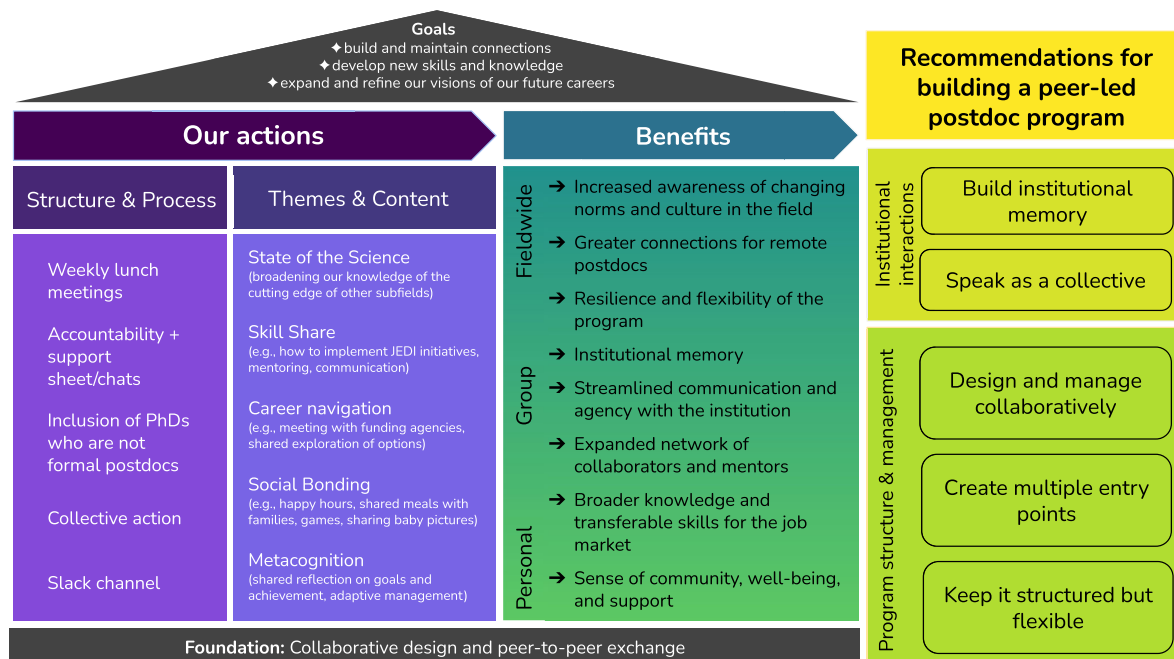


Fig. 1. Schematic of the components of our postdoc program. The structure, process, and content of our postdoc program (“Our Actions”) have taken place in all-virtual, hybrid, and fully in-person settings, based on the locations and restrictions of participants. The benefits we have identified as resulting from our program (“Benefits”) span a gradient of scales from personal to field-wide. Our suggestions for other postdocs looking to build a similar program (“Recommendations for building a peer-led postdoc program”) concern what has worked well for us in structuring and managing our program and interacting with and advocating for change or resources from our institution. The acronym “JEDI” refers to justice, equity, diversity, and inclusion.

economic instability and loneliness for postdocs (Duncombe 2020). While our institution has employed postdocs working remotely for some time, the sudden (and ongoing, at the time of writing) switch to completely virtual work has led to increased inclusion of remote postdocs, which we hope to continue to support even as some of our members return to a shared office. Additionally, we think that the additional existential stresses and isolation we have experienced during the pandemic spurred us to be more open with one another about our personal struggles, small non-professional victories, and self-care recommendations. Our experience was that this openness helped us build trust and shared experience that strengthened our professional development work, so we hope to continue to facilitate this in the future. One of the biggest successes of our program has been hardiness in the face of the global pandemic.

POSTDOC PROGRAM STRUCTURE, THEMES, AND CONTENT

Collaborative design, inclusion, and peer exchange of information are the foundation of our postdoc program (Fig. 1). The group is not exclusive to people in positions with “postdoctoral” titles; we include other early-career, non-tenure-track-equivalent scientists who contribute their perspectives and knowledge while also sharing the camaraderie of being at a similar career stage. Critically, we are able to adapt our model and content to continuously mold the program to the changing professional and social needs of individuals and our community. Because postdocs are in a transient career stage where long-term goals can be explored and refined, this adaptability is crucial in allowing room for discovery and shifting goals and priorities.

Table 1. Themes addressed in weekly meetings of our postdoc program and examples of thematic content.

Theme	Description	Examples
State of the science	Individual postdocs give a brief talk and lead a discussion about the current state of their field, with the goal that it stimulates intelligent, thoughtful conversations outside our specialty	<ul style="list-style-type: none"> • “Carbon in inland waters” • “Quantifying and measuring controls on the terrestrial carbon sink” • “Urban plant communities”
Skill share	We identify areas in which we are interested in building skills and someone (within or outside the group) who can lead us in building those skills	<ul style="list-style-type: none"> • Science communication with non-scientists • How to implement meaningful justice, equity, diversity, and inclusion (JEDI) initiatives
Career navigation	We explore potential careers, their skill requirements, and what work–life balance would look like through formal and informal conversations and activities	<ul style="list-style-type: none"> • Built a shared list of potential options based on members of our networks and passing on resources from our individual searches • Identified our values and strengths • Developed alternative 5-yr plans (based on a template from Burnett and Evans 2016)
Social bonding	We set aside a few minutes at the start of each weekly meeting and occasional whole lunches or ad hoc evening hours (virtual or in-person) to socialize	<ul style="list-style-type: none"> • Sharing pictures and stories from our childhoods • Craft nights • Recounting a personal achievement from the week • Game nights
Metacognition	Every few months, we revisit our goals, assess how well we are meeting them, and make a plan to adaptively manage our program accordingly	<ul style="list-style-type: none"> • Writing this paper • Periodically revisiting schedule and balance of weekly activities

Note: These activities are possible in all-virtual, hybrid, or fully in-person settings.

While our institution has employed postdocs for many years, we began collectively developing the current program in late 2019, when a “critical mass” of postdocs (six) was present at the institution. Initially, the “program” consisted of in-person postdocs meeting weekly for lunches at which we focused on a particular, predetermined theme. As we began to formalize our schedule and agenda, we included remote colleagues through teleconferencing platforms. We maintain a shared calendar to plan weekly meetings and ad hoc activities in addition to a living document of potential topics to include.

We focus our agenda under five themes (Table 1). The themes and content of our weekly meetings primarily serve the goals that gave rise to this program. Preparation for the future of our careers is an explicit focus of some meetings. We accomplish this through a number of different types of activities: First, we learn about potential career paths through workshops and group informational interviews with contacts in alternative-to-academia careers such as startups, NGOs, private industry, and government (Appendix S1: List S1). Some meetings are devoted to peer review of job application documents or general discussion of their content and organization, such as what to include in a diversity statement or how to convert a CV into a

federal resume. We also devote meetings to peer-teaching and instruction from other scientists at our institution on specific skills relevant to our careers, such as conducting research with undergraduates, communicating science with members of the public, and creating manuscripts or reports using RMarkdown (“Skill Share,” Table 1). Finally, we work together to build a broad knowledge base through brief talks given by our members that describe current questions and grand challenges in our respective sub-fields of ecology and related disciplines (“State of the Science,” Table 1). We discuss meeting content in advance but retain flexibility to shift our plans to what feels important at the moment. For example, in spring 2020, we delayed scheduled content in order to spend several weeks discussing racial justice and encouraging anti-racist initiatives at our institution.

Between our weekly gatherings, we have also organized other forms of accountability and mutual aid. For example, we maintain a shared spreadsheet where we can record daily goals, accomplishments, and struggles and receive feedback and encouragement from others (Appendix S1: Fig. S1). Other members of our program engage in short daily video check-ins for accountability and social contact. Like many groups, we also use the application Slack for

short communications, sharing of resources (e.g., job postings, ice cream shop recommendations, meditation apps), and questions between scheduled meetings and discussions (Appendix S1: Fig. S2), with channels for topics including writing accountability, general questions (e.g., questions on statistics or voting rights), and specific projects (e.g., this manuscript) and initiatives (e.g., anti-racism).

Including a blend of social, scientific, and professional activities as part of the program provides multiple “entry points.” Different types of meetings, with varied personal or professional activities, incentivize attendance for those with different needs and goals. During each weekly meeting, we spend time checking in on the “life” side of work–life balance by sharing tales of personal victory or including children and pets on our laps in the virtual frame. We occasionally schedule purely social events, such as crafting, games, hikes, and happy hours, and aim to make these events virtual or hybrid to include remote members in the social and professional fabric of the group.

Every few months, we revisit our mutual and individual goals so that we can make course corrections to more effectively move forward as a group (Table 1). Together, we read through our list of activities we have brainstormed but not yet covered. We make a consensus decision about which activities best serve our short-term (i.e., 2–3 months) needs and prioritize them. We also identify broad themes in the list and identify thematic gaps with respect to our individual and group goals, and brainstorm new activities to fill these gaps. As our goals and priorities shift, some activities are abandoned (e.g., we discussed learning Python through a group coding project, but have since shifted our goals away from this priority).

Future goals

The forward-thinking, adaptive nature of our group means that we have a number of ongoing and future goals for our work together. Our group is collaboratively writing a “handbook” for future postdocs at our institution that provides a relevant overview of the facilities, resources, and un-written rules and norms as well as knowledge and materials we have curated as part of building this program. With this effort, we hope to build institutional memory

in the postdoc group that outlives our temporary positions. A goal for the future is to conduct a program assessment to formally assess the process and outcomes of our program. We also plan to maintain longitudinal data on our members after they move on to other positions, both to formalize a network for new postdocs and to contribute to assessment of outcomes of our program. As some of us move on from our institution, we have continued to welcome alumni to our weekly meetings and to collaboration on shared projects, such as this manuscript, that grew out of our postdoc program.

Institutional support

In addition to the individual training we receive from our advisors, our program is bolstered by mentorship from three permanent staff scientists who sit on a committee for postdoc affairs together with an equal number of postdocs. These permanent staff members provide continuity as postdocs cycle through the institute on relatively short-term contracts. The committee meets as necessary to discuss funding and institutional needs of the postdocs and advises the upper administration on postdoc affairs. In addition, our institute allocates a modest annual fund (~\$2,000) for postdoc professional development. Some of the uses we had planned for this budget included funding a writing retreat, enrollment costs for attending outside courses and workshops, offsetting publication costs for joint manuscripts, and visiting Washington, D.C., to meet with National Science Foundation program officers and Congressional staffers.

BENEFITS OF A POSTDOC PROGRAM

At many institutions, postdocs may feel isolated because of heavy workloads, insular laboratory structure, and lack of coordination or community for postdocs in the department or institution (Arnold 2014, Shaw 2014). The benefits we have identified from creating a postdoc program that cuts across this structure are multi-layered, addressing overlapping individual, group, and field-wide needs (Fig. 1). For our group, the benefits include minimizing the challenges associated with the temporary nature of the position and uncertainty in the world, addressing the contraction and competition of

the contemporary job market, and creating a collective that enhances networking and identification of opportunities.

As individuals, we benefit from having a formalized postdoc group through a sense of community, well-being, and support that mitigates the social and psychological challenges associated with this type of position (Shaw et al. 2015). Meeting regularly, facilitated by technology that enables virtual participation, has increased interactions and peer mentorship among the postdocs at our institution, and helps to curtail the effects of social isolation and work–life imbalances. Building this program has also expanded our network of collaborators and peer-mentors as we discuss and connect ideas.

Our program also provides benefits that address the unfavorable job market. Given the mismatch between training and the diverse set of trajectories taken by PhD holders in ecology (Ålund et al. 2020), we set up a structure to facilitate learning and sharing of transferable skills useful across a wide range of potential careers (Table 1). Second, we pool information (e.g., where to find online training, how to prepare and format an application) gained in conversations with members of our individual networks working in alternative-to-academic careers to increase our awareness of career pathways and opportunities. We also peer-review one another's application documents and share our tips and experiences from job interviews. Together, these provide us with the flexibility to pursue and be competitive for a variety of career opportunities.

As a group, we benefit in our current roles and positions through streamlined communication and agency within our institution. Because our postdoc group is recognized by the institution, communication is more structured, efficient, and transparent, which is advantageous to both institution and individual postdocs. This recognition was marked by the reviving of the institutional postdoc committee (made up of permanent scientific staff and postdocs) after the postdoc group began meeting regularly. By recording and sharing experiences and resources within the group, we can provide coherent institutional memory to new members through time. This institutional memory improves communication, which increases our leverage and agency within the institution (Stephan 2013). For example, we

were able to use this leverage to institute a postdoc seat on our institution's justice, equity, diversity, and inclusion committee, giving postdocs a voice in these important decisions going forward. We are able to share information about funding policies and communicating our group's consensus opinions and suggestions about topics like racial equity through formal and informal channels. In addition, we are more aware of and have increased involvement in the issues and opportunities at our institution, which provides us with validation, voice, and confidence in discussing institutional progress and policies with leadership.

Expanding our academic network has further exposed us to cultural shifts that are occurring within the field of ecology, such as increasing recognition and partnerships that emphasize Indigenous, traditional, and local ecological knowledge (Ford and Martinez 2000 and references therein, Kimmerer 2015). Our discussions led us to organize a public series of four seminars and two workshops that focus on justice in ecology in spring 2021. Seminar themes included Critical Ecology, participatory research, Indigenous environmental justice, and partnerships with Indigenous experts, while the workshops (designed and led by our postdoc group) focused on building personal capacity and plans for incorporating justice into one's own work. While this Ecology and Justice Series grew into public events outside our postdoc program, the program allowed us to incubate the idea and collaborate to bring it to fruition in a way that would have been difficult without the built-in structure for working together. Furthermore, our discussions on justice and ecology, coupled with our group's breadth of experience and expertise, allow us to consider career and research trajectories that align with current scientific and societal recognition of these critically important matters. By discussing such cultural shifts in ecological science, we remain aware and informed about the contextual needs of the field as a whole, thereby improving our ability to communicate effectively across disciplinary boundaries and conduct more innovative disciplinary research, teaching, and application of ecology. This reflection on science, both outward toward the field, and inward toward our own work, makes us more effective and adaptable scientists.

RECOMMENDATIONS FOR DEVELOPING A PEER-LED POSTDOC PROGRAM

Others have provided thoughtful and useful suggestions for what universities, professional societies, and academia as a whole can do to support early-career researchers in this vulnerable career stage (Stephan 2013, Powell 2015, Shaw et al. 2015, Pain 2018, Burgio et al. 2020). Here, we complement these suggestions with our recommendations for how early-career ecologists can create their own peer-led community. While we have benefitted from the investment and support of our institution, we believe these recommendations can be useful for building and investing in a peer-network regardless of whether or not external support exists.

In reflecting on the process of creating and implementing our postdoc program, we have generated a series of recommendations for groups of postdocs who wish to develop robust, supportive programs (Fig. 1). These recommendations fall into two broad categories: (1) program structure and management and (2) institutional interactions. These recommendations emphasize the importance of building a democratic and accessible venue for colleagues to work together to grow their abilities and relationships. We do not intend our recommendations to be prescriptive. Rather, they can serve as guidelines to develop specific actions that best meet the needs of a specific group.

Looking inward, we found that the creation of multiple “entry points” (i.e., a mix of activities that build trust, foster social connection, and serve various professional aims) was important for drawing in and retaining interested members with diverse needs and goals. Collaborative, consensus-based design and management of our group’s activities resulted in a collective sense of ownership that helped keep members engaged with the group, and a structured format with built-in flexibility allowed the content we designed to change as group members explored and tested goals and potential career paths.

Looking outwards, speaking as a collective group rather than as individuals helped build bridges between the institution and ourselves, thereby fostering communication and helping us advocate for ourselves and for institutional

progress in other areas, including racial justice. Our experience has been that forming an organization to represent our collective interests lends legitimacy to our requests and communications in contrast to those coming from individuals with less structural power within the institution. We suggest that other postdoc groups can use the legitimacy and power that comes from collective recognition to negotiate with their institutions to change undesirable or harmful policies, to ask for funding for professional development, and other requests that may not be as persuasive coming from individuals. We also recommend taking notes, retaining lists of compiled resources, and collecting longitudinal data on members to build institutional memory. We hope that our ongoing work to build this into our program (in part, through recording the structure and process of our program here!) will help future postdocs at (and beyond) our institution by providing a scaffold on which to build their own collaborative, peer-led content.

Given the transitional nature of a postdoc, it is important that incoming postdocs need not reinvent programs when a new cohort begins their positions. Elements of the structure and management we have implemented in our program contribute to its consistency, and sharing and adapting our goals, progress, and successes with our group of colleagues serves to sustain the program over time. We hope that other groups will be empowered to use the lessons and strategies we offer here to alleviate some of the known obstacles facing postdocs and further grow professionally through the development of a peer-led postdoc community.

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DATA AVAILABILITY

No new data were collected or used in the preparation of this manuscript.

SUPPORTING INFORMATION

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