The Biophysicist

The Power and Promise of Mentoring in Biophysics

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Editors

This special issue of *The Biophysicist* is dedicated to the art of mentoring and the use of evidence-based practices to support effective mentoring across all levels of career development, from a K–12 student first learning what biophysicists do, to a career scientist thinking about making a pivot later in life, and everything in between. The 2019 Report from the National Academies of Sciences, Engineering, and Medicine, the "Science of Effective Mentoring in STEMM," defines mentoring as

> a collaborative learning relationship and working alliance based on intentionality, trust, and shared responsibility for the interactions in that relationship and the effectiveness of those interactions. (NASEM)

Mentoring can take the form of guidance within a work setting, such as a research lab, that may include but is not limited to career guidance, skills development, psychosocial support, sponsorship, or a host of other activities that model the behaviors associated with a task, a lifestyle, or a career. Most active scientists can look back on their lives and careers and identify a series of individuals who served as mentors at various times, and, certainly in our cases, we can specifically tie career choices we have made to the input and guidance of some of these individuals. Unfortunately, mentoring is not a standardized professional practice in our field; nor is there equity in how it is accessed. In addition, mentoring rarely meets the criteria of intentionality: the idea that mentors and mentees enter these relationships with a clear understanding of expectations and the ways in which the mentor and mentee will engage with one another to make the process effective and productive for both individuals.

Why is mentoring specifically important to the field of biophysics, the Biophysical Society, and the editors of *The Biophysicist*? In other words, why did we, as editors of *The Biophysicist*, choose to publish a special issue on this topic? In our minds, this question is really about the health and future of our discipline. The field of biophysics is different in many ways from other STEM disciplines because of its position at the interface of multiple fields and the requirement that practitioners often use advanced principles and techniques from chemistry, physics, biology, engineering, and computer science daily. Universities rarely offer biophysics courses for freshmen—and sometimes not even to undergraduates—because it requires foundational knowledge from each of these fields. So, unlike the student who takes an early course in chemistry and finds a desire to dive more deeply into the

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Received: 10 January 2024
Accepted: 17 January 2024
Published: 2 December 2024

science, entry into biophysics is often a gradual process of conversion, moving stepwise closer and closer to biophysics from one of the primary disciplines. This interdisciplinarity also means that our community of biophysicists is formed from people who grew up scientifically in the culture of another STEM discipline before becoming a biophysicist. Thus, we address these questions and problems from different places, with adjacent knowledge bases, and we carry these early experiences with us throughout our careers. Mentoring within biophysics is what ultimately brings us together into a cohesive community, respecting where we came from while building strength in the new areas that we need to learn as we seek to solve interdisciplinary problems. Rarely will trainees or collaborators join projects with all of the knowledge and skills across the breadth of biophysics. We must commit to supporting colleagues adding skillsets at each stage of development so that we speak the same vernacular and can communicate effectively, taking advantage of our differences and using that as a strength within our community.

As a discipline, we need to make mentoring more available. Research advisors were previously thought of as "the mentor." We would rephrase this, acknowledging that the research advisor is "a mentor" and recognizing that most burgeoning scientists are best served by a team of individuals with whom they can interact in different ways. The network should include elements of vertical mentoring but also peer and near-peer components. As active scientists working with students on a research problem, we can teach them the techniques associated with our own work and share experiences based on our own career progression. If a student is considering a career direction that is outside our personal experience or network, we may or may not be the appropriate people to provide input or guidance on that transition. It would likely be far more helpful to guide the individual to appropriate sources for the advice they need. Thus, we should be thinking of mentorship as coming from a cadre of individuals who each serve as a piece within the jigsaw puzzle of the mentoring network.

We also cannot leave the process of finding mentors to chance. If we do, we bias the availability of mentors to those who already have social capital within our system. When ALF first sought a lab position more than 30 years ago, during one of the first interviews, a professor sent him away after 5 minutes with the following advice: Take 3 more years of math and another year of physics, and then call me back. The professor's view was that there was nothing ALF could contribute to the laboratory until he had met those prerequisites. This response was likely better than many receive; at least he heard back from the professor and was invited to meet with him, despite the somewhat numbing reception.

PS had a somewhat different experience. A Latina physics colleague invited her to join an NSF ADVANCE network aimed at mentoring faculty at primarily undergraduate institutions. The invitation came in a timely manner because transitioning back to work from a third maternity leave was challenging. Through the network, PS learned the theories that explain human behavior and how to leverage systems and structures to run an undergraduate-only research lab. Those interventions and pragmatic knowledge were critical in building her portfolio for tenure and promotion and also contributed to her long-term success. We must make biophysics accessible to all types of aspiring scientists because the higher we make the barrier to entry, the fewer voices we will have to shape our field in the future.

As biophysicists, implementing evidence-based mentoring makes us more effective at our job while enhancing the overall research experiences of the students and trainees with whom we work. Culturally aware mentoring helps us implement practices targeted to all stakeholders and be more effective when working with individuals from diverse backgrounds and differently lived experiences from our own. Finally, these techniques will provide both mentors and mentees a more holistic mentoring experience. We must commit to being more intentional in our mentoring; this advice crosses longitudinally across our discipline. Senior mentors such as ourselves should commit

to understanding the science behind effective mentoring and being open to our own professional development, for example, by attending workshops on how to improve our skills. This models to our trainees that we take mentoring seriously and that we are continuously updating our knowledge. We must also consider where new members of our community learn the art of mentoring. Mentoring is not a skill that simply develops by osmosis and is then practiced. We must ask ourselves how biophysicists will learn and develop mentoring skills. Do we develop structures within our departments such as mentoring circles, akin to literature clubs, where we spend time once per month sharing experiences and learning from each other? Do we invite expert facilitators who have been trained in intentional mentoring to offer day-long workshops (e.g., CIMER training)? Who on our campuses or from the Biophysical Society can be tapped to help structure these interactions to make them effective and worthwhile, with actionable outcomes we are able use immediately after attending? Ultimately, it is a question of our values and our leadership. Can we commit to being the mentors we want to be, that our colleagues deserve, and that serve our community well?

Numerous resources are available if we want to become better mentors. The first step, however, is to commit to this self-improvement: to recognize that we must strive to be better mentors. A few valued resources are listed here, and, of course, the authors for the articles in this special edition of *The Biophysicist* have provided their own take on mentoring in biophysics and highlight additional places to find the most recent science on effective mentoring. To kickstart this conversation, in October 2023 editors of *The Biophysicist* and members of the Biophysics Education Committee jointly sponsored a webinar during which several exceptional mentors from our community talked about their mentoring work. A recording of this event is available on the Biophysical Society website. The webinar was just the beginning of this conversation, which continues with the articles in this special issue. We look forward to continuing this significant and critical discussion because it is essential to our experience as people, as scientists, and as biophysicists.

RECOMMENDED RESOURCES

#MentorFirst. About #MentorFirst. Accessed 1 October 2023. https://mentorfirst.org/about

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