The Biophysicist

Biophysics in Isolation: Pushing Beyond the Niche

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On 16 March 2020, an abrupt change entered my daily life, as it did for many others in the United Kingdom. All of a sudden, instead of working in a laboratory fabricating microfluidic devices, operating single-molecule detection setups, and preparing for my weekly undergraduate teaching, I found myself scrambling to bag up everything I might need from my office so that I could be productive from home for an indefinite period of time. It seemed a bit surreal, only having been back in the country for 2 weeks after attending the Biophysical Society meeting in San Diego, California, and taking a short holiday in the United States to visit family, to suddenly be leaving again. However, as we all did, I packed up my things, and away I went.

Three days later, I found myself shackled in the countryside of the English county of Hampshire, attempting to find a new way to progress my PhD without any ability to gather wet-lab data. No longer could I spend every day in the lab, doing experiments to study the molecular determinants of protein phase separation. I would have to become more creative about how to spend my time. Still, due to the rich nature of my scientific field, I found a way. Instead of pipetting solutions, I now spend my mornings pouring a second cup of coffee and reading a backlog of articles that I said I would come back to. These range from those directly implicated in my research in phase separation to more distant articles, such as how high-energy impacts from meteorites could have been the catalyst to forming early biologic covalent bonds. Instead of operating microfluidic devices, I find myself analyzing a copious amount of data, writing, editing, making figures, and rewriting, trying to piece together coherent stories to share with the scientific community. Instead of instructing undergraduates, I find myself engrossed in online trainings of how to fit reaction data and process biological images.

Isolation has afforded me much time to reflect, particularly on why I decided to go into biophysics for my PhD, and specifically how lucky I am to be in this field at this chaotic time. It took something quite drastic for me to rise above the hustle and bustle of daily life in academia and sit back and think about the greater purpose of studying biophysics. For me, biophysics represents not a single field but a scientific way of thinking that uses the interwoven nature of all areas of science. It recognizes the intricate complexities of the natural world that extend beyond the pigeonholes of strictly defined disciplines. It is a field in which someone with a background in

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chemistry, such as myself, can easily branch out to learn about the in-depth fluid dynamics of proteins in the cytoplasm, and at the same time, learn lessons from the physics of polymer blends to better understand cohesive forces between biomolecules.

This lack of boundaries comes to light for me each day, when I think about problems related to the expression of a chimeric protein, aimed at studying the spread of aggregates between cells at one moment, while the next moment, I am designing microfluidic devices for assaying the most fundamental thermodynamic properties of biochemical systems. Later on, I can be found developing models for how the translational friction coefficients of protein assemblies change during growth for different assembly geometries. Needless to say, one doesn't have to be locked away in the countryside to realize the interdisciplinary nature of their field, but it certainly does afford one ample time for such contemplation.

After this time in isolation, I see profound changes happening in the way I am conducting my PhD. It is too easy to be bogged down in a single niche subfield when scrambling to complete a thesis, and I'm not sure it affords one the best preparation for life after graduation. Instead, I'll continue my isolation practices of reading diverse topics, planning experiments, and spending time to understand theories that are not only scientifically interesting but that also teach me new information and techniques to add to my scientific repertoire. At the end of the day, a PhD is about learning as much as you can, pushing the boundaries for continued knowledge gathering and improvement.

Those of us in biophysics should consider ourselves lucky to not have strict boundaries, to be able to pursue vastly different realms of science under a central umbrella, and to never forget to keep branching out.

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