Growth can come in phases

Even though I work with microbes on a daily basis, I never thought I would relate to them in a personal way. Now, though, as I’m finishing up my Ph.D. and reflecting on my graduate school experience, I see an analogy between my own intellectual development as a scientist and the growth cycle of microbes when they are moved to a new environment. In both cases there are lag phases—periods in which there is little visible growth as the organisms adjust to their new surroundings—and growth phases once the organisms “learn” how to flourish. In retrospect I recognize that, for me as well as for the microbes, the seemingly unproductive lag phases, although sometimes discouraging, have been necessary preludes to the following growth phases.

My first lag phase occurred as I was transitioning from my early scientific training in China to my graduate program in the United States. In China, in addition to being taught the basics of lab techniques, I was instilled with the importance of the motto “publish or perish” and a magic number: the impact factor, which is widely accepted there as an objective, accurate measure for evaluating scientists. So I experienced great culture shock when I moved to the University of Illinois, Urbana-Champaign, for graduate school and learned that the impact factor is not as big a deal in the United States. “Then how do you evaluate scientists?” I asked one distinguished professor in my department, who is also involved in professor evaluation and promotion. “We read their papers,” he answered. “From the papers, we understand what problems they are tackling, how difficult they are, and what contributions they made to the field.” This was a revelation to me.

The lag phase continued for my first few semesters of grad school, as I continued to adjust to the transition from China to the United States and from undergraduate training to graduate research. I wasn’t making great progress in lab, but the time wasn’t wasted. As I conducted my research, read papers, and discussed science with my classmates and professors, I started to appreciate that science is a continuous process of making discoveries through methodical, incremental, and creative problem-solving. Publishing is important, of course, but I began to realize that it is only a piece of the process. I was slowly and steadily transformed, until I was finally ready to emerge from my lag phase.

My first growth phase occurred after I spent the first year and a half of grad school on a project that ended up refuting the hypothesis my adviser and I had initially developed. After a brief moment of disappointment and frustration, I decided to persevere by testing a different idea. This new tack led to my first eureka moment and later crystallized into my first conference talk and first publication.

But after that, I found myself in another lag phase. For the last 2 years, I have struggled to generate enough biological material to follow up on my earlier work, and my morale has fallen. Meanwhile, to fulfill another part of the Ph.D. training requirement, I started teaching and therefore could not commit as much time to research as I wanted. Now, though, after much troubleshooting, I finally have a handle on how to solve the problem that had been holding up my experiments, and I sense that a second growth phase is coming.

As I continue to encounter new situations and tackle new challenges, I expect that I will go through more cycles of lag and growth, and I hope that I will have the perspective and patience to appreciate the lag times as integral parts of my development. As for the many international students living in other countries to pursue your dreams of being scientists, if you are struggling, take heart from the fact that even microbes initially have a hard time when they are transferred into a new culture. ■

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