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UNDERGRADUATE  
PERSPECTIVE:  
THE BENEFITS OF  
PERFORMING  
UNDERGRADUATE  
RESEARCH



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As is common for the majority of incoming biology majors, I began my undergraduate experience expecting to eventually find myself in medical school. Now, almost five years after starting my undergraduate education, I am a first year graduate student pursuing a PhD in Cellular and Molecular Biology and could not be further from medical school. How did my career trajectory change? What were the key events during my four years as an undergraduate student that triggered the switch from medical doctor to basic biology researcher?

When it came time to search for the university I would call home for the four years of undergrad, one of my priorities was the opportunity to work in a research lab. Everyone I had spoken with at universities I was considering said research is a great resume builder for medical school. My only previous laboratory experience was in high school science labs. I had never seen a real research lab, nor did I understand what the research process truly was. The only perspective I had of research at this time was knowing pharmaceuticals are developed from research and go through clinical trials to be approved for use. There I was, 17 years old and putting top priority on something I did not understand.

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Flashforward to my sophomore year of undergrad, when I took my first microbiology class. The major assignment for the lab section of the class was identifying an unknown bacterium using the skills we had learned throughout the semester. At first, this assignment seemed overwhelming. I kept thinking to myself, “How I am supposed to identify an unknown bacterium?” However, as I began to plan out the tests I wanted to perform on my bacterium, I discovered this would actually be fun. I began equating the research with solving puzzles (one of my favorite hobbies). In order to make discoveries in research (solve the puzzle), you need to be able to think critically about all of the data you have acquired (the puzzle pieces) and compile it into the bigger picture. This class taught me how to approach scientific questions, and I wanted to seek out a research lab to learn more about this side of science. This assignment was the turning point in my path of deciding between medicine and research.

The process for joining a research lab as an undergraduate differs between universities and between labs at the same university. Getting involved with research as an undergraduate was relatively easy for me. I simply looked up what type of research was occurring in the biology labs using the biology department website and emailed professors whose work sounded interesting to me. However, certain labs and universities have a more intensive application process. The professors at Ball State University want

to be involved with the students and help them learn what they need to succeed, so they are very willing to talk to students about their research and joining their labs. That is one of the greatest benefits I enjoyed attending a smaller undergraduate university. Moreover, the labs are not filled with post-doctoral fellows or PhD students, so as an undergrad I was working directly with the professor. This helped me gain confidence in my abilities because I knew I was getting the best training possible. However, I do not believe this is solely a small university trait. Since I began graduate school at the University of Wisconsin–Madison, I have also noticed that the professors at this top R01 research university care about giving both the undergraduate and graduate students the best education and training possible.

I had an unusual undergraduate education in that I received training in two very different research labs. The first lab centered on studying the virulence and biofilm potential of *Bacillus amyloliquefaciens* isolated from ultra-high temperature pasteurized milk. The second lab studied the mechanism and purpose of pseudouridine RNA modifications in *Candida albicans*. My time in the two labs partially overlapped, which is not something I would necessarily encourage a busy undergraduate student to do. I really enjoyed having the opportunity to work on two completely different projects, but it took time away from other parts of my life in order to equally commit time to both projects. While it is important for undergraduates to learn research techniques, the most important aspect of research an undergraduate student can learn is how to critically think about scientific questions.

For any undergraduate student interested in pursuing a career in any type of research, my advice is to find a lab working on something interesting. I think it is very important for undergraduates to find a stimulating project to work on because this will ultimately determine if they want to continue pursuing research. If their first research experience is working on something they do not find intriguing, then they will not be motivated to commit time to working on the project. It's important for undergraduates beginning in a lab to feel inspired by the science, so that they develop the desire to pursue answers for unknown questions. I encourage undergraduates to get involved in research as early as possible, so they have time to develop this curiosity, but I do not believe joining a research lab as soon as you start at your undergraduate institute is necessary. If you are truly interested in science and research, your curiosity to pursue questions will develop naturally and extra time in the lab will not provide benefit for that aspect of learning. The main benefit of joining early as an undergraduate is that it presents students with more opportunities to participate in summer research programs at other universities. I began reaching out to professors during my sophomore year of undergrad and did not begin working in the lab until the summer before my junior year. I believe my two years working in the lab was the perfect amount of time for me to discover that I enjoyed doing research and wanted to pursue graduate school. I was a competitive applicant when applying for graduate school, and I ultimately ended up at my first-choice school. Two years was enough time for me to develop a strong foundation of skills that I need to succeed as a graduate student.

I encourage students to not be discouraged in their abilities when they are meeting

new people at conferences, interviews, jobs, and graduate school who have experiences different from theirs. I have always struggled with impostor syndrome, the belief that your achievements occur by random chance and at any moment “truly” successful people will realize that you are not good enough to be where you are with your career. Impostor syndrome is very prevalent in academia and extremely common in graduate students. During the first week of orientation for graduate school, I finally had the chance to meet the other students in my cohort. This was when my impostor syndrome really set in. To my surprise, I quickly learned that all but three of the students in my cohort had had at least one year off of school where they worked in a research lab. Most of my peers had either attended R01 universities for undergraduate or worked at an R01 institute as a technician. They all talked about their incredibly interesting and diverse research, and it made me feel like I had not experienced or learned enough about research yet to be in the same place along our paths for our careers. However, something that I have had to continually remind myself is that everyone experiences a learning curve when beginning graduate school. We were all starting over in our research, so while it is possible that I may not know all of the techniques my classmates know, they still have to learn new techniques for their thesis projects, as do I.

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If I had not performed research as an undergraduate, I do not believe I would be prepared for graduate school. It provided me the exposure I needed to understand how research labs work, and it taught me the fundamental skill of thinking critically when approaching a research question. My ability to problem solve in research is not perfect, and I will continually work to develop it throughout graduate school, but I would be lacking in that skill if I had not had prior research experience. I am very grateful for the opportunity to perform research as an undergraduate student. It taught me many valuable skills and helped me determine what type of career I want.

Ultimately, I advise anyone entering a STEM major to look into joining a research lab, even if they are not necessarily interested in a research career. Conducting research supplements and solidifies undergraduate education because students learn to apply the theories they are taught in class. Performing research as an undergraduate is beneficial because it teaches many critical thinking skills that can be used in any work environment. Research also helps to diversify students’ experiences, making them more competitive when entering the workforce. When an undergraduate student conducts research for a significant period of time, it shows that they have experience with problem solving, big picture thinking, and collaborating with peers. I encourage students to branch out from their comfort zone, pursue something new (like research), and use that experience to help them develop new skills and discover what they enjoy related to their field.