Overcoming Challenges as an Undergraduate Researcher

by Austin Monaghan

The Tuesday/Thursday slots on my schedule are reserved for something special, and it’s not skiing. No, those days are blocked out for research at the High Altitude Observatory (HAO) in Boulder. Although research is technically work, my enthusiasm for it makes it feel like recreation. I almost felt guilty collecting a check this past summer because I knew that, if it really came down to it, I would work for free.

That being said, I must confess that many aspects of undergraduate research, from getting a position to managing goals, can prove to be a nuisance for the prospective undergraduate researcher. While I am no expert, I’ve been lucky enough to spend about three of my undergraduate years conducting research, and I’ve stepped in enough puddles to give the reader some measure of advice. These “tips and tricks” are based not only on my experiences, but those of my peers. With any luck, the collective knowledge of many undergraduate researchers, socks soaked through with puddle water, can help you avoid some of the common pitfalls of research.

Start looking for opportunities now

If you think you aren’t good enough to conduct research as a freshman, sophomore, transfer, etc., then you have already stepped into big fat puddle numero uno. You are not only capable, but there is certainly a professor or graduate student on this campus who needs you. Reaching out early indicates a passion for whatever it is you intend to research and an intention to follow through if an individual makes time in their schedule to meet with you. Even if this individual does not have funding for you at the time, spending just a few hours a week cultivating lab skills is invaluable down the road, and often leads to paid positions in the near future. Frankly, many researchers are quite pleased to read an email from a student interested in their work, and even more will gladly take an excuse to ignore the remainder of their inbox. Either way, you have nothing to lose, so go ahead and reach out.

Explore summer REU opportunities

If you have ever heard of an REU (Research Experience for Undergraduates), then you know that these fully-funded NSF programs are an excellent way to dip your toes into research (instead of a puddle). There are thousands of programs in academia and industry, ranging from lab work to fabrication, STEM fields to social sciences and even to the arts! These opportunities are fully funded with travel, housing, and a weekly stipend that often pays as well as most internships. REU programs also have an educational component which typically manifests as a one or two week “summer school” in your field. For me it was a week of solar and space physics, for others it may be quantum computing or robotics. pathwaystoscience.org lists thousands of these opportunities and many more non-REU programs in the US and abroad.
Don’t stress about progress (or lack thereof)

As an undergraduate researcher, there is not a critical grant or large project that entirely and exclusively depends on your work. Your mentors understand that you are there to learn first, provide results second. If you are coming into the lab on weekends driven by passion for research or a desire to escape roommates, great! That being said, if the slowly mounting dread over lack of progress is driving you out of your warm bed at night and into the lab, then it’s time to pump the brakes. Research is often slow and frustrating, and many undergraduates forget that the accomplishments of their peers took years – even decades – to cultivate. You are never expected to sacrifice your weekend nor other priorities for the sake of getting your data two weeks earlier than you would at a more reasonable pace.

Never be shy about asking for help

Your mentors do it all the time. Asking the same question over again for clarity or memory’s sake is also encouraged. Not only do questions open the door for group inquiry and brainstorming, half of the working out of any problem comes in the form of phrasing questions! I have been stuck banging my head on a problem for hours, only to have a breakthrough when I attempted to articulate this funky issue to my colleagues over coffee. When you ask questions, you are thinking and so are those around you. If you instead sit staring at the same plot, willing the answer to reveal itself, your brain will simply sit on its hamster wheel, spinning in circles using the same 10 neurons, until you finally give up. For this reason...

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Don’t skip the 10am office coffee break.

Your mind thrives on varied input and social interaction. Just like muscles, your brain needs to stretch every once in a while to stay fresh and limber, not to mention the opportunity to do some mental hygiene. Not only does taking breaks provide a boost in productivity (want confirmation? You know how to use google), but it is also the best opportunity to get to know your coworkers. Your coworkers are an essential tool for your work. Explaining a problem to them stimulates your brain, and even the most innocuous comment on their part can lead to an important discovery. As the young blood in the office, coworkers are often a little too enthusiastic about dropping their own time-critical projects to help you troubleshoot a problem of your own. I am not sure if there is some sort of psychological reason for this, perhaps they “see themselves” in you, but I can say from personal experience this phenomenon is real.

Ask about conferences, meetings, bowling night, and other opportunities to network.

Networking is an aspect of establishing a career that I personally dreaded. I pictured myself putting on a suit and tie, beaming my largest, fakest smile, and shaking hands with gross stuffy old dudes. Luckily, as I am not looking for a career in banking, this was far from the case. The truth is networking happens continuously, almost accidentally, every time you communicate with researchers in your field. That time your mentor introduced you to a visiting scientist?
Networking. Joining the group for a lunch seminar? Networking. Presenting a poster at a conference? Networking. The beer with your mentor and crew afterwards? The most essential kind of networking. As a specific anecdote, my mentor wanted to head to the bars to celebrate a successful conference. I tagged along, and soon a steady current of prominent scientists started streaming in. I shook hands with an important division director at Marshall Space Flight Center, a famed staff scientist at Goddard, engineers from JPL, and astronomers to name a few. Meeting them created many LinkedIn connections, but more importantly it made me privy to all the juicy gossip in the world of solar physics. Seriously, if you want to determine if a field is right for you, you must meet the people in it and hear the ‘gossip.’ The truth is that science is only 49% driven by your individual passion for exploration; what remains is driven by people. You might struggle to envision yourself as a glaciologist until you have actually met a glaciologist and learned all the glacier-related puns. That evening, I met a group of kindred spirits that I could relate to, and before I knew it, I felt that sense of belonging that many of us crave. You might find that you absolutely despise the folks in you field, and you will be all the wiser for it.

Take your time and enjoy the ride! Research is unlike any other work you will do at school. The answers aren’t online. Your professor might know less than you. You might grind for hours, days, weeks, only to realize that you haven’t been asking the right question! But when you do have a breakthrough, and you will, small or big, that breakthrough belongs to you and your colleagues alone. Cherish it, as it represents what your powerful brain can do!