

Research opportunities for undergraduates

Research at the undergraduate (UG) level comprises a varied mix of experiences for college students. It is fairly common for beginning UGs to do research projects as part of their coursework. These projects often have modest objectives, and are largely meant to introduce concepts of experimental design, replication, systematic observations, standardization of methods and gaining writing skills. For more advanced UGs, research can also mean a portal to gain hands-on experience with the process of scientific enquiry. They perform supervised tasks that contribute incrementally to the research goals of their host laboratory.

It is relatively rare for UGs to actually lead a research project (here I include students in BS/B Sc courses and also those in integrated BS-MS courses). Opportunities to conceptualize a problem, execute a plan, course-correct and trouble-shoot, and finally produce an intellectual contribution in the form of peer-reviewed literature, are quite rare. Swain and Chatterjee¹ provide a rare example at this thinly populated end of the spectrum, to go with some other equally endearing instances that I am aware of². By taking the attention away from grey-haired professors, these examples re-establish our faith in the virtues of innate curiosity, and how science can be fun and engaging. Today, unfortunately, we find ourselves amidst a deeply frustrating enterprise where the merit of scientific work is judged by a phalanx of bibliometric indices. Editors and referees routinely judge worth based on potential

impact. The modern successful scientist of today does good research on topics that are in vogue, packages it attractively, and finally is able to sell it.

On one hand, these quirks in the publish-or-perish game can skew the playing field in favour of researchers with the most experience in navigating the prevailing quagmire in the publication process³. On the other, it could also be potentially linked with all forms of fraud and misconduct⁴. These scenarios paint a depressingly gloomy picture for any young student. We, the scientific community, must now accept additional responsibility to foster continued trust in science. We must ensure that the next generation of scientists, our UGs, remain motivated to pursue science as a career, rather than get discouraged by all that ails it. Admittedly, the science publication and peer-review process is currently strained like never before, and suffers from inherent flaws. Yet, due to great diligence of editors and referees, we occasionally see encouraging signs^{1,2}. However, for me, what makes Swain and Chatterjee¹ especially charming, is that this work was done exclusively by two UGs. Both were students in my course at the Indian Institute of Science, Bengaluru. In my experience, the typical student in my course takes my words for granted, memorizes them, and strives to remember and reproduce them during examinations. I was pleasantly surprised when they responded to my lectures on inter-specific interactions and the purported role of competition with furrowed

brows – a topic of fundamental importance to much of modern ecological thought. In the ensuing months, they questioned the assumptions of the conventional wisdom, conducted thought-experiments over alternative ideas, and sought the opinions of their peers in the dormitory and in the classroom. While I merely cheered from the sidelines, various editors and referees showed tremendous patience and interest to encourage their work further, and saw it to fruition¹. In the end, they emerged with a rare example where ideas discussed in a classroom met with innate curiosity and some encouragement. I know of very few such instances⁵. Only time will tell how their work is received by peers. But, for now, it gives us reason to believe that curiosity still remains the main fodder for scientific enquiry, and there is scope to uphold this relationship in a UG classroom.

1. Swain, A. and Chatterjee, S., *Curr. Sci.*, 2017, **112**(9), 1920–1926.
2. Blackawton, P. S. *et al. Biol. Lett.*, 2011, **7**, 168–172.
3. Jacques, T. S. and Sebire, N. J., *JRSM Short Rep.*, 2010, **1**.
4. Couzin, J., *Science*, 2006, **314**, 1853.
5. Channel, R. and Lomolino, M. V., *Nature*, 2000, **403**, 84–86.

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