

Identifying Rising Stars in Biology: A Response to Bruna

We assessed Bruna's (doi:10.1093/biosci/biu003) assertions and found no evidence that the approaches he advocates would have appreciably improved our analysis or altered our conclusions.

Bruna asserts that we should have incorporated the extent to which an academic biologist's employing institution was research intensive and the proportion of his or her time available for research. However, this suggestion is problematic. Both aspects are probably at least as much *consequences* as they are *causes* of high productivity (a *circulus in probando* logical fallacy). This is because productive scientists will clearly be better than unproductive ones at securing positions at research-intensive institutions and at devoting more time to research. Furthermore, quantifying these two variables would be difficult, because many academics change institutions or work patterns during their careers. Sourcing such information for a large sample of researchers would have been highly time consuming and antithetical to the goal of our study: to assess the relative importance of simply derived variables for explaining variation in researcher productivity.

In terms of incorporating the country of each researcher in our models as a random effect, we initially

considered this tactic but discarded it, for two reasons. First, we had inadequate within-factor replication, with many countries in our sample represented by just one or a few researchers. Second, researchers as a group are remarkably mobile. If one wanted to include *country* as a random effect, would one use the country (or countries) where a researcher was born and raised, the country where he or she received his or her PhD, or the country (or countries) where he or she was subsequently employed?

We did, nonetheless, repeat our analyses with each researcher's native-born continent as a random variable, because, at this coarse level, we did have adequate replication. This increased the amount of variance explained by our models (see <http://is.gd/PEc76Q>) but did not alter our main conclusions—that the number of papers researchers had published at the time of PhD conferral was the most important predictor of their long-term productivity and that the ranking of the university from which they received their PhD was the least important predictor.

Empirical analyses such as ours can always be expanded or made more exhaustive by including more potential predictors. We favored simplicity over complexity. Many seem to like our

approach: Our article has been recommended on *Faculty of 1000* (<http://f1000.com/prime/718146531>), and a popular synopsis that we penned (<http://is.gd/Hoz6nt>) has had over 15,000 views so far.

WILLIAM F. LAURANCE, D. CAROLINA USECHE, SUSAN G. LAURANCE, AND COREY J. A. BRADSHAW

William F. Laurance (bill.laurance@jcu.edu.au) is a distinguished research professor and Australian laureate with the Centre for Tropical Environmental and Sustainability Science and with the School of Marine and Tropical Biology at James Cook University in Cairns, Queensland, Australia. D. Carolina Useche is a biodiversity and climate change researcher at the Alexander von Humboldt Institute on Biological Resources Colombia, in Bogotá. Susan G. Laurance is a tropical leader and associate professor at James Cook University and president of the Association for Tropical Biology and Conservation. Corey J. A. Bradshaw is a professor with the Environment Institute and the School of Earth and Environmental Sciences at the University of Adelaide, in Australia.

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