On Identifying Rising Stars in Ecology

Laurance and colleagues (2013) argue that the primary predictor of scientists' productivity in the decade following the completion of their doctorate is the number of papers they published prior to completing their degree. Unfortunately, shortcomings in Laurance and colleagues' (2013) data collection and analyses call into question the generality of this relationship. First, it appears that they failed to control—statistically or in their sampling—for the type of institution where their focal researchers were based. Given differences in obligations and resources, scientists are likely to have very different relationships between pre- and postdoctoral productivity if they are based at large research universities, smaller colleges focused on undergraduates, or government research institutes. Second, they neglected to correct for the fact that not all researchers, even those at the same institution, devote the same proportion of their time to research. For example, at the University of Florida (which is categorized as a research university with very high levels of research actvity by the Carnegie Foundation 2013), the proportion of one's full-time equivalent (FTE) devoted to research can vary from 10% to 100%, with the remainder dedicated to teaching, extension, service, or administration. Laurance and colleagues (2013) should have used productivity per research FTE, rather than absolute productivity, as the response variable in their analyses. Finally, Laurance and colleagues (2013) appear to have pooled researchers from different countries in their analyses without including national identity as a factor in their model. The countries alluded to in their methods have vastly different academic cultures, training philosophies, resources, expectations, and incentives for publication. Without explicitly considering the influence of national identity—or, at the very least, reporting the number of researchers sampled from each country—it is difficult to determine whether their results are widely applicable or driven by countries overrepresented in their data set.

The generality of Laurance and colleagues' (2013) results ultimately depends on two factors: the composition of the study population and their analyses of its productivity. Without knowing details about the former, including in what countries the scientists were based, the types of institutions employing them, and the structure of their positions, it is challenging to assess the appropriateness of the latter. This is lamentable, especially given the implications of their suggestion to use early productivity as a means of identifying "rising stars" in biology.

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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