Global Disparity in Ecological Science: A Complex Systems Perspective

Simple explanations have a tradition in science that comes from Descartes; however, for complex systems, such a method may in fact “disfigure” reality (Rogers et al. 2013). We propose that this is precisely what occurs with the recent article published in BioScience by George Livingston and colleagues, “Perspectives on the Global Disparity in Ecological Science” (Livingston et al. 2016). They show that scientists from countries with higher income or higher human development index (HDI) do most of the research in ecological science and they are published more frequently than those from low income or low HDI countries; so what’s new? Science is written mostly in English since the First and Second World Wars (Porzuczk 2014). Furthermore, if we use Maslow’s pyramid (Maslow 1943), ecological research is clearly not among the main priorities in low income countries. Chu and colleagues (2003) proposed two essential features of complexity: radical openness and contextuality. Using the former, we propose that Livingston and colleagues (2016) do not include a critical condition of ecological research—and one, most likely, of other disciplines—around the world: Local research funds have policies that maintain the status quo of international science (i.e., the dominance of the English language and the use of International Scientific Indexing [ISI] impact factors). In other words, there is a tight positive feedback between local science funding systems and its global environment. For example, Chile is classified within the countries with high HDI (UNDP 2015). Chile's official language is Spanish; English literacy is only 10 percent (www.ine.cl). Ecological research is not a priority because only 6.4 percent of funds for science and technology are allocated to its various subdisciplines (www.conicyt.cl); still, the instructions for the submission of proposals to compete for governmental funds state that for ecological research, among other disciplines, they should be written in English. Furthermore, 30 percent of the total proposal score depends on the curriculum of the principal investigator, which for ecological research considers only the publications evaluated by means of an equation that depends linearly on ISI scores. Therefore, Livingston and colleagues’ proposals to improve ecological research (i.e., their “shifting the center of ecology”) are not simple; they are naïve. What seems to be necessary is a scientific revolution (in the sense of Kuhn 1969) with emblematic actions (e.g., Wright 2013). However, will that stop the positive feedback between local funds and global science? It remains to be seen.

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Response from Livingston and Colleagues

We would have been naive had we thought that ours is the ultimate word on global inequities in ecological science. Our group certainly included those who saw other dimensions to the problem we addressed, but these were beyond the scope of our quantitative analyses (Livingston et al. 2016). Marin and Delgado do just what we called for: They initiate a discussion among ecologists. However, they focus their attention on two critiques that are not framed constructively: (1) reinforcement between local funding and global science and (2) how to work on complex systems.

We did not argue that the only path forward is for low human development index (HDI) countries to break from “global science” in favor of “local science.” Countries at any HDI level can co-opt a share of global science by implementing strong feedback structures around the evaluation of researchers’ publication records, precisely as Chile has done. These efforts could ultimately increase the representation of those countries in global science and catalyze the shifts we call for.

Ecology frequently confronts complex systems, and all approaches to understand nature follow a simplification process. A flawed and oversimplified interpretation of our results would be that ecological science only needs further economic growth to flourish in low HDI countries. Despite our simplified framework, a key result of our analysis is that low HDI countries have substantial leverage to prioritize
funding for ecological research. As a related example, Brown and colleagues (2011) produced a simple explanation of how global development is driven by energetic constraints, but they also show the complexities of each country's energy and gross domestic product (GDP) trajectories. They do not try to convince the reader that their simple model captures and explains all variability for any single country, nor do we. In our case, it is obvious that any single country and academic group will have singular experiences dealing with ecological science. We urge Marín and Delgado to extend the type of global analysis we initiated. At the same time, we call for more focused analyses to be carried out separately within regions, countries, and academic groups.

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