Surviving the growing pains of the inter-to-disciplinary lifecycle

In PNAS, Shaman et al. (1) introduces a collection of articles from the Arthur M. Sackler Colloquium of the National Academy of Sciences “Fostering Advances in Interdisciplinary Climate Science.” The papers provided an informative account of progress in interdisciplinary climate science, examples of emerging research, and some of the challenges that can impede interdisciplinary research (e.g., planning, funding, execution, and dissemination). However, when one reviews the literature, a pattern emerges where these same challenges relating to attitudinal (planning), communication (planning, execution, and dissemination), and structural bias (funding) have persisted over the past three decades (see, for example, refs. 2, 3, 4, and 5). Are these obstacles too massive to overcome? Or are the “growing pains” of maturing from an adolescent (emerging interdisciplinary field) into an adult (an established discipline) part of the inter-to-disciplinary lifecycle?

We agree with Shaman et al. (1) that emerging interdisciplinary research fields struggle to gain recognition and that some fail, but we propose that such selection is both “natural” and perhaps beneficial. Researchers accept that if a species is washed ashore on the Galápagos Islands, then it must adapt or perish and that a new business must quickly become competitive or will fail. In the same way, emerging interdisciplinary research fields must demonstrate their added value. Interdisciplinary climate science pro-

vides an excellent example. It has endured growing pains to mature into an established discipline. Globally, there are scientists, research institutes, journals, and training courses dedicated to interdisciplinary climate science. How did this happen? Pioneers, such as Jim Hansen and Stephen Schneider, championed the interdisciplinary climate science cause. They articulated exciting and novel research questions, raised funds for projects and research institutes, attracted the brightest scientists, engaged with different disciplines, and communicated the science via the mass media or assessment processes (e.g., the Intergovernmental Panel on Climate Change). Climate change is now recognized as one of the most urgent societal challenges of our time, demanding the integration of the natural, social, and human sciences and the engagement of science and society to provide options for the responsible management of the world’s climate.

A decade ago, the seminal National Academies report *Facilitating Interdisciplinary Research* (4) concluded that complex challenges motivate interdisciplinarity and the emergence of new disciplines, attracting researchers toward exciting questions and the interface of disciplines. However, 10 y on, the same challenge remains to provide the institutional and funding support required for interdisciplinary research. Rather than repeatedly identify the same barriers, we propose researchers, funding agencies, and

academies might better devise methods to penetrate barriers and tools to identify interdisciplinary efforts not yet strong enough to stand alone.

The barriers to interdisciplinary research are not insurmountable, as demonstrated by the new interdiscipline of climate. On the contrary, the growing difficulties are healthy evidence of the inter-to-disciplinary lifecycle, where “natural selection” enables the most worthy scientific enterprise to flourish and leaves weaker species time to adapt.

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5 Phelan L, Jones H, Marlon JR (2013) Bringing new PhDs together for interdisciplinary climate change research. *Eos Trans AGU* 94(5):57.

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