
Species invasions have long provided grist for fundamental studies and insights into ecology, evolution, and biogeography. Classic marine examples are Jane Lubchenco’s experimental studies on the role of the periwinkle snail *Littorina littorea* in regulating intertidal communities in New England, where this mollusk was unknown until the 1860s, and John Sutherland’s experimental work in North Carolina on multiple stable points at the community level, based in large part on the phenology of the Asian sea squirt *Styela plicata*. More recently, invasions have raised increasing concerns about what to do to prevent or manage newer invasions mediated by human activity. *Species Invasions: Insights into Ecology, Evolution, and Biogeography*, edited by Dov Sax, John Stachowicz, and Steven Gaines, seeks to extend our thinking on how invasions can contribute to basic research questions.

Not long after the first cells got together on this planet, they moved, or were moved, and organisms ever since have flowed along corridors in a reasonably predictable manner. In all three main types of habitat (terrestrial, freshwater, and marine), we often interpret biological flow through physical expectation: As the winds or water flow, so do living organisms. Barriers restrict such flow: At the regional scale, these may be as simple as a river or a mountain chain; at a global scale, they may be continents or ocean basins. Over time, these barriers are created or dissolved: Land masses move and break apart, narrow bridges between them come and go, oceans become extinct or are created, or large-scale atmospheric events occur.

But humans have changed all that, and anthropogenic invasions, like many other environmental insults perpetrated by people, are *sui generis*. These are invasions that are not expected and are not historical facts of life. Human activity instantaneously dissolves all barriers of time and space across the entire planet, such that übermixing is now a fact of life. Because of human-mediated vectors, Australian insects may arrive in Britain within hours, and the estuaries of Australia are only days away from the estuaries of southern California. Such journeys are impossible without human intervention. The globalization of colonization by nonnative species is a modern-day phenomenon without precedent; the wholesale translocation of entire communities from one side of the planet to the other is quite a different story from those of the past.

The results of these anthropogenic invasions, some of which are sampled in Sax and colleagues’ useful volume, are all that an ecologist or evolutionary biologist could imagine (I won’t say hope for, although the results do provide an incredible array of insights into basic ecological and evolutionary processes). Thousands of species are doing quite well, thank you, in parts of the world where they did not evolve, a fact that alone provides the material for endless investigations. The editors and authors also note, summarizing earlier literature and contributing new information, that the general outcome of most invasions is to increase the overall pool of resident species (although losses of many species at the hands of exotic predators, pathogens, and parasites have occurred). But increased diversity often comes at the expense of fundamental alterations to community structure, and while the prior species may still be there after the invaders have become established, the former are often rendered functionally extinct. The mixing of tens of thousands of species worldwide is thus a Whittam’s Sampler of competition, predation, and disturbance, with every possible positive and negative outcome (in the ecological and specifically population biological senses, not in the societal sense). Given this incredible complexity, the challenge, noted by several chapter authors and by the editors, is to construct a framework that would permit more elegant prediction in the face of the many invasions yet to come.

The editors divide the book into three parts—Ecology (5 chapters, totalling 123 pages), Evolution (6 chapters, 174 pages), and Biogeography (6 chapters, 156 pages)—bookended by a preface, an introduction, and a conclusion (“Capstone”). Each section begins with a short overview essay, for a total of 23 contributions.

This is a good book, and one worth buying. There is much to mine here, and even seasoned invasion ecologists will find new juxtapositions to ponder. Invasion ecologists who typically find themselves habitat restricted will find new perspectives and numerous references throughout a rich literature that they may have overlooked. That said, and of necessity, this book offers only a sample of old and new literature: There is a vast and complex literature produced over the past 150 years of tens of thousands of papers on invasions of plants, vertebrates, and invertebrates, and this book can provide only a taste of these.

Many of the authors in *Species Invasions* attempt to provide guidance through this labyrinth. Bruno and colleagues, Stachowicz and Tilman, Huey and colleagues, Ricklefs, Kinlan and Hastings, and Sax and colleagues use invasions as a prodding or prying tool to offer synthesis, insight, and in some cases new theory on the complexities of teasing out what may regulate populations, communities, and ecosystems. Other contributors elucidate insights gained from invasions of infectious diseases, plants, birds, insects, and fish. Novak and Mack review the reality of genetic bottlenecks (and particularly the lack thereof). Wares and colleagues, Holt and colleagues, and Rice and Sax offer approaches into how invasions do or could contribute to fundamental evolutionary questions.

If you are an active member of the biological scientific community, you cannot have escaped noticing: Everything seems to be robust these days. The genetic code is a robust encoding of amino acids into codons, RNA molecules are robust to point mutations, proteins are robust to translation errors, developmental pathways are robust to environmental or genetic disturbances, metabolic networks are robust to changes in enzyme efficiency...the list goes on and on. While not all of these ideas are new (e.g., the idea of robustness in organismal development goes back to Conrad Hal Waddington’s work in the 1950s), the amount of research devoted to the robustness of various biological systems has exploded in recent years. However, there is a danger in using a concept such as robustness, in that it can be so generic and widely applicable that its use may contribute little to the understanding of specific biological systems. For example, it is not clear a priori that a robust RNA molecule that can fold correctly despite nucleotide substitutions has anything to do with a robust metabolic network that continues to function after gene deletion.

Enter Andreas Wagner’s book on robustness. Wagner’s book has two aims, to review the current knowledge on robustness and to identify common principles that cause biological systems to be robust. The book is divided into four parts. The first two parts, “Robustness Below the Gene Level” and “Robustness Above the Gene Level,” provide a comprehensive review of all things robust. Wagner begins with nucleotides themselves; talks about the genetic code, RNA, and protein molecules; and moves to successively larger scales, including meta-