
Frontiers of Biogeography: New Directions in the Geography of Nature was developed from papers presented at the 2003 inaugural meeting of the International Biogeography Society. One of the main goals of this society is to facilitate greater communication and collaboration between biogeographers across different academic disciplines. With this in mind, the 436-page, 18-chapter text brings together the research findings of 43 authors who conduct research under the biogeography banner. The book is divided into five parts deemed to be the biogeography’s most active and important subdisciplines. The chapters in each section generally summarize the history, current activity and “frontiers” of the research in question.

Part I on paleobiogeography is a logical place to start as it deals with the past distribution of species and the factors that have affected them. Chapter 1 reconstructs the movements of the continents beginning with the break-up of Pangea 240 million years ago using results from the PALEOMAP project. Understanding the spatial distribution of the continents and how it affected species distribution and the development of new species is a critical biogeographical topic. Chapter 2 discusses the use of rodent midden records to explore the historical biogeography of desert regions and highlights North and South American findings. Expanding the use of the middens beyond mere vegetation description through morphological, isotopic, and genetic analysis is also discussed. Chapter 3 on Quaternary biogeography provides a good summary of paleoecological methods and how they relate to biogeographical lines of research including the effects of climate change on species distributions and community compositions. One of the key points mentioned is that there is no “standard” Quaternary state, as climate varies at all time scales. Another section deals with the potential re-fusing of paleoecology and biogeography through the use of new techniques such as molecular markers. While I was not personally aware that there was friction between these two groups, I believe these sorts of problems occur when people define their disciplines by research techniques and methods instead of the questions addressed. Chapter 4 outlines the history and uses of area cladistics in biogeography. This chapter (along with the chapters in Part II) may be a difficult read if you do not have a background in the area.

Part II is on phylogeography and diversification. Phylogeography investigates the principles and mechanisms that determine the geographic distribution of genealogical lineages. Chapter 5 concerns the growth of phylogeography as a new (~15 years old) discipline. The authors evaluate phylogeography’s conceptual position as a bridge between microevolutionary (population genetics) and macroevolutionary (phylogenetic biogeography) disciplines and discusses its place in historical biogeography. Chapter 6 deals with how data and perspectives derived from palaeontology can influence and benefit phylogenetic biogeography. Chapter 7 discusses the differences between cladistics and phylogenetic biogeographic models and demonstrates how secondary Brooks Parsimony Analysis (BPA) can contribute to historical biogeography.

Part III is about diversity gradients. Chapter 8 discusses the problems of measuring diversity with a single metric, which has historically been taxonomic richness. The authors demonstrate how our understanding of species distributions can change when using other metrics such as morphological and functional information. Chapter 9 discusses the global diversity gradient (i.e., that there are more species in the tropics than at the poles) and examines the three major types of theory for explaining it: species-energy theory, niche-assembly theory, and those that invoke evolution and history. The authors suggest that it would be profitable to start with the simplest theories (neutral-species-energy model) and then build upwards. Chapter 10 is somewhat similar to Chapter 8. The authors discuss the need to “deconstruct” species richness into smaller subsets of species with similar biological characteristics, etc., in order to understand the mechanisms that are responsible for patterns of species richness. Chapter 11 deals with species richness on islands. The authors first evaluates MacArthur and Wilson’s dynamic equilibrium model of island ecology and then presents another conceptual framework that includes both equilibrial/non-equilibrial and dynamic/static continuums in order to include islands that do not fit into the original island ecology model. The problems with this model, primarily dealing with scaling factors, are then discussed leading into a subsection on scale and climatic gradients.

Part IV dealing with marine biology was an eye-opener for me, if only to show me that I have a terrestrial bias and rarely consider the marine environment. Chapter 12 compares and contrasts terrestrial island ecology with marine island ecology. The authors invoke some of the same concerns voiced in chapters 8 and 10, i.e., a need to include more than just species names to describe diversity. Chapter 13 presents evidence that the East Indies Triangle is a centre of origin from which species radiate in contrast to a geographic area receiving species from elsewhere. Finally, Chapter 14 examines the latitudinal gradient from the tropics to the poles in a marine setting with observations being made on how diversity patterns change with both scale and time. An interesting section concerns how four major Cenozoic tectonic events affected marine diversity.

Part V, about conservation biogeography, is comprised of chapters that demonstrate how biogeographical methods and theories can be applied to conserve biodiversity. Chapter 15 asks how do biological invasions alter diversity patterns. The mechanics of species invasions are reviewed and then the effects on alpha and beta diversity are discussed. Several studies indicate that alpha diversity often remains the same while beta diversity may decrease due to an increased homogenization of the ecosystems. One problem with these interpretations is that diversity is being regarded simply as species names and numbers. The characteristics of the species and how they affect the ecological integrity of the studied ecosystems are lacking (this point is briefly touched upon as a future research direction at the end of the chapter). The potential of using the unified neutral theory to model biological invasions is also explored. Chapter 16 demonstrates that geographic information system (GIS) along with ecological niche model-