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A much needed compilation of studies of a Neotropical elevation gradient

Ecological Gradient Analyses in a Tropical Landscape: Ecological Bulletins 54. Grizelle González, Michael R. Willig & Robert B. Waide (editors), 2013, Wiley-Blackwell. 252 pp. £37.50 (Hardback) ISBN: 9781118659328; http://eu.wiley.com/

Since Humboldt's studies of mountain regions (Humboldt and Bonpland 1807), altitudinal gradients have served as a foundation for many ecological processes documenting biodiversity and species distributions. The Luquillo mountains in Puerto Rico are perhaps one of the most studied tropical montane forests, where tree distributions across the gradients have been well documented (Weaver and Murphy 1990). Studies in these mountains have generated foundational knowledge about tropical ecology, such as the transition and classification of ecosystems or "life zone systems" in a landscape (Holdridge 1947), the importance of cloud cover on tropical montane forests (Te Linde et al. 2001), and the impacts of hurricanes on forest structure (Scatena and Larsen 1991).

When studying elevational gradients we generally have two choices. Start description and observations of lesser-known mountains, the species occurring in them, and the hydrology and geology of sites across the gradients; or, build on previous knowledge of the few mountain ranges that are well studied and design experiments based on findings that date from the 1940s. There are advantages in each approach but there is unique value in studying a well known mountain range: previous knowledge enables the range to be used as a natural experiment in which species' distributions and microclimatic and habitat transitions are known. Thanks to researchers including Leslie Holdridge, Fred Scatena, Ariel Lugo, Grizelle González, Tamara Heartsil, Michael Willig, Robert Waide and others who devoted their lives to studying many climatological, ecological and geological aspects across the Luquillo mountains, we can further develop theories about elevation gradients and ask more complex questions about these processes.

This book is a beautiful hard cover edition including a well-balanced compilation of 15 studies describing the Luquillo mountains. The book is organized in four sections, preceded by an introduction of the current knowledge of the area and ending with an insightful conclusion. The compilation serves as a testament to the breadth of questions one can pose in a mountain range that is well studied. It is a must-read for researchers planning to work in the Luquillo mountains, or any tropical mountains, since it will bring them up to speed with what has been studied and will provide many insights to what still needs to be understood about tropical mountain ranges.

Since the Luquillo mountains have been a center of attention for ecologists since 1947, current studies included in this book have been able to start looking at the diversity gradients of organisms that typically are neglected, like snails (Willig et al., p. 117), those dwelling in under-explored microhabitats such as soil, and epiphytes (Richardson and Richardson, p. 101). This book also describes how elevation affects less known aspects of ecology such as nutrient gradients and soil carbon (Medina et al., p. 157). The book includes a study on changes in ecological functioning across elevation which reveals that the gradient in biogeochemistry (i.e., the REDOX gradient) does not have a linear relationship with elevation, forest type, or net primary productivity (NPP). Instead, it is shown to be tied to the physical properties of the soil, such as its bulk density (Whendee et al., p. 195).

An important read for biogeographers and macroecologists is the study by Harris and collaborators (p. 233) who test the maximum power hypothesis. They clarify the balance between photosynthesis and respiration to define the elevation at which the net power flow of the forest is maximized. This elevation band corresponds to where vegetation complexity is at its highest and there

are more tree species per unit area. This study is one of the first to examine the physics behind species distributions and could, by virtue of understanding the climatic conditions present at these elevation bands, lead not only to more accurate predictions of the fate of species impacted by climate disruption locally but also across entire mountain ranges that share similar cloud cover conditions. Also important, Aaron et al. (p. 211) describe landslides in the Luquillo Mountains, which along with the literature on extreme climatological events, such as hurricanes, highlights just how dynamic and resilient are the forests across the elevational gradient of this mountain range.

Genoveva Rodríguez-Castañeda
Section of Integrative Biology,
University of Texas in Austin, Texas, USA
genioveva@gmail.com

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