

# UC Merced

## Frontiers of Biogeography

### Title

book review: Past environmental change in Latin America

### Permalink

<https://escholarship.org/uc/item/7xm312j7>

### Journal

Frontiers of Biogeography, 2(4)

### Author

Gosling, William D.

### Publication Date

2011

### DOI

10.21425/F5FBG12365

### Copyright Information

Copyright 2011 by the author(s). This work is made available under the terms of a Creative Commons Attribution License, available at

<https://creativecommons.org/licenses/by/4.0/>

It is exciting to see such dynamic development of new approaches to island biogeography; whether one studies metapopulation dynamics, conservation biogeography, or adaptive radiations on oceanic islands, the field of island biogeography continues to offer broad horizons. If it is true that the paradigm initiated by MacArthur and Wilson is being supplanted in both ecological and evolutionary island biogeography, the new paradigms owe much of their development to the robust research agenda laid out 40 years ago.

MacArthur, R.H. & Wilson, E.O. (1967) *The theory of island biogeography*. Princeton University Press, Princeton.

Lawrence R. Heaney

Field Museum of Natural History, Chicago, IL,  
USA

e-mail: [lheaney@fieldmuseum.org](mailto:lheaney@fieldmuseum.org)  
[http://fm1.fieldmuseum.org/aa/  
staff\\_page.cgi?staff=lheaney](http://fm1.fieldmuseum.org/aa/staff_page.cgi?staff=lheaney)

## References

MacArthur, R.H. & Wilson, E.O. (1963) An equilibrium theory of insular zoogeography. *Evolution*, 17, 373-387.

Edited by Markus Eichhorn and Joaquín Hortal

book review

## Past environmental change in Latin America

*Late Cretaceous and Cenozoic History of Latin America Vegetation and Terrestrial Environments*, by Alan Graham

Missouri Botanical Garden Press, *Flora Mesoamericana* Vol. 4(1), June 2010, 617 pp. ISBN: 978-1-930723-68-9

Price: \$95.00 (Hardback)

<http://www.mbgpress.info/>

This authoritative text by Prof. Alan Graham of the Missouri Botanic Gardens is based upon nearly four decades of research in the Neotropics. The volume provides a comprehensive foundation for understanding the past environmental change that underlies the biogeographic patterns found in Latin America (defined as 32°N to 55°S), and is a companion volume to his earlier work which focused upon North America (Graham, 1999), in addition to another recent book on the palaeoecological history of the New World (Graham, 2010<sup>1</sup>). The introductory note to the Latin America book states that the target level is advanced undergraduate and graduate students, and that the aim is to be appropriate for use within university courses and seminars. In my opinion this book achieves this goal by providing up-to-date information in a well organised, concise and interesting manner.

The book is logically set out and written in an easily-digestible style which should be understood by most undergraduate students. Divided into three sections (Background, Database and Synthesis) and eight chapters, there is a natural progression in the format, which means that the text could easily be utilised as a support for a seminar series or lecture course. The background section contains a wealth of basic information on the climate, geography, geology and vegetation, which provides the scene-setting details which would be required for any undergraduate lecture series on the past environments of Latin America. The clear and consistent geographic organisation of chapters and subsections also lends itself to the teacher or student who wishes to extract information on a particular region of interest; Mexico, the Antilles, Central America or South America.

<sup>1</sup>A review of this book will appear in a future issue of *Frontiers of Biogeography*.

The appendix and database section provide primary data on modern plant distribution, and micro- and mega-fossil fossil discoveries respectively. The lists of plants and fossil finds are a useful collation especially for any new research student embarking on a project focused upon Latin America. The database chapters also include clearly reproduced maps, pollen diagrams and images of key pollen taxa and the discussion assesses the evidence for change at particular sites and across the regions. The databases section is not merely names and numbers; it contains far more commentary and scientific debate than I can hope to cover in this review. Therefore, to give you a flavour of the text I will focus on one of the areas with which I am more familiar to hopefully provide an idea of the level of detail presented.

In the region-specific 'South America' chapter, the Quaternary history of environmental change on the Bolivian Altiplano is given specific attention because of the relative abundance of information (Chapter 7, p. 418-424). Understanding the likely response of water resources to predicted future climate change is critically important today because of the millions of people living in, and around, La Paz (Bolivia) and the fragile, highly biodiverse, ecosystems which are reliant on the persistence of glaciers and lakes. Past fluctuations in climate on the Altiplano and the extent to which these controlled the size, duration and timing of mega-lakes have been the focus of much recent research. Graham sets out clearly the basic understanding of late Quaternary moisture balance change which has been gathered from sedimentary records, ice cores and glacial features. The review of the literature in the book is comprehensive up to 2006; I will summarise the evidence discussed and add some context from recently published research.

One of the main issues that must be considered when thinking about the waxing and waning of mega-lakes on the dry central Altiplano in Bolivia is: how do you get the positive moisture balance to 'grow' the lakes? Following the examination of sediments from Salar Uyuni, Baker et al. (2001) evoked an elegant model which suggested that orbitally forced movement of the Inter Tropi-

cal Convergence Zone conveyed more (or less) moisture to this region dependent on the angle of the rotation of the Earth's axis relative to the Sun. Assuming that movement of the ITCZ is key to getting moisture onto the Altiplano we can anticipate that a c. 20,000 year cyclicity would be evident in records of moisture change found across the Andes and Amazon. As Graham points out, Burbridge et al. (2004) find a similar pattern in the southern Amazonian lowlands and suggest a similar mechanism. However, on the Bolivian Altiplano, recent work by Placzek et al. (2011) on tufa barrages, assumed to record the age of lake high stands, suggests that the timing of lake high-stands does not necessarily fit the pattern anticipated from precessional forcing. A pertinent, yet not often considered, question related to this is raised by Graham in reference to discrepancies in the timing and extent of lake level changes: what influence have subterranean tectonic shifts had, and how could these have altered ground water flow and therefore influenced the surface lakes and water drainage systems. Evidence from new fossil pollen records obtained from Lake Titicaca suggest that a further complicating factor may be the impact of local, regional or extra-regional climate feedbacks. Bush et al. (2010) point out that today Lake Titicaca modifies its local climate, particularly rainfall, and that feedbacks associated with this are likely to have magnified past environmental changes on the Altiplano during the last 370,000 years. Reconciling the seemingly conflicting records of lake level change and understanding the biogeographic implications is an on-going challenge for researchers. This is one of many short sections within Graham's book which provide an excellent foundation for setting up debate, well-supported by references and with a growing body of new literature available for students to discover for themselves.

The final section of this book continues to present key issues in a clear manner but focuses on bringing together data to understand the broader picture. This section covers major biogeographic events and issues, including the closure of the isthmus of Panama, the origins of Neotropical rain forest, and debate surrounding

the existence, or otherwise, of Quaternary glacial forest refugia in the Amazon lowlands. The insight and coverage offered throughout this impressive text reflects Alan Graham's experience and interests. What is more, the digestible way in which the vast array of complex data and discussion is conveyed demonstrates his breadth of knowledge and literary skill. In summary, this book contains a wealth of useful information for those wishing to get to grips with the key issues of surrounding past vegetation and terrestrial environments in Latin America. The text would be an excellent support for a lecture course or sections could be used as a springboard for a related student research project.

### References

- Baker, P.A., Rigsby, C.A., Seltzer, G.O., Fritz, S.C., Lowenstein, T.K., Bacher, N.P. & Veliz, C. (2001). Tropical climate changes at millennial and orbital timescales on the Bolivian Altiplano. *Nature*, 409, 698-701.
- Burbridge, R.E., Mayle, F.E. & Killeen, T.J. (2004). 50,000 year vegetation and climate history of Noel Kempff Mercado national park, Bolivian Amazon. *Quaternary Research*, 61, 215-230.
- Bush, M.B., Hanselman, J.A. & Gosling, W.D. (2010). Non-linear climate change and Andean feedbacks: An imminent turning point? *Global Change Biology*, 16, 3223-3232.
- Graham, A. (1999). *Late Cretaceous and Cenozoic History of North American Vegetation (North of Mexico)*. Oxford University Press, Oxford.
- Graham, A. (2010). *A Natural History of the New World: The Ecology and Evolution of Plants in the Americas*. The University of Chicago Press, Chicago.
- Placzek, C.J., Quade, J. & Patchett, P.J. (2011). Isotopic tracers of paleohydrological change in large lakes of the Bolivian Altiplano. *Quaternary Research*, 75, 231-244.

William D. Gosling

Earth & Environmental Sciences (CEPSAR),

The Open University, UK

e-mail: [w.d.gosling@open.ac.uk](mailto:w.d.gosling@open.ac.uk)

<http://www.open.ac.uk/science/earthsciences/palaeo/>

Edited by Markus Eichhorn

### New editorial policy for book reviews

*Frontiers of Biogeography* will publish in-depth reviews of recently published books (typically less than one year old) on biogeography or of interest to biogeographers, alongside a 'Noted with Interest' section providing brief details of new publications. Authors, editors or third parties are invited to suggest books for review to the Book Review Editor, Dr Markus Eichhorn, School of Biology, University Park, Nottingham NG7 2RD, United Kingdom; telephone ++44 (0) 115 951 3214; e-mail [markus.eichhorn@nottingham.ac.uk](mailto:markus.eichhorn@nottingham.ac.uk). We welcome offers to review books for *Frontiers of Biogeography*, but will not accept an offer to review a specific book. Anyone wishing to review books should send a brief *curriculum vitae*, description of competencies, and a statement of reviewing interests to the Book Review Editor. Reviews should be in an essay style, expressing an opinion about the value of the book, its focus and breadth, setting it in the context of recent developments within the field of study. Textbook reviews should consider their utility as resources for teaching and learning. Avoid describing the book chapter-by-chapter or listing typographical errors. The length should normally be 1000 words (1500 words for joint reviews of related texts) including a maximum 10 references. Authors may suggest a short heading for the review, followed by the title of the book(s), the authors/editors, publisher, publication date, price, hbk/pbk, pages, ISBN and website (where available). Figures or tables will not ordinarily be included. Authors of reviews must verify that they have not offered (and will not offer) a review of the same book to another journal, and must declare any potential conflict of interest that might interfere with their objectivity. This may form a basis for editorial decisions and such disclosures may be published. Book reviews will usually go through a light editorial review, though in some circumstances also will be considered by one or more referees.