Macroecology (#001-2-3094)

Lecturer: Uri Roll and Gabriel Caetano

2 credits, 2 weekly hours, spring term (Tuesdays 17:15-19:00), Albert Katz International School for Desert Studies, Sede Boqer Campus, BGU

Course description

Broadscale ecological patterns have captivated naturalists and scientists for centuries. The recent development in high power computational capabilities enable testing, revisiting and developing some of the classical hypotheses on large-scale patterns of biodiversity and evolutionary processes that have been proposed over the last two centuries, using Big Data and elaborate computational models. This course will introduce students to recent progress in the fields of macroecology and macroevolution and will equip them with a few common tools used in the study of large-scale phenomena in both space and time.

Course structure

The course will include readings and discussions of cutting-edge topics and open questions in the field. The students will be required to present and lead a discussion on selected topics. The course will include practical exercises dedicated to some of the main methods explored (see below).

Grade components

Presentation of a selected topic	(50%)
Active participation in discussions	(30%)
Practical exercises	(20%)

Main topics:

1. What are Macroecology and Macroevolution?
2. Macroecological laws and rules—who follows them?
3. Overview of methods: phylogenetic comparative methods, trait evolution models, ancestral state reconstruction, diversification analysis and spatial analyses. *Practical exercises*.
4. Macroecological spatio-temporal patterns (e.g. species richness, phylogenetic diversity) and processes governing them: diversity gradients (e.g. latitudinal gradients), diversification etc.
5. Historical contingency, determinism, and convergence (Gould's thought experiment)
6. Macroecological concepts of niches and assemblages: niche conservatism and niche breadth.
7. Macroecology and conservation: assessing, prioritizing, and quantifying biodiversity at large scales

Required background: basic background in ecology, evolutionary theory, and statistics. Knowledge of the R programming language is preferable.

Contact the lecturer with specific queries regarding necessary background.

References

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Riemer, K., Guralnick, R.P., White, E.P., 2018. No general relationship between mass and temperature in endothermic species. eLife 7, e27166.

Sexton, J.P., Montiel, J., Shay, J.E., Stephens, M.R., Slatyer, R.A., 2017. Evolution of ecological niche breadth. Annual Review of Ecology, Evolution, and Systematics 48.

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Rapacciuolo, G., 2019. Strengthening the contribution of macroecological models to conservation practice. Global Ecology and Biogeography 28, 54-60.

Pollock, L.J., Thuiller, W., Jetz, W., 2017. Large conservation gains possible for global biodiversity facets. Nature 546, 141-144.