

DY 9: Plenary Talk: Ehud Meron

Time: Monday 14:00–14:45

Location: H15

Plenary Talk

DY 9.1 Mon 14:00 H15

From patterns to function in living systems: dryland ecosystems as a case study — ●EHUD MERON — Ben-Gurion University of the Negev, Beer-Sheva, Israel

Dryland landscapes show a variety of vegetation pattern-formation phenomena; banded vegetation on hill slopes and nearly hexagonal patterns of bare-soil gaps in grasslands (“fairy circles”) are two striking examples. Vegetation pattern formation is a population-level mechanism to cope with water stress. It couples to other response mechanisms operating at lower and higher organization levels, such as phenotypic changes at the organism level and biodiversity changes at the community level, and plays a crucial role in understanding ecosystem response and ecosystem function in changing environments. In

this talk I will present a platform of mathematical models for dryland ecosystems and describe some of the ecological questions we have studied using this platform. I will discuss the mechanisms that destabilize uniform vegetation and lead to periodic vegetation patterns, the variety of extended and localized patterns that can appear along a rainfall gradient, the impact of pattern formation on critical state transitions (regime shifts), pattern-induced species coexistence, and restoration of degraded landscapes as a spatial resonance problem. I will conclude with a discussion of two open problems, the coupling between pattern formation and biodiversity, and the reconciliation of human intervention and ecological integrity in disturbed ecosystems.

Reference: Ehud Meron, *Nonlinear Physics of Ecosystems*, CRC Press 2015.