National Institute for Mathematical and Biological Synthesis

cordially invites you to an

Interdisciplinary Seminar

with

Dr. Glenn Ledder

on

"Allocation of resources in two-component systems"

Thursday, April 14, 2016
3:30-5 p.m.
Reception & refreshments at 3 p.m.

Hallam Auditorium, Room 206
1122 Volunteer Boulevard

Glenn Ledder earned his PhD in Applied Mathematics at Rensselaer Polytechnic Institute and has been in the Department of Mathematics at the University of Nebraska-Lincoln (UNL) since 1989. His expertise is in mathematical modeling for systems in physical and biological sciences. His current focus is on life history theory for plants, work being done in partnership with Professor Sabrina Russo of the UNL School of Biological Sciences, with a particular interest in adaptations of plants to specific soil types. He is a co-organizer of the DEB Modeling of Trees NIMBioS Working Group, which also includes NIMBioS postdoctoral fellow Caroline Farrior and former NIMBioS postdoctoral fellow Angie Peace.

Abstract: How plants allocate resources towards different functions, such as light-absorption by shoots versus nutrient and water-absorption by roots, is a critical determinant of their growth and survival. Yet, the mechanisms underlying such differential allocation in heterogeneous environments are unknown. It is generally thought that plants allocate resources to achieve optimal growth, but this would require central planning, a capacity that plants are unlikely to have. An alternative hypothesis is that differential allocation is accomplished through local allocation rules operating independently in roots and shoots, with each of these components acting selfishly, as happens in obligate syntrophy. We describe a simple model for a plant as a system of "roots" and "shoots" that collect "carbon" and "nitrogen," respectively. Nitrogen collected by roots is sent directly to a root synthesizing unit to be combined with carbon into new root tissue. Any excess (unused) nitrogen is passed from the roots to the shoots. Similarly, carbon collected by shoots goes to the shoot synthesizing unit, with any excess sent to the roots. Analysis shows that this selfish allocation protocol manages to yield patterns consistent with those generated by a model of optimal plant growth, for synthesizing unit models defined with both a simplified Liebig minimum rule and a more realistic co-limitation model.

The University of Tennessee Knoxville

The seminar will be live streamed. Visit http://www.nimbios.org/videos/livestream.
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