

Patterns and Forms in Nature

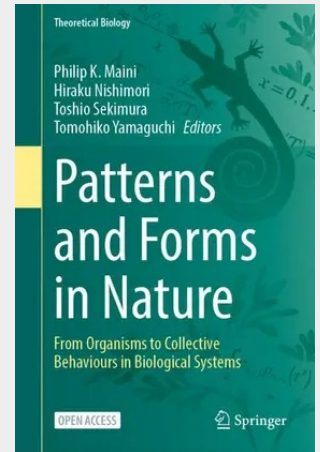
From Organisms to Collective Behaviours in Biological Systems

This open access book presents a multidisciplinary examination of how biological shapes, structures, and dynamic patterns emerge, evolve, and persist in the natural world. Drawing on genetics, developmental biology, evolutionary theory, physics, chemistry, and mathematical modeling, the book brings together leading researchers who illuminate the fundamental principles behind the diversity of forms found in living organisms.

The chapters span a wide scientific landscape. Readers encounter discussions of symmetry breaking from physics to biology, models of collective cell behavior, and the mechanisms and evolutionary history of female-limited Batesian mimicry in *Papilio* butterflies. The volume also includes mathematical and computational analyses of pattern formation and population dynamics, as well as investigations into the development and evolution of butterfly wing patterns. Additional chapters examine how a single gene can determine snail coiling direction, explore morphospace approaches to evolution, and analyze the functional morphology of molluscan shells. Other contributions reveal the mechanical optimality embedded in plant structures and highlight striking spiral patterns and morphologies found in chemical systems.

Based on invited lectures delivered at the 6th Yamada Symposium in Tokyo, this book provides readers with an integrated view of pattern formation across scales and disciplines. It serves as an engaging guide for researchers, students, and anyone interested in understanding how nature generates its remarkable variety of forms.

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