

Collective Animal Behavior

David J. T. Sumpter

Fish travel in schools, birds migrate in flocks, honeybees swarm, and ants build trails. How and why do these collective behaviors occur? Exploring how coordinated group patterns emerge from individual interactions, *Collective Animal Behavior* reveals why animals produce group behaviors and examines their evolution across a range of species.

Providing a synthesis of mathematical modeling, theoretical biology, and experimental work, David Sumpter investigates how animals move and arrive together, how they transfer information, how they make decisions and synchronize their activities, and how they build collective structures. Sumpter constructs a unified appreciation of how different group-living species coordinate their behaviors and why natural selection has produced these groups. For the first time, the book combines traditional approaches to behavioral ecology with ideas about self-organization and complex systems from physics and mathematics. Sumpter offers a guide for working with key models in this area along with case studies of their application, and he shows how ideas about animal behavior can be applied to understanding human social behavior.

Containing a wealth of accessible examples as well as qualitative and quantitative features, *Collective Animal Behavior* will interest behavioral ecologists and all scientists studying complex systems.

DAVID J. T. SUMPTER is professor of applied mathematics at Uppsala University in Sweden.

"This is a comprehensive, insightful, and fascinating introduction to how, and why, animals behave as a collective. From swarming ants and locusts, to flocking birds and human crowds, this modern synthesis is a must-read for biologists, mathematicians, physicists, and computer scientists who seek to understand the underlying mechanisms and evolutionary principles of animal grouping. Both scholarly and accessible, this book provides us a tantalizing overview of one of the most exciting new fields in biology—collective animal behavior."

—Iain D. Couzin, *Princeton University*

"This well-organized, engaging, and authoritative book demonstrates that significant strides have been made in the mathematical models examining the collective behaviors of animals. No other book draws the disparate literature in this field together. This in itself would be an achievement, but Sumpter offers more: insightful comparisons between models, noteworthy bridges between mechanistic and functional schools of model building, and illuminating discussions of models' successes and limitations."

—Graeme Ruxton, *University of Glasgow*

"This book fills an important niche that will be of interest to scientists across disciplines. Clear and well-illustrated, this is an excellent learning and teaching resource."

—Darren P. Croft, *University of Exeter*

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