



Principles of Animal Locomotion

R. McNeill Alexander

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How can geckoes walk on the ceiling and basilisk lizards run over water? What are the aerodynamic effects that enable small insects to fly? What are the relative merits of squids' jet-propelled swimming and fishes' tail-powered swimming? Why do horses change gait as they increase speed? What determines our own vertical leap? Recent technical advances have greatly increased researchers' ability to answer these questions with certainty and in detail.

This text provides an up-to-date overview of how animals run, walk, jump, crawl, swim, soar, hover, and fly. Excluding only the tiny creatures that use cilia, it covers all animals that power their movements with muscle--from roundworms to whales, clams to elephants, and gnats to albatrosses. The introduction sets out the general rules governing all modes of animal locomotion and considers the performance criteria--such as speed, endurance, and economy--that have shaped their selection. It introduces energetics and optimality as basic principles. The text then tackles each of the major modes by which animals move on land, in water, and through air. It explains the mechanisms involved and the physical and biological forces shaping those mechanisms, paying particular attention to energy costs.

Focusing on general principles but extensively discussing a wide variety of individual cases, this is a superb synthesis of current knowledge about animal locomotion. It will be enormously useful to advanced undergraduates, graduate students, and a range of professional biologists, physicists, and engineers.

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