

Animal Locomotion Paperback

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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

this book examines how animals move comparing running swimming and flying it also reviews the common principles of design and movement that animals have evolved to move through very different physical environments

this book is about how animals travel around on land in water and in the air it is mainly about mechanisms of locomotion their limitations and their energy requirements there is some information about muscle physiology in chapter 1 but only as much as seems necessary for the discussions of mechanisms and energetics there is information in later chapters about the patterns of repetitive movement involved for instance in different gaits but nothing about nervous mechanisms of coordination i have tried to include most of the widely used methods of locomotion but have not thought it sensible to try to mention every variety of locomotion used by animals this book is designed for undergraduates but i hope that other people will also find it interesting it is possible and sometimes illuminating to use complex mathematics in discussions of animal locomotion this book includes many equations but little mathematics such mathematics as there is is simple discussions of the mechanisms and energetics of locomotion inevitably involve mechanics i expect that some readers will know a lot of mechanics and some hardly any i have tried to help the latter without boring the former by putting a summary of the necessary mechanics in an appendix p 140 references from the main text to the appendix will tell readers where they can find help if they need it figures and equations in the appendix have numbers distinguished by a prefix a for instance figure a 3

this groundbreaking work from the 19th century examines the mechanics of animal locomotion from the movement of insects and fish to the flight of birds the author s pioneering research into the principles of aëronautics laid the groundwork for modern aviation making this book essential reading for anyone interested in the science of motion this work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it this work is in the public domain in the united states of america and possibly other nations within the united states you may freely copy and distribute this work as no entity individual or corporate has a copyright on the body of the work scholars believe and we concur that this work is important enough to be preserved reproduced and made generally available to the public we appreciate your support of the preservation process and thank you for being an important part of keeping this knowledge alive and relevant

uses a high speed camera to display many types of animal and bird actions

describes animal movement and why it s important to their survival

introduces various methods of animal locomotion discussing quadrupedal gaits flight aquatic movement and more unconventional variations

this book provides a clear foundation based on physical biology and biomechanics for understanding the underlying mechanisms by which animals have evolved to move in their physical environment it integrates the biomechanics of animal movement with the physiology of animal energetics and the neural control of locomotion the author also communicates a sense of the awe and fascination that comes from watching the grace speed and power of animals in motion movement is a fundamental distinguishing

feature of animal life and a variety of extremely effective mechanical and physiological designs have evolved common themes are observed for the ways in which animals successfully contend with the properties of a given physical environment across diversity of life forms and varying locomotor modes understanding the common principles of design that span a diverse array of animals requires a broad comparative and integrative approach to their study this theme persists throughout the book as various modes and mechanisms of animal locomotion are covered since an animal's size is equally critical to its functional design the effects of scale on locomotor energetics and mechanics are also discussed biewener begins by examining the underlying machinery for movement skeletal muscles used for force generation skeletons used for force transmission and spring like elements used for energy savings he then describes the basic mechanisms that animals have evolved to move over land in and on the surface of the water and in the air common fluid dynamic principles are discussed as background to both swimming and flight in addition to discussing the locomotor mechanisms of complex animals the locomotor movement of single cells is also covered common biochemical features of cellular metabolism are then reviewed before discussing the energetic aspects of various locomotor modes strategies for conserving energy and moving economically are again highlighted in this section of the book emphasis is placed on comparisons of energetic features across locomotor modes the book concludes with a discussion of the neural control of animal locomotion the basic neurosensory and motor elements common to vertebrates and arthropods are discussed and features of sensori motor organization and function are highlighted these are then examined in the context of specific examples of how animals control the rhythmic patterns of limb and body movement that underlie locomotor function and stability

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