



Mechanical Design In Organisms

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Sciences, National Materials Advisory
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Mechanical Design In Organisms:

Mechanical Design in Organisms Stephen A. Wainwright, 1982-07-21 This book deals with an interface between mechanical engineering and biology It reviews biological structural materials and systems and their mechanically important features and demonstrates that function at any particular level of biological integration is permitted and controlled by structure at lower levels of integration

Mechanical Design in Organisms Stephen A. Wainwright, W. D. Biggs, J. D. Currey, John M. Gosline, 1976 *Mechanical Design of Structural Materials in Animals* John M. Gosline, 2018-05-15

Mechanical Design of Structural Materials in Animals explores the principles underlying how molecules interact to produce the functional attributes of biological materials their strength and stiffness ability to absorb and store energy and ability to resist the fatigue that accrues through a lifetime of physical insults These attributes play a central role in determining the size and shape of animals the ways in which they can move and how they interact with their environment By showing how structural materials have been designed by evolution John Gosline sheds important light on how animals work Gosline elucidates the pertinent theories for how molecules are arranged into macromolecular structures and how those structures are then built up into whole organisms In particular Gosline develops the theory of discontinuous fiber reinforced composites which he employs in a grand synthesis to explain the properties of everything from the body wall of sea anemones to spiders silks and insect cuticles tendons ligaments and bones Although the theories are examined in depth Gosline's elegant discussion makes them accessible to anyone with an interest in the mechanics of life Focusing on the materials from which animals are constructed this book answers fundamental questions about mechanical properties in nature

Functions: From Organisms to Artefacts Jean Gayon, Armand de Ricqlès, Antoine C. Dussault, 2023-07-25 This book originally published in French examines the philosophical debates on functions over the last forty years and proposes new ways of analysis Pervasive throughout the life sciences the concept of function has the air of an epistemological scandal ascribing a function to a biological structure or process amounts to suggesting that it is explained by its effects This book confronts the debates on function with the use of the notion in a wide range of disciplines such as biology psychology and medicine It also raises the question of whether this notion which is as old in the history of technology as it is in the life sciences has the same meaning in these two domains

Structural Biomaterials Julian Vincent, 2012-07-29 Introduction to the structural materials in natural organisms and what we can learn from them to improve man made technology from nanotechnology to textiles to architecture Emphasizes the mechanical properties of structural biomaterials their contribution to the lives of organisms and how these materials differ from man made ones

Life's Devices Steven Vogel, 2025-05-27 An entertaining and informative book that explores how living things contend with nonbiological reality Life on Earth is subject to the pull of gravity the properties of air and water and the behavior of diffusing molecules yet such physical factors are constraints that drive evolution and offer untold opportunities to creatures of all sizes In this lively introduction to the science of

biomechanics Steven Vogel invites you to wonder about the design of the plants and animals around us You will learn why a fish swims more rapidly than a duck can paddle why healthy trees more commonly uproot than break how sharks manage with such flimsy skeletons and why a mouse can easily survive a fall onto any surface from any height With an illuminating foreword by Rob Dunn this Princeton Science Library edition of Life's Devices includes examples from every major group of animals and plants along with illustrative problems and suggestions for experiments that require only common household materials

Comparative Ecology of Microorganisms and Macroorganisms John H. Andrews, 2017-06-27 This second edition textbook offers an expanded conceptual synthesis of microbial ecology with plant and animal ecology Drawing on examples from the biology of microorganisms and macroorganisms this textbook provides a much needed interdisciplinary approach to ecology The focus is the individual organism and comparisons are made along six axes genetic variation nutritional mode size growth life cycle and influence of the environment When it was published in 1991 the first edition of Comparative Ecology of Microorganisms and Macroorganisms was unique in its attempt to clearly compare fundamental ecology across the gamut of size The explosion of molecular biology and the application of its techniques to microbiology and organismal biology have particularly demonstrated the need for interdisciplinary understanding This updated and expanded edition remains unique It treats the same topics at greater depth and includes an exhaustive compilation of both the most recent relevant literature in microbial ecology and plant animal ecology as well as the early research papers that shaped the concepts and theories discussed Among the completely updated topics in the book are phylogenetic systematics search algorithms and optimal foraging theory comparative metabolism the origins of life and evolution of multicellularity and the evolution of life cycles From Reviews of the First Edition John Andrews has succeeded admirably in building a bridge that is accessible to all ecologists Ecology I recommend this book to all ecologists It is a thoughtful attempt to integrate ideas from and develop common themes for two fields of ecology that should not have become fragmented American Scientist Such a synthesis is long past due and it is shameful that ecologists both big and little have been so parochial The Quarterly Review of Biology

Encyclopedia of Tidepools and Rocky Shores Mark W Denny, Steve Gaines, 2007-09-03 This is the book I have been waiting for Written by experts in each field this encyclopedia provides a wealth of information not only about the tidepool and shore life but also the oceanography associated with these habitats This will be a major reference guide for years to come Dr Nigella Hillgarth Executive Director Birch Aquarium at Scripps Scripps Institution of Oceanography The Encyclopedia of Tidepools and Rocky Shores covers much more than one might guess It ranges from oceanography to physiology biomechanics and conservation science along with the expected treatment of the diverse groups of organisms that live in those habitats The coverage of each topic is kept short and comprehensible to almost everyone from high schools to colleges and certainly to the general public interested in learning more about this fascinating part of our natural world Best of all the editors have managed to get some of the best scientists in the world the absolute experts in their fields to write the

articles The relatively short length of each entry also makes this book an ideal source for assigned readings to accompany marine biology ecology or oceanography classes laboratories and field trips It will be much appreciated by teachers and students Ken Sebens Director of the Friday Harbor Marine Laboratories University of Washington The place where vast oceans meet the land is wondrous complex and fascinating Visitors from research scientists to toddlers have explored these ecosystems one of nature s most popular theme parks Anyone who has spent time amongst the sea stars crabs and kelp departs full of unanswered questions Now these questions can be answered by dipping into the Encyclopedia of Tidepools and Rocky Shores The editors and contributors to this reference have created a new standard that will be an immediate classic Leon Panetta Director The Leon Sylvia Panetta Institute for Public Policy This volume is a wonderful introduction to the hidden and fascinating world of rocky tidepools Grab a copy and head out with your kids or students for an outdoor experience that s sure to get them hooked From remarkable adaptations of marine algae to weird animal life histories tidepools hold amazing stories to tell They deserve our interest and our care as part of earth s natural systems that sustain us all Julie Packard Executive Director Monterey Bay Aquarium Tide pool lovers the world around will satisfy their curiosity uncover new gems of insight and renew their wonder of nature at lands end in this authoritative fascinating and insightful compilation Revealed within are the secrets of rocky shores and tide pools that most dynamic of interfaces between the land and the sea that treasure chest of rich biodiversity and keen insight that world where science literature beauty and stewardship combine to form the now that integrates the past and tempts the future Jane Lubchenco Oregon State University

Conceptual Change in Biology Alan C. Love, 2014-11-07 This volume explores questions about conceptual change from both scientific and philosophical viewpoints by analyzing the recent history of evolutionary developmental biology It features revised papers that originated from the workshop Conceptual Change in Biological Science Evolutionary Developmental Biology 1981 2011 held at the Max Planck Institute for the History of Science in Berlin in July 2010 The Preface has been written by Ron Amundson In these papers philosophers and biologists compare and contrast key concepts in evolutionary developmental biology and their development since the original seminal Dahlem conference on evolution and development held in Berlin in 1981 Many of the original scientific participants from the 1981 conference are also contributors to this new volume and in conjunction with other expert biologists and philosophers specializing on these topics provide an authoritative comprehensive view on the subject Taken together the papers supply novel perspectives on how and why the conceptual landscape has shifted and stabilized in particular ways yielding insights into the dynamic epistemic changes that have occurred over the past three decades This volume will appeal to philosophers of biology studying conceptual change evolutionary developmental biologists focused on comprehending the genesis of their field and evaluating its future directions and historians of biology examining this period when the intersection of evolution and development rose again to prominence in biological science

Biomechanics in Animal Behaviour R.W. Blake, P. Domenici, 2021-05-31

Biomechanics in Animal Behaviour offers a unique approach by integrating fully the fields of animal behaviour and biomechanics. It demonstrates how an understanding of biomechanical issues is an important part of evaluating and predicting animal behaviour. The book examines how behaviour is determined and/or constrained by biomechanical variables such as hydrodynamics, aerodynamics, kinematics and the mechanical properties of biomaterials. **Structural**

Biomaterials Julian F. V. Vincent, 1990. This book should go a long way towards filling the communication gap between biology and physics in the area of biomaterials. It begins with the basic theory of elasticity and viscoelasticity describing concepts like stress, strain, compliance and plasticity in simple mathematical terms. For the non biologist, these chapters provide a clear account of macromolecular structure and conformation. Vincent's work is a delight to read, full of interesting anecdotes and examples from unexpected sources. I can strongly recommend this book as it shows how biologists could use mechanical properties as well as conventional methods to deduce molecular structure. Anna Furth, The Times Higher Education Supplement. In what is now recognized as a standard introduction to biomaterials, Julian Vincent presents a biologist's analysis of the structural materials of organisms using molecular biology as a starting point. He explores the chemical structure of both proteins and polysaccharides, illustrating how their composition and bonding determine the mechanical properties of the materials in which they occur, including pliant composites such as skin, artery and plant tissue; stiff composites such as insect cuticle and wood; and biological ceramics such as teeth, bone and eggshell. Here Vincent discusses the possibilities of taking ideas from nature with biomimicry and intelligent or self-designing and sensitive materials. **Coelenterate Ecology and Behavior** G.O. Mackie, 2013-06-29. The study of coelenterates is now one of the

most active fields of invertebrate zoology. There are many reasons for this and not everyone would agree on them, but certain facts stand out fairly clearly. One of them is that many of the people who study coelenterates do so simply because they are interested in the animals for their own sake. This, however, would be true for other invertebrate groups and cannot by itself explain the current boom in coelenterate work. The main reasons for all this activity seem to lie in the considerable concentration of research effort and funding into three broad general areas of biology: marine ecology, cellular developmental biology and neurobiology, in all of which coelenterates have a key role to play. They are the dominant organisms or are involved in an important way in a variety of marine habitats, of which coral reefs are only one, and this automatically ensures their claims on the attention of ecologists and marine scientists. Secondly, the convenience of hydra and some other hydroids as experimental animals has long made them a natural choice for a variety of studies on growth, nutrition, symbiosis, morphogenesis and sundry aspects of cell biology. Finally, the phylogenetic position of the coelenterates as the lowest metazoans having a nervous system makes them uniquely interesting to those neurobiologists and behaviorists who hope to gain insights into the functioning of higher nervous systems by working up from the lowest level. **Nanochemistry**

Geoffrey A. Ozin, André Arsenault, 2023-01-17. International interest in nanoscience research has flourished in recent years as

it becomes an integral part in the development of future technologies The diverse interdisciplinary nature of nanoscience means effective communication between disciplines is pivotal in the successful utilization of the science Nanochemistry A Chemical Approach to Nanomaterials is the first textbook for teaching nanochemistry and adopts an interdisciplinary and comprehensive approach to the subject It presents a basic chemical strategy for making nanomaterials and describes some of the principles of materials self assembly over all scales It demonstrates how nanometre and micrometre scale building blocks with a wide range of shapes compositions and surface functionalities can be coerced through chemistry to organize spontaneously into unprecedented structures which can serve as tailored functional materials Suggestions of new ways to tackle research problems and speculations on how to think about assembling the future of nanotechnology are given Primarily designed for teaching this book will appeal to graduate and advanced undergraduate students It is well illustrated with graphical representations of the structure and form of nanomaterials and contains problem sets as well as other pedagogical features such as further reading case studies and a comprehensive bibliography Hierarchical Structures in Biology as a Guide for New Materials Technology National Research Council, Division on Engineering and Physical Sciences, National Materials Advisory Board, Commission on Engineering and Technical Systems, Committee on Synthetic Hierarchical Structures, 1994-02-01 Hierarchical structures are those assemblages of molecular units or their aggregates embedded within other particles or aggregates that may in turn be part of even larger units of increasing levels of organization This volume reviews the state of the art of synthetic techniques and processing procedures for assembling these structures Typical natural occurring systems used as models for synthetic efforts and insight on properties unusual characteristics and potential end use applications are identified Suggestions are made for research and development efforts to mimic such structures for broader applications **Adaptation** Michael R. Rose, George V. Lauder, 1996-09-22 The study of evolutionary adaptation returns to the center stage of biology with this important volume This innovative treatise discusses new developments in adaptation with new methods and new theoretical foundations achievements and prospects for a rich intellectual future It is an insightful reintroduction to the themes that Darwin and his successors regarded as central to any profound understanding of biology **Physical (Biological) Anthropology** P. Rudan, 2009-07-29 Physical Biological Anthropology theme is a component of Encyclopedia Of Biological Physiological And Health Sciences EOLSS which is an integrated compendium of twenty one Encyclopedias Biological anthropology also known as physical anthropology is a scientific discipline concerned with the biological and behavioral aspects of human beings their related non human primates and their extinct hominin ancestors It is a subfield of anthropology that provides a biological perspective to the systematic study of human beings This volume is aimed at the following five major target audiences University and College Students Educators Professional Practitioners Research Personnel and Policy Analysts Managers and Decision Makers NGOs and GOs **The Architecture of Evolution** Marco Tamborini, 2022-12-20 In the final decades of the twentieth century the advent of

evolutionary developmental biology evo devo offered a revolutionary new perspective that transformed the classical neo Darwinian gene centered study of evolution In *The Architecture of Evolution* Marco Tamborini demonstrates how this radical innovation was made possible by the largely forgotten study of morphology Despite the key role morphology played in the development of evolutionary biology since the 1940s the architecture of organisms was excluded from the Modern Evolutionary Synthesis And yet from the beginning of the twentieth century to the 1970s and 80s morphologists sought to understand how organisms were built and how organismal forms could be generated and controlled The generation of organic form was they believed essential to understanding the mechanisms of evolution Tamborini explores how the development of evo devo and the recent organismal turn in biology involved not only the work of morphologists but those outside the biological community with whom they exchanged their data knowledge and practices Together with architects and engineers they worked to establish a mathematical and theoretical basis for the study of organic form as a mode of construction developing and reinterpreting important notions that would play a central role in the development of evolutionary developmental biology in the late 1980s This book sheds light not only on the interdisciplinary basis for many of the key concepts in current developmental biology but also on contributions to the study of organic form outside the English speaking world

Plant Biomechanics Karl J. Niklas, 1992-08 In this book the author analyzes plant form and how it has evolved in response to basic physical laws He examines the ways these laws limit the organic expression of form size and growth in a variety of plant structures and in plants as whole organisms drawing on both the fossil record and studies of extant species

Ecological Mechanics Mark Denny, 2015-12-29 An in depth exploration of how biomechanics and ecology work together Plants and animals interact with each other and their surroundings and these interactions with all their complexity and contingency control where species can survive and reproduce In this comprehensive and groundbreaking introduction to the emerging field of ecological mechanics Mark Denny explains how the principles of physics and engineering can be used to understand the intricacies of these remarkable relationships Denny opens with a brief review of basic physics before introducing the fundamentals of diffusion fluid mechanics solid mechanics and heat transfer taking care to explain each in the context of living organisms Why are corals of different shapes on different parts of a reef How can geckos climb sheer walls Why can birds and fish migrate farther than mammals How do desert plants stay cool The answers to these and a host of similar questions illustrate the principles of heat mass and momentum transport and set the stage for the book's central topic the application of these principles in ecology Denny shows how variations in the environment in both space and time affect the performance of plants and animals He introduces spectral analysis a mathematical tool for quantifying the patterns in which environments vary and uses it to analyze such subjects as the spread of invasive species Synthesizing the book's materials the final chapters use ecological mechanics to predict the occurrence and consequences of extreme ecological events explain the emergence of patterns in the distribution and abundance of organisms and empower

readers to explore further Ecological Mechanics offers new insights into the physical workings of organisms and their environment Marine Technology Society Journal Marine Technology Society, 1977

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