



# Mechanical Design In Organisms

**Rachel S Tattersall**



## **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. **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. *Robotics and Artificial Intelligence* Michael Brady, L.A. Gerhardt, H.F. Davidson, 2012-12-06. Dr. Lester A. Gerhardt, Professor and Chairman, Electrical, Computer, and Systems Engineering, Rensselaer Polytechnic Institute, Troy, New York 12180. This book is a collection of papers on the subject of Robotics and Artificial Intelligence. Most of the papers contained herein were presented as part of the program of the NATO Advanced Study Institute held in June 1983 at Castelvecchio Pascoli, Italy, on the same subject. Attendance at this two-week Institute

was by invitation only drawing people internationally representing industry government and the academic community worldwide Many of the people in attendance as well as those presenting papers are recognized leaders in the field In addition to the formal paper presentations there were several informal work shops These included a workshop on sensing a workshop on educational methodology in the subject area as examples This book is an outgrowth and direct result of that Institute and includes the papers presented as well as a few others which were stimulated by that meeting A special note is the paper entitled State of the Art and Predictions for Artificial Intelligence and Robotics by Dr R Nagel which appears in the Introduction and Overview chapter of this book This paper was originally developed as part of a study for the United States Army performed by the National Research Council of the National Academy of Science and published as part of a report entitled Applications of Robotics and Artificial Intelligence to Reduce Risk and Improve Effectiveness by National Academy Press in 1983

**The Illusory Boundary** Martin Reuss, Stephen H. Cutcliffe, 2010-09-20 The view of nature and technology inhabiting totally different even opposite spheres persists across time and cultures Most people would consider an English countryside or a Louisiana bayou to be natural though each is to an extent the product of technology Pollution widely thought to be a purely man made phenomenon results partly from natural processes All around us things from the natural world are brought into the human world At what point do we consider them part of culture rather than nature And does such a distinction illuminate our world or obscure its workings This compelling new book challenges the view that a clear and unwavering boundary exists between nature and technology Rejecting this dichotomy the contributors show how the history of each can be united in a constantly shifting panorama where definitions of nature and technology alter and overlap In addition to recognizing the artificial divide between these two concepts the essays in this book demonstrate how such thinking may affect societies ability to survive and prosper The answers and ideas are as numerous as the landscapes they consider for there is no single path toward a more harmonious vision of technology and nature Technologies that work in one place may not in another Nature that is preserved in one community might become the raw material of technological progress somewhere else Add to this the fact that the natural world and technology are not passive players but are profoundly involved in cultural construction Understanding such dynamics not only reveals a new historical complexity it prepares us for coping with many of the most difficult and pressing social issues facing us today Contributors Peter Coates Craig E Colten Stephen H Cutcliffe Hugh S Gorman Betsy Mendelsohn Joy Parr Peter C Perdue Sara B Pritchard Martin Reuss William D Rowley Edmund Russell Joel A Tarr Ann Vileisis James C Williams Thomas Zeller

**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

**Canopies in Aquatic Ecosystems: Integrating Form, Function, and Biophysical Processes** Virginia B. Pasour, Brian L. White, Marco Ghisalberti, Matthew Philip Adams, Matthew H. Long, Matthew A. Reidenbach, Uri Shavit, Julia E. Samson, 2020-01-27

**Principles of Paleontology** Michael Foote, Arnold I. Miller, 2007 Michael Foote and Arnold Miller have stepped in to revise this classic text It is their vision to take the core approach of the second edition and reflect the substantial changes to the rudiments of the subject from the previous two decades This third edition remains an excellent text for those studying geophysical sciences

**Symbiotic Multi-Robot Organisms** Paul Levi, Serge Kernbach, 2010-05-18 This book examines the evolution of self organised multicellular structures and the remarkable transition from unicellular to multicellular life It shows the way forward in developing new robotic entities that are versatile cooperative and self configuring

**Marine Technology Society Journal** Marine Technology Society, 1977

The Gas Exchangers John N. Maina, 2012-12-06 Amongst animals diversity of form and of environmental circumstances have given rise to a multitude of different adaptations subserving the relatively unified patterns of cellular metabolism Nowhere else is this state of affairs better exemplified than in the realm of respiration Jones 1972 The field of comparative respiratory biology is expanding almost exponentially With the ever improving analytical tools and methods of experimentation its scope is blossoming to fascinating horizons The innovativeness and productivity in the area continue to confound students as well as specialists The increasing wealth of data makes it possible to broaden the information base and meaningfully synthesize rationalize reconcile redefine consolidate and offer empirical validation of some of the earlier anecdotal views and interpretations helping resolve the issues into adequately realistic and easily perceptible models Occasional reflections on the advances made as well as on the yet unresolved problems helps chart out new grounds formulate new concepts and stimulate inquiry Moreover timely assessments help minimize isolation among investigators averting costly duplication of effort This exposition focuses on the diversity of the design of the gas exchangers and gives a critical appraisal of the plausible or constrained the evolution of respiration The factors that have motivated cause and effect relationship between the phylogenetic developmental and environmental factors conditions and states which at various thresholds and under certain backgrounds conspired in molding the gas exchangers is argued

*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

**Animals and Science** Niall Shanks, 2002-06-21 Animals and Science examines the debates from the

Renaissance to the present surrounding issues of animal rights consciousness and self awareness Animals and Science examines what science has and has not taught us about the nature of nonhuman animals and explores the moral religious social and scientific implications of those teachings It shows how the scientific study of animals especially their cognitive abilities has transformed our understanding of them Animals and Science traces our evolving understanding of animal pain and considers its moral relevance to humans It discusses Darwin's belief shattering notion that species differences are not absolute then traces its impact to the present day Ultimately Animals and Science is about the nature of science the kinds of questions science can and cannot answer and the role of theory in shaping the interpretation of evidence **Proceedings of the Ocean Thermal Conversion (OTEC) Biofouling and Corrosion Symposium, October 10-12, 1977, Seattle, Washington**, 1978 **Solid Biomechanics** Roland Ennos, 2012 Offering a review of the biomechanical design of organisms from bacteria onwards this book shows how the bodies of animals plants are masterpieces of engineering enabling them to survive in a hostile world **Designing with Natural Materials** Graham A. Ormondroyd, Angela F. Morris, 2018-09-03 In a world now forced to address the issues of sustainability environmental impact and the widespread pollution of land and oceans with manmade materials alternative resources must be considered for the future of the planet A vast array of natural materials is available throughout the world with properties that are often superior to the man made alternatives Designing with Natural Materials fills the gap between the current scientific knowledge of the use of natural materials and product design and acts as a bridge between the two disciplines The book serves as an introduction to natural materials within the context of design The chapters include case studies research and a historical perspective It develops ideas of designing with natural materials in specific areas and looks to the future of new biobased materials and how these will influence design The work offers insight to designers of biobased materials across a range of different design disciplines while also providing insights to scientists on the process of design production and the needs of a material beyond those traditionally analyzed in the laboratory The final chapters touch on the use of bioinspiration and biomimicry in the development and use of biobased materials and how natural design will influence both material design and products in the future The book will be of interest to engineers scientific researchers professional designers students those working in industry who are considering using natural materials as an alternative to current unsustainable options and anyone who has an interest in the subject

*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.

**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.

**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



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