biomimetics in architecture

architecture of life and buildings

petra gruber



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Petra Gruber

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Biomimetics in Architecture Petra Gruber, 2010-12-29 The purpose of investigating the overlaps between architecture and biology is neither to draw borders or make further distinctions nor to declare architecture alive but to clarify what is currently happening in the blurred fields and to investigate the emerging discipline of biomimetics in architecture Architekturbionik An overview of the present state of research in the relatively young scientific field of biomimetics shows the potential of the approach The new discipline aims at innovation by making use of the subtle systems and solutions in nature having evolved within millions of years Approaches that have been taken to transfer nature s principles to architecture have provided successful developments. The new approach presented in this book transfers the abstract concept of life onto built environment Strategic search for life s criteria in architecture delivers a new view of architectural achievements and makes the innovative potential visible which has not been exploited yet A selection of case studies illustrates the diversity of starting points from vernacular architecture to space exploration **Biomimetic Research for** Architecture and Building Construction Jan Knippers, Klaus G. Nickel, Thomas Speck, 2016-12-19 This book comprises a first survey of the Collaborative Research Center SFB TRR 141 Biological Design and Integrative Structures Analysis Simulation and Implementation in Architecture funded by the Deutsche Forschungsgemeinschaft since October 2014 The SFB TRR 141 provides a collaborative framework for architects and engineers from the University of Stuttgart biologists and physicists from the University of Freiburg and geoscientists and evolutionary biologists from the University of T bingen The programm is conceptualized as a dialogue between the disciplines and is based on the belief that that biomimetic research has the potential to lead everyone involved to new findings far beyond his individual reach During the last few decades computational methods have been introduced into all fields of science and technology In architecture they enable the geometric differentiation of building components and allow the fabrication of porous or fibre based materials with locally adjusted physical and chemical properties Recent developments in simulation technologies focus on multi scale models and the interplay of mechanical phenomena at various hierarchical levels In the natural sciences a multitude of quantitative methods covering diverse hierarchical levels have been introduced These advances in computational methods have opened a new era in biomimetics local differentiation at various scales the main feature of natural constructions can for the first time not only be analysed but to a certain extent also be transferred to building construction Computational methodologies enable the direct exchange of information between fields of science that until now have been widely separated As a result they lead to a new approach to biomimetic research which hopefully contributes to a more sustainable development in architecture and building construction Biomimicry in Architecture Michael Pawlyn, 2019-08-12 When searching for genuinely sustainable building design and technology designs that go beyond conventional sustainability to be truly restorative we often find that nature got there first Over 3 5 billion years of natural history have evolved innumerable examples of forms systems and

processes that can be applied to modern green design For architects urban designers and product designers this new edition of Biomimicry in Architecture looks to the natural world to achieve radical increases in resource efficiency Packed with case studies predicting future trends this edition also contains updated and expanded chapters on structures materials waste water thermal control and energy as well as an all new chapter on light An amazing sourcebook of extraordinary design solutions Biomimicry in Architecture is a must read for anyone preparing for the challenges of building a sustainable and Built to Grow - Blending architecture and biology Barbara Imhof, Petra Gruber, 2016-01-15 Das Werk ist das Ergebnis der Erforschung unterschiedlicher Wege des Experimentierens mit Biologie und Architektur auf dem neuen Feld der lebenden Architektur Es untersucht architektonische Visionen selbstwachsender H user mit Blick auf Wachstumsmuster und Dynamiken in der Natur um sie auf Zukunftsszenarien anzuwenden Dazu werden Ideen und Konzepte gewachsener Strukturen pr sentiert welche ein interdisziplin res Team aus den Bereichen Architektur Kunst Biologie Robotik und Mechatronik entwickelt hat Der Hauptteil des Buches dokumentiert die k nstlerischer Forschungsarbeit von mehr als zwei Jahren Sie schlie t Experimente im Labor mit biologischen Vorbildern wie den wegefindenden Schleimpilz und Myzeliumstrukturen ebenso ein wie Untersuchungen metabolischer Systeme um einen neuartigen beweglichen 3D Drucker Die von Begrifflichkeiten wie Agency emergente Systeme oder Resilienz und die Diskussion ber die immanenten Werte und ethischen Aspekte dieser Forschung reflektieren die Arbeit an lebender Architektur innerhalb unserer sich ver ndernden Welt und lassen so gesamtheitliche Zusammenh nge erkennen **Architecture Follows Nature-Biomimetic Principles** for Innovative Design Ilaria Mazzoleni, 2013-03-21 This full color volume proposes an innovative methodology that uses the functional aspects of nature to inspire improvements in building design and form encouraging designers to apply biomimetic principles to architectural processes. The book focuses on the analysis of various animal skins translating the principles of communication thermoregulation water balance and protection into the built environment Illustrating how biomimetic principles can create a more sustainable way of building this is the first time the author's new methodology as well as the 12 case studies has been published Emergence and Modularity in Life Sciences Lars H. Wegner, Ulrich Lüttge, 2019-02-12 This book focuses on modules and emergence with self organization in the life sciences As Aristotle observed so long ago the whole is more than the sum of its parts However contemporary science is dominated by reductionist concepts and tends to neglect the non reproducible features of complex systems which emerge from the interaction of the smaller units they are composed of The book is divided into three major parts the essays in part A highlight the conceptual basis of emergence linking it to the philosophy of science systems biology and sustainability This is subsequently exemplified in part B by applying the concept of emergence to various biological disciplines such as genetics developmental biology neurobiology plant physiology and ecology New aspects of emergence come into play when biology meets the technical sciences as revealed in a chapter on bionics In turn part C adopts a broader view revealing how the organization of life

follows a hierarchical order in terms of scalar dimensions ranging from the molecular level to the entire biosphere The idea that life is primarily and exclusively shaped by processes at the molecular level and in particular by the information encoded in the genome is refuted rather there is no hierarchy with respect to the level of causation in the cross talk between the levels In the last two chapters the evolutionary trend toward ever increasing complexity in living systems is interpreted in terms of the Gaia hypothesis sensu Lovelock the entire biosphere is viewed as a functional unit or holobiont like system organized to develop and sustain life on Earth Building Information Modelling (BIM) in Design, Construction and Operations L. Mahdjoubi, C.A. Brebbia, R. Laing, 2015-09-09 Building Information Modelling BIM in Design Construction and Operations contains the proceedings of the first in a planned series of conferences dealing with design coordination construction maintenance operation and decommissioning The book gives details of how BIM tools and techniques have fundamentally altered the manner in which modern construction teams operate the processes through which designs are evolved and the relationships between conceptual detail construction and life cycle stages. The papers contributed by experts from industry practice and academia debate key topics develop innovative solutions and predict future trends The interdisciplinary nature of the contents and the collaborative practices discussed so important within the built environment will appeal to those engaged in design surveying visualisation infrastructure real estate construction law insurance and facilities management Topics covered include BIM in design coordination BIM in construction operations BIM in building operation and maintenance BIM and sustainability BIM and collaborative working and practices BIM health and safety and BIM facilities management integration among others Biomimetics, Biodesign and Bionics Amilton José Vieira Arruda, Felipe Luis Palombini, 2024-05-13 Nature is a vast source of inspiration and information for the resolution of complex problems and can influence many varieties of design Biomimetics biodesign and bionics are three branches of interdisciplinary research merging biological and applied sciences This volume collects cases that highlight recent breakthroughs in these disciplines Biological features such as patterns shapes mechanisms colors structures and more can be analyzed organized and modeled for application in human creations Therefore design engineering and architecture projects can benefit from solutions that were already tested and verified through evolution in the natural world With the development of new technologies for the investigation simulation and testing of natural features the path from nature to product can be accelerated The cases presented in this work showcase how technological advancements are leading to improved design solutions and influencing our very comprehension of natureand its complex organization **Biomimetics** of Motion Sandra Persiani, 2018-06-13 This book provides readers with a timely guide to the application of biomimetic principles in architecture and engineering design and describes various aspects of motion in living systems Geometric mechanical and rhythmic parameters are listed and illustrated using examples from flora and fauna and contextualized within an integrated mapping of biomechanical combinations that have proved their success in the course of evolution For

designers the schemes identify those aspects that have a high probability of being efficiently combined paving the way for new solutions and offering a method of evolutionary problem solving The book guides readers through the field of nature inspired design offering an extraordinary resource for professional architects engineers and designers as well as for researchers and students Throughout the book natural evolution is approached as a powerful resource that can enrich architecture and design by providing innovative optimal and sustainable solutions *Civil Engineering And Urban Planning* - Proceedings Of The 5th International Conference On Civil Engineering And Urban Planning (Ceup2016) Ahmed Mebarki,2017-06-02 The 5th International Conference on Civil Engineering and Urban Planning CEUP2016 was held in Xi an China on August 23 26 2016 CEUP2016 gathered outstanding scientists and researchers worldwide to exchange and discuss new findings in civil engineering and urban planning associated with transportation and environmental topics The conference program committee is also greatly honored to have four renowned experts for taking time off to present their keynotes to the conference The conference had received a total of 410 submissions which after peer review by the Technical Program Committee only 108 were selected to be included in this conference proceedings which covers Architecture and Urban Planning Civil Engineering and Transportation Engineering

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