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Z15S3G - ROACH DAISY

Presenting a novel biomimetic design method for transferring design solutions from nature to technology, this book focuses on structure-function patterns in nature and advanced modeling tools derived from TRIZ, the theory of inventive problem-solving. The book includes an extensive literature review on biomimicry as an engine of both innovation and sustainability, and discusses in detail the biomimetic design process, current biomimetic design methods and tools. The structural biomimetic design method for innovation and sustainability put forward in this text encompasses (1) the research method and rationale used to develop and validate this new design method; (2) the suggested design algorithm and tools including the Find structure database, structure-function patterns and ideality patterns; and (3) analyses of four case studies describing how to use the proposed method. This book offers an essential resource for designers who wish to use nature as a source of inspiration and knowledge, innovators and sustainability experts, and scientists and researchers, amongst others.

Discover how the natural world inspires innovation in science and technology to create the latest and greatest breakthroughs and discoveries in this exciting book. Did you know that scientists have developed a bionic tool shaped like an elephant's trunk that helps lift heavy objects? Or that the needle--like pointed beak of the kingfisher bird encouraged engineers in Japan to change the design of the Shinkansen "bullet trains" to reduce noise? Across multiple fields of study and methods of problem-solving, scientists are turning to biomimicry, or engineering inspired by biology or nature, to make all kinds of cool technological advancements. From robots that protect people and gather information to everyday inventions, like reflectors on the roads and ice-proof coatings for airplanes, to new sources of renewable energy, this book dives into the ways

that nature can give us ideas on how to improve our world. Discover more than 40 examples of technology influenced by animals, learn about some of the incredible creatures who have inspired multiple creations, and meet some of the scientists and the stories behind their inventions.

Plants, animals, insects and fish are moving in. Invasive species threaten local ecosystems and the planet's biodiversity, but are they all as bad as we think they are? In Nature Out of Balance:How Invasive Species Are Changing the Planet author Merrie-Ellen Wilcox profiles all-star invasive species around the world, starting in her own neighbourhood, and warns that humans are the most invasive species of all. We find out how and why species become invasive, what we can do to stop their spread and whether it's time to think differently about invasive species that are here to stay.

Biomimicry, the practice of observing then mimicking nature's strategies to solve business challenges, offers a path to healthy profit while working in partnership, and even reciprocity, with the natural world. Other books have described biomimicry, its uses, and its benefits. This book shows readers how to create their own biomimetic or bioinspired solutions with clear benefits to the bottom line, the environment, and people. Fashioned through storytelling, this book blends snapshots of five successful companies – Nike, Interface, Inc., PAX Scientific, Sharklet Technologies, and Encycle – which decided to partner with nature by deploying biomimicry. The book details how they discovered the practices, introduced them to staff, engaged in the process, and measured outcomes. The book concludes with challenges for readers to determine their own next steps in business and offers practical and useful resources to get there. By revealing the stories of each professional's journey with lessons they learned, then providing resources and issuing a challenge and pathway to do business better, this book serves as a tool for entrepreneurs, seasoned professionals, and students to emulate nature's brilliance, apply it at work, and contribute to a healthier, more prosperous world.

Engineered Biomimicry covers a broad range of research topics in the emerging discipline of biomimicry. Biologically inspired science and technology, using the principles of math and physics, has led to the development of products as ubiquitous as VelcroTM (modeled after the spiny hooks on plant seeds and fruits). Readers will learn to take ideas and concepts like this from nature, implement them in research, and understand and explain diverse phenomena and their related functions. From bioinspired computing and medical products to biomimetic applications like artificial muscles, MEMS, textiles and vision sensors, Engineered Biomimicry explores a wide range of technologies informed by living natural systems. Engineered Biomimicry helps physicists, engineers and material scientists seek solutions in nature to the most pressing technical problems of our times, while providing a solid understanding of the important role of biophysics. Some physical applications include adhesion superhydrophobicity and self-cleaning, structural coloration, photonic devices, biomaterials and composite materials, sensor systems, robotics and locomotion, and ultra--

lightweight structures. Explores biomimicry, a fast--growing, cross-disciplinary field in which researchers study biological activities in nature to make critical advancements in science and engineering Introduces bioinspiration, biomimetics, and bioreplication, and provides biological background and practical applications for each Cutting-edge topics include bio-inspired robotics, microflyers, surface modification and more

People have been finding inspiration in nature in solving their problems, from the very beginning of their existence. In the most general sense, biomimicry, defined as "inspire from the nature," has brought together the engineers and designers nowadays. This collaboration creates innovative and creative outcomes that encourage people with their interdisciplinary relationships. Accordingly, the aim of this book is to bring together different works or developments on biomimetics in interdisciplinary relationship between different areas, especially biomimicry, engineering, and design. The twenty-first century has conceived many new and amazing designs. The book in your hands will surely be an important guide to take a quick look at the future possibilities.

“Young readers will be captivated by the contemporary inventors and inventions featured, and inspired to incorporate biomimicry into their own designs.” —Miranda Paul, author of One Plastic Bag and Water is Water Who's the best teacher for scientists, engineers, AND designers? Mother nature, of course! When an inventor is inspired by nature for a new creation, they are practicing something called biomimicry. Meet ten real-life scientists, engineers, and designers who imitate plants and animals to create amazing new technology. An engineer shapes the nose of his train like a kingfisher's beak. A scientist models her solar cell on the mighty leaf. Discover how we copy nature's good ideas to solve real-world problems! WINNER AAAS/-Subaru SB&F Prize for Excellence in Science Books A National Science Teacher Association Best STEM Book “Mimic Makers reveals marvels of engineering inspired by nature with images that invite careful observation and explanations that are expressive, but never over simplified.” —Kim Parfitt, AP Biology and Environmental Science teacher, curriculum developer for Howard Hughes Medical Institute Biointeractive, and recipient of the Presidential Award for Excellence in Science and Math Teaching. “Amazing! . . . Love that the book features the scientists and inventors, and that there is a diverse set of them. —Janine Benyus, co-founder of the Biomimicry Institute Repackaged with a new afterword, this "valuable and entertaining" (New York Times Book Review) book explores how scientists are adapting nature's best ideas to solve tough 21st century problems. Biomimicry is rapidly transforming life on earth. Biomimics study nature's most successful ideas over the past 3.5 million years, and adapt them for human use. The results are revolutionizing how materials are invented and how we compute, heal ourselves, repair the environment, and feed the world. Janine Benyus takes readers into the lab and in the field with maverick thinkers as they: discover miracle drugs by watching what chimps eat when they're sick; learn how to create by watching spiders weave fibers; harness energy by examining how a leaf converts sunlight into fuel in trillionths

of a second; and many more examples. Composed of stories of vision and invention, personalities and pipe dreams, Biomimicry is must reading for anyone interested in the shape of our future.

It is clear that the climate is changing and ecosystems are becoming severely degraded. Humans must mitigate the causes of, and adapt to, climate change and the loss of biodiversity, as the impacts of these changes become more apparent and demand urgent responses. These pressures, combined with rapid global urbanisation and population growth mean that new ways of designing, retrofitting and living in cities are critically needed. Incorporating an understanding of how the living world works and what ecosystems do into architectural and urban design is a step towards the creation and evolution of cities that are radically more sustainable and potentially regenerative. Can cities produce their own food, energy, and water? Can they be designed to regulate climate, provide habitat, cycle nutrients, and purify water, air and soil? This book examines and defines the field of biomimicry for sustainable built environment design and goes on to translate ecological knowledge into practical methodologies for architectural and urban design that can proactively respond to climate change and biodiversity loss. These methods are tested and exemplified through a series of case studies of existing cities in a variety of climates. Regenerative Urban Design and Ecosystem Biomimicry will be of great interest to students, professionals and researchers of architecture, urban design, ecology, and environmental studies, as well as those interested in the interdisciplinary study of sustainability, ecology and urbanism.

This book provides in--depth coverage of smart materials, including electroactive polymers (EAPs), synthetic muscle, pneumatic artificial muscle, soft pneumatics, hydro--muscle, and other cutting-edge transformational smart material technologies. It looks at ways smart materials respond to stimuli, such as electricity, pressure, temperature, magnetism, or light. State-of-the-art developments in EAP based actuation and pneumatics are covered, including nanotechnology, soft robotics, EAP considerations for NASA applications and thermal control of satellites, control of mirrors using dielectric elastomeric actuators, and biomimetic design and function in robotics and prosthetics. A detailed analysis of the challenges of smart materials on Earth and in space is included, with an interview about considerations and training for Missions to Moon and Mars. This book is a must-read within the smart material and space communities, from tech savvy students to industry professionals.

Part playful poetry, part nonfiction information, this kid-friendly introduction to biomimicry highlights the remarkable ways plants and animals have helped us solve some of our toughest engineering challenges. One well-known example of biomimicry is the invention of Velcro - inspired by the sticky burrs from a plant. Discover six more ways nature did first Back matter includes a glossary and a STEM challenge activity to use at home or in the classroom.

Companion to the film Fantastic Fungi. Contributions from Michael Pollan, Andrew Weil, Eugenia Bone, and many more expterts make Fantastic Fungi an awe-inspiring visual jour-

ney through the exotic, little-known realm of fungi and its amazing potential to positively influence our lives. An all-star team of professional and amateur mycologists, artists, foodies, ecologists, doctors, and explorers joined forces with time-lapse master Louie Schwartzberg to create Fantastic Fungi, the life-affirming, mind-bending film about mushrooms and their mysterious interwoven rootlike filaments called mycelium. What this team reveals will blow your mind and possibly save the planet. This visually compelling companion book of the same name, edited by preeminent mycologist Paul Stamets, will expand upon the film in every way through extended transcripts, new essays and interviews, and additional facts about the fantastic realm of fungi. Fantastic Fungi is at the forefront of a mycological revolution that is quickly going mainstream. In this book, learn about the incredible communication network of mycelium under our feet, which has the proven ability to restore the planet's ecosystems, repair our health, and resurrect our symbiotic relationship with nature. Fantastic Fungi aspires to educate and inspire the reader in three critical areas: First, the text showcases research that reveals mushrooms as a viable alternative to Western pharmacology. Second, it explores studies pointing to mycelium as a solution to our gravest environmental challenges. And, finally, it details fungi's marvelous proven ability to shift consciousness. Motivating both the visually stunning film and this follow-up book is an urgent mission to change human consciousness and restore our planet.

This volume contains studies on the evolution and function of lightweight constructions of planktonic and other organisms, and examples of how they can be used to create new solutions for radical innovations of lightweight constructions for technological application. The principles and underlying processes responsible for evolution and biodiversity of marine plankton organisms are highly relevant and largely unresolved issues in the field of marine science. Amongst the most promising objects for the study of evolution of stable lightweight constructions are marine organisms such as diatoms or radiolarians. Research in these fields requires interdisciplinary expertises such as in evolutionary modelling, paleontology, lightweight optimization, functional morphology, and marine ecology. Considerable effort and expert knowledge in production engineering or lightweight optimization is necessary to transfer knowledge on biogenic structures and evolutionary principles into new lightweight solutions. This book show methods and examples of how this can be achieved efficiently.

The Biomimicry Resource Handbook: A Seed Bank of Best Practices contains over 250 pages of our most current biomimicry thinking, methodology, and tools for naturalizing biomimicry into the culture. We believe there is no better design partner than nature. But biomimicry is more than just looking at the shape of a flower or dragonfly and becoming newly inspired; it's a methodology that's being used by some of the biggest companies and innovative universities in the world. While reading this text you'll be immersed into the world of Biomimicry the "verb", you'll gain a competitive edge, and a fresh perspective on how the world around us can, does, and

should work. After reading the text, you'll be well on your way to thinking in systems, designing in context, identifying patterns, and most importantly seeing the millions of organisms around us....differently. The text is directly applicable to designers, biologists, engineers, entrepreneurs and intrapreneurs, but has also proven valuable to students, educators, and a wide variety of other disciplines. Visit biomimicry.net to learn more. A digital version is available at shop.biomimicrygroup.-com

Contains descriptions of technological innovations inspired by things found in the natural world.

With escalating concerns over the current state of our planet, the realization to work toward reducing our environmental footprint is gaining momentum. Scientists have realized that green chemistry is the key to reduce waste, rendering healthy environment, and improving human health. The 12 principles of green chemistry are the basic tenets that require understanding at the most fundamental level and implementation to promoting sustainable synthesis. This book discusses innovations in the form of greener technologies (superior green catalysts, alternate reaction media, and green energy sources) and elaborates their tremendous potential in combating the critical global challenges on the horizon. It intends to empower and educate students to grasp the key concepts of green chemistry, think out of the box and come up with new ideas, and apply the basic concepts in greening the world. It extensively covers the goals of the United Nation’s 2030 Agenda of Sustainable Development, which can be successfully achieved with the aid of green chemistry. It also highlights cutting-edge greener technologies such as biomimicry, miniaturization, and continuous flow. Edited by two active green chemists, the book presents in-depth knowledge of this field and is extremely helpful for undergraduate, graduate, and postgraduate readers, as well as academic and industrial researchers.

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 restorative future.

Nature did it first! A beautiful and whimsically illustrated explanation of cool inventions like Velcro and scuba suits that were inspired by the natural world Discover how bats led to the development of radar, whales inspired the pacemaker, and the lotus flower may help us produce indestructible clothing. "Biomimicry" comes from the Greek "bio" (life) and "mimesis" (imitation)." Here are various and amazing ways that na-

ture inspires us to create cool inventions in science and medicine, clothing design, and architecture. From the fireflies that showed inventors how LEDs could give off more light to the burdock plant that inspired velcro to the high speed trains of Japan that take the form of a kingfisher's sleek, aerodynamic head, there are innumerable ways that we can create smarter, better, safer inventions by observing the natural world. Author Seraphine Menu and illustrator Emmanuelle Walker also gently explain that our extraordinary, diverse, and awe-inspiring world is like a carefully calibrated machine and its fragile balance must be treated with extreme care and respect. "Go outside," they say, "observe, compare, and maybe some day you'll be the next person to be struck by a great idea."

Biomimetics - imitating life's natural processes - is one of the hottest areas of design research and inspiration. The natural world contains infinite examples of how to achieve complex behaviours and applications by using simple materials in a clever way, as all organisms make use of limited raw materials to survive. In the popular imagination, the best-known example is the microscopic 'hook' on burrs that led to the development of Velcro, but there are many more applications, from kingfisher beaks inspiring the shape of bullet trains to shark skin being used as a model for advanced swimsuits. This book presents many examples, showing each natural phenomenon alongside its application, with an accessible explanation of the biology and the story of the design. While most are concrete examples that have already been developed, others point the way to what might be possible for an enterprising designer, providing a starting point for creativity. This timely overview is the perfect introduction for designers of all disciplines, and a reminder that inspiration may be just down the garden path. With 439 illustrations

Biomimetics in Materials Science provides a comprehensive theoretical and practical review of biomimetic materials with self-healing, self-lubricating and self-cleaning properties. These three topics are closely related and constitute rapidly developing areas of study. The field of self-healing materials requires a new conceptual understanding of this biomimetic technology, which is in contrast to traditional engineering processes such as wear and fatigue. Biomimetics in Materials Science is the first monograph to be devoted to these materials. A new theoretical framework for these processes is presented based on the concept of multi-scale structure of entropy and non-equilibrium thermodynamics, together with a detailed review of the available technology. The latter includes experimental, modeling, and simulation results obtained on self--healing/lubricating/cleaning materials since their emergence in the past decade.

Can we emulate nature's technology in chemistry? Through billions of years of evolution, Nature has generated some remarkable systems and substances that have made life on earth what it is today. Increasingly, scientists are seeking to mimic Nature's systems and processes in the lab in order to harness the power of Nature for the benefit of society. Bioinspiration and Biomimicry in Chemistry explores the chemistry of Nature and how we can replicate what Nature does in abiological settings. Specifically, the book fo-

cuses on wholly artificial, man-made systems that employ or are inspired by principles of Nature, but which do not use materials of biological origin. Beginning with a general overview of the concept of bioinspiration and biomimicry in chemistry, the book tackles such topics as: Bioinspired molecular machines Bioinspired catalysis Biomimetic amphiphiles and vesicles Biomimetic principles in macromolecular science Biomimetic cavities and bioinspired receptors Biomimicry in organic synthesis Written by a team of leading international experts, the contributed chapters collectively lay the groundwork for a new generation of environmentally friendly and sustainable materials, pharmaceuticals, and technologies. Readers will discover the latest advances in our ability to replicate natural systems and materials as well as the many impediments that remain, proving how much we still need to learn about how Nature works. Bioinspiration and Biomimicry in Chemistry is recommended for students and researchers in all realms of chemistry. Addressing how scientists are working to reverse engineer Nature in all areas of chemical research, the book is designed to stimulate new discussion and research in this exciting and promising field.

This book provides the readers with a timely guide to the application of biomimetic principles in architecture and engineering design. As a result of a combined effort by two internationally recognized authorities, the biologist Werner Nachtigall and the architect Göran Pohl, the book describes the principles which can be used to compare nature and technology, and at the same time it presents detailed explanations and examples showing how biology can be used as a source of inspiration and “translated” in building and architectural solutions (biomimicry). Even though nature cannot be directly copied, the living world can provide architects and engineers with a wealth of analogues and inspirations for their own creative designs. But how can analysis of natural entities give rise to advanced and sustainable design? By reporting on the latest bionic design methods and using extensive artwork, the book guides readers through the field of nature-inspired architecture, offering an extraordinary resource for professional architects, engineers, designers and urban planners, as well as for university teachers, researchers and students. Natural evolution is seen throughout the book as a powerful resource that can serve architecture and design by providing innovative, optimal and sustainable solutions.

Applying Properties of Animals Skins to Inspire Architectural Envelopes Biology influences design projects in many ways; the related discipline is known as biomimetics or biomimicry. Using the animal kingdom as a source of inspiration, Ilaria Mazzoleni seeks to instill a shift in thinking about the application of biological principles to design and architecture. She focuses on the analysis of how organisms have adapted to different environments and translates the learned principles into the built environment. To illustrate the methodology, Mazzoleni draws inspiration from the diversity of animal coverings, referred to broadly as skin, and applies them to the design of building envelopes through a series of twelve case studies. Skin is a complex organ that performs a multitude of functions; namely, it serves as a link between the body

and the environment. Similarly, building envelopes act as interfaces between their inhabitants and external elements. The resulting architectural designs illustrate an integrative methodology that allows architecture to follow nature. "Ilaria Mazzoleni, in collaboration with biologist Shauna Price, has developed a profound methodology for architectural and design incentives that anticipates and proposes novel ways to explore undiscovered biological inspirations for various audiences." ¿Yoseph Bar-Cohen

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 Tübingen. 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.

The first resource in the emerging field of biomimicry targeted directly at design professionals and students The natural world contains infinite examples of how to achieve complex behaviors and applications by using simple materials in a clever way. As we begin to exhaust the natural resources we rely on to create our products and environments, designers are increasingly turning to nature—where organisms make use of limited raw materials to survive—for inspiration about how to invent fascinating solutions to everyday design problems. The importance of biomimicry—manufacturing materials that imitate life's natural processes—has been known for years, and designers have often looked to nature for formal solutions. In the popular imagination, the best-known example is the microscopic "hook" on burrs that inspired the development of Velcro, but there are many more applications, from kingfisher beaks inspiring the shape of bullet trains to shark

skin being used as a model for advanced swimsuits. Author Veronika Kapsali, trained biologist and designer, presents insightful examples, showing each natural phenomenon alongside its man-made application, with an accessible explanation of the biology and the story of the design. While most are concrete examples that have already been developed, others point the way to what might be possible for an enterprising designer.

Biomimicry uses our scienti?c understanding of biological systems to exploit ideas from nature in order to construct some technology. In this book, we focus onhowtousebiomimicryof the functionaloperationofthe “hardwareandso- ware” of biological systems for the development of optimization algorithms and feedbackcontrolsystemsthatextendourcapabilitiestoimplementsophisticated levels of automation. The primary focus is not on the modeling, emulation, or analysis of some biological system. The focus is on using “bio-inspiration” to inject new ideas, techniques, and perspective into the engineering of complex automation systems. There are many biological processes that, at some level of abstraction, can berepresentedasoptimizationprocesses,-manyofwhichhaveasa basicpurpose automatic control, decision making, or automation. For instance, at the level of everyday experience, we can view the actions of a human operator of some process (e. g. , the driver of a car) as being a series of the best choices he or she makes in trying to achieve some goal (staying on the road); emulation of this decision--making process amounts to modeling a type of biological optimization and decision-making process, and implementation of the resulting algorithm results in “human mimicry” for automation. There are clearer examples of - ological optimization processes that are used for control and automation when you consider nonhuman biological or behavioral processes, or the (internal) - ology of the human and not the resulting external behavioral characteristics (like driving a car). For instance, there are homeostasis processes where, for instance, temperature is regulated in the human body.

Nature has always been a source of inspiration for the design of the human environment. The analysis of biological constructions can not only lead to astonishing technical solutions but can also inspire the design of architecture. Bionics is a fascinating border area between pure research and practical application: biologists, chemists, physicists, mineralogists, and paleontologists meet up with material scientists, engineers, and architects and transfer their knowledge to architecture and construction. Using numerous practical examples, this richly illustrated introduction traces the process from the understanding of how something functions, to abstraction—for example in computer models—and the construction of initial prototypes, through to fully functional manufacture and production.

Invaluable to biochemists, biophysicists, and pharmacological scientists; this book provides insights into the essential principles required to understand why and how electrochemical and electrophysiological tools are fundamental in elucidating the mode of ion transport across biomembranes. • Describes the essential electrochemical basics required to understand why and how electrochemical and electrophysiological tools are fundamental in elucidating the mode of ion transport across

biomembranes • Requires only basic physical chemistry and mathematics to be understood, without intermediate stumbling blocks that would discourage the reader from proceeding further • Develops contents in a step-by-step approach that encourages students and researchers to read from beginning to end

Putting forward an innovative approach to solving current technological problems faced by human society, this book encompasses a holistic way of perceiving the potential of natural systems. Nature has developed several materials and processes which both maintain an optimal performance and are also totally biodegradable, properties which can be used in civil engineering. Delivering the latest research findings to building industry professionals and other practitioners, as well as containing information useful to the public, ‘Biotechnologies and Biomimetics for Civil Engineering’ serves as an important tool to tackle the challenges of a more sustainable construction industry and the future of buildings.

The wave of the future has been around since the beginning of times: it's called Nature. Let inventor and entrepreneur Jay Harman introduce you to stunning solutions to some of the world's thorniest problems. Why does the bumblebee have better aerodynamics than a 747? How can copying a butterfly wing reduce the world's lighting energy bill by 80%? How will fleas' knees and bees' shoulders help scientists formulate a near-perfect rubber? Today an interdisciplinary and international group of scientists, inventors and engineers is turning to nature to innovate and find elegant solutions to human problems. The principle driving this transformation is called biomimicry, and Harman shares a wide range of examples of how we're borrowing from natural models to invent profitable, green solutions to pressing industrial challenges. Aimed at a business audience, aspiring entrepreneurs, environmentalists and general science readers, The Shark's Paintbrush reflects a force of change in the new global economy that does more than simply gratify human industrial ambition; it teaches us how to live in harmony with nature and opens bright opportunities for a better future.

Biomimetics is an innovative paradigm shift based on biodiversity for sustainability. Biodiversity is not only the result of evolutionary adaption but also the optimized solution of an epic combinatorial chemistry for sustainability, because the diversity has been acquired by biological processes and technology, including production processes, operating principles, and control systems, all of which differ from human technology. In the recent decades, biomimetics has gained a great deal of industrial interest because of its unique solutions for engineering problems. In this book, researchers have contributed cutting-edge results from the viewpoint of two types of industrial applications of biomimetics. The first type starts with engineering tasks to solve an engineering problem using biomimetics, while the other starts with the knowledge of biology and its application to engineering fields. This book discusses both approaches. Edited by Profs. Masatsugu Shimomura and Akihiro Miyauchi, two prominent nanotechnology researchers, this book will appeal to advanced undergraduate- and graduate-level students of biology, chemistry, physics, and engineering and to re-

searchers working in the areas of mechanics, optical devices, glue materials, sensor devices, and SEM observation of living matter.

This book argues that, to be healthy, human beings should love nature and stay in balance with it as much as possible. In other words: do not unbalance nature so that your own balance is not disturbed. The best and healthiest way for human beings to live is to find balance in life and nature. In this regard, the book discusses useful, nutritious, functional foods, nutraceuticals and antioxidants, and how natural molecules, which are provided by nature, can be the best medicine for human beings. At a molecular level, stress is defined by the presence of unbalanced free radicals in the body. Most diseases – especially type 2 diabetes, which accounts for the majority of diabetics – can be traced back to this problem. Our scientific evidence indicates that type 2 diabetes isn't just a disease resulting from sugar, but also from stress. The book seeks to promote a healthier lifestyle by considering the psychoemotional dimension of wellness. And finally, it contends that good sleep is at the root of health and happiness for humanity, and that unbalanced free radicals are expelled from the body during restful sleep. The authors hope that this book will be a helpful guide and source of peace for readers, especially given their need for inner calm during the COVID-19 pandemic, and that the suggestions provided will show them the way to a better life.

Provides a professional, contemporary, and concise review of the current knowledge and advances in biomimetics This book covers the field of biomimicry, an area of science where researchers look to mimic aspects of plants or animals in order to solve problems in aerospace, shipping, building, electronics, and optics, among others. It presents the latest developments in biomimicry and gives readers sufficient grounding to help them understand the current, and sometimes technically complex, research literature. Different themes are covered throughout and text boxes deal with the relevant physics for readers who may lack this knowledge. Biomimetics: Nature-Inspired Design and Innovation examines issues in fluid dynamics such as avoiding sonic booms, reducing train noise, increasing wind turbine efficiency, and more. Next, it looks at optical applications, e.g. how nature generates color without dyes and pigment, and how animals stay cool in desert environments. A chapter on the built environment discusses cooling systems for buildings based on termite mounds; creating self-cleaning paint based on lotus leaves; unobtrusive solar panels based on ivy; and buildings that respond to the environment. Two more sections focus on biomimicry for the creation of smart materials and smart devices. The book finishes with a look at the field's future over the next decade. Presents each topic in sufficient detail in order to enable the reader to comprehend the original scientific papers Emphasizes those examples of biomimicry that have made it into products Features text boxes that provide information on the relevant physics or engineering principles for biologists who do not have a physics background Covers the scientific literature up to July 2019 Biomimetics: Nature-Inspired Design and Innovation is an excellent book for senior undergrad-

uates and post-graduate students in the life sciences, material sciences, and bioengineering. It will also appeal to lay readers with an interest in nature as well as scientists in general.

We are all investors. We invest our time, our energy, our money. We invest every single day, as citizens, as consumers, as businesspeople. At its core, investing involves connection, exchange, and mutual benefit. Lately, however, the primary, beneficial function of investing has been overshadowed by ever-more mechanized iterations of finance. We have created funds of funds, securitizations of securitizations, and entire firms whose business is based on harvesting the advantage of microseconds of trading speed. The Nature of Investing calls for a transformation of the investment process from the roots up. Drawing on the author's twenty-plus years of leadership experience in top investment firms, the book connects real-world finance with the field of biomimicry. Citing real-life examples and discussing principles from the natural world, The Nature of Investing shows how we can create an investment framework that is different from the mechanized one currently employed. Readers will discover an approach that re-aligns investing with the world it was originally meant to serve. An approach that values resiliency over rigidity and elegant simplicity over synthetic complexity. This is the true nature of investing.

Did you know that lamps can be powered by glowing bacteria instead of electricity? That gloves designed like gecko feet let people climb straight up glass walls? Or that kids are finding ways to make compostable plastic out of banana peels? Biomimicry, the scientific term for when we learn from and copy nature, is a revolutionary way to look to nature for answers to environmental problems such as climate change. In Design Like Nature young readers discover innovations and inventions inspired by the environment. Nature runs the entire planet with no waste and no pollution. Can humans learn to do this too? It's time to step outside and start designing like nature.

Audisee® eBooks with Audio combine professional narration and sentence highlighting for an engaging read aloud experience! It's a bird, it's a plane, it's a . . . robo-hummingbird? Meet robots engineered using biomimicry that are built to move like animals. These robots are changing the way we live today and shaping the way we'll live in the future. On spreads pairing photos of robots with the animals they mimic, you'll discover robots that race through water like fish, run like cheetahs, jump like a kangaroo, swarm through the sky like honeybees, and more!

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 na-

ture-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.