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***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***

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***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***

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in Chemistry explores the chemistry of Nature and how we can replicate what Nature does in abiological settings. Specifically, the book focuses on wholly artificial, man-made systems that employ or are

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***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***

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such topics as: Bioinspired
molecular machines
Bioinspired catalysis
Biomimetic amphiphiles and
vesicles Biomimetic principles
in macromolecular science
Biomimetic cavities and

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***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***

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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

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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

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***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***

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field.

Detailing techniques in wound healing and reconstruction, this reference describes the mechanisms and architecture of biological systems to formulate and design natural

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Delivery
**and synthetic compounds,
degradable and non-
degradable scaffolds, and
targeted drug delivery devices.
It offers strategies to control
adhesive interactions, elicit
specific cellular responses, and**

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improve the biocompatibility, performance, and durability of prosthetic materials. Covering advances in the field, the book discusses the effect of topographical features on cell behaviors such as orientation,

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***adhesion, migration,
proliferation, and
differentiation.***

***Bioinspired and Biomimetic
Materials for Drug Delivery
delves into the potential of
bioinspired materials in drug***

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delivery, detailing each material type and its latest developments. In the last decade, biomimetic and bioinspired materials and technology has garnered increased attention in drug

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delivery research. Various material types including polymer, small molecular, protein, peptide, cholesterol, polysaccharide, nano-crystal and hybrid materials are widely considered in drug

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delivery research. However, biomimetic and bioinspired materials and technology have shown promising results for use in therapeutics, due to their high biocompatibility and reduced immunogenicity. Such

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materials include dopamine, extracellular exosome, bile acids, ionic liquids, and red blood cell. This book covers each of these materials in detail, reviewing their potential and usage in drug

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***delivery. As such, this book will
be a great source of
information for biomaterials
scientists, biomedical
engineers and those working
in pharmaceutical research.
Explores latest developments***

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***for a broad range of
bioinspired and biomimetic
materials for drug delivery
applications Helps researchers
overcome the challenges of
biocompatibility and
immunogenicity in drug***

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*Delivery
development Provides both
theoretical and practical
knowledge in regards to
materials characterization and
use in a range of drugs
Advancements in Polymer-
Based Membranes for Water*

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Remediation describes the advanced membrane science and engineering behind the separation processes within the domain of polymer-based membrane systems in water remediation. Emphasis has

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***been put on several aspects,
ranging from fundamental
concepts to the
commercialization of pressure
and potential driven
membranes, updated with the
latest technological***

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***progresses, and relevant
polymer materials and
application potential towards
water treatment systems. Also
included in this book are
advances in polymers for
membrane application in***

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***reverse osmosis,
nanofiltration, ultrafiltration,
microfiltration, forward
osmosis, and polymeric ion-
exchange membranes for
electrodialysis and capacitive
deionization. With its critical***

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analyzes and opinions from experts around the world, this book will garner considerable interest among actual users, i.e., scientists, engineers, industrialists, entrepreneurs and students. Evaluates water

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***remediation using pressure
driven and potential driven
membrane processes Reviews
emerging polymer systems for
membranes preparation Offers
a comprehensive analysis in
the development of polymer-***

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***based membranes and their
applications in water
remediation Analyzes
membrane performance
parameters to evaluate
separation efficiency for
various water pollutants***

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Covers concept-to-commercialization aspects of polymer-based membranes in terms of water purification, pollutant removal, stability and scalability

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***Materials for Drug Delivery
Bioinspired Materials Science
and Engineering
Nanobiotechnology in
Bioformulations
Handbook Of Biomimetics And
Bioinspiration: Biologically-***

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***driven Engineering Of
Materials, Processes, Devices,
And Systems (In 3 Volumes)
Principles and Applications
Technologies and Applications***

**In this thesis, the author
introduces various bio-**

inspired smart nanochannel systems. A strategy for design and preparation of novel artificial responsive symmetric/asymmetric single nanochannel systems under various symmetric/asymmetric stimuli is presented for the

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first time. The author's
research work utilizes ion
track etching polymer
nanochannels with different
shapes as examples to
demonstrate the feasibility of
the design strategy for
building novel artificial

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**functional nanochannels
using various
symmetric/asymmetric
physicochemical
modifications. The
development of these
nanochannels and their
potential applications is a**

burgeoning new area of research, and a number of exciting breakthroughs may be anticipated in the near future from the concepts and results reported in this thesis. Research into artificial functional nanochannels

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**continues to drive new
developments of various real-
world applications, such as
biosensors, energy conversion
systems and nanofluidic
devices. The work in this
thesis has led to more than 15
publications in high-profile**

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journals.

Here, front-line researchers in the booming field of nanobiotechnology describe the most promising approaches for bioinspired drug delivery, encompassing small molecule delivery,

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**delivery of therapeutic
proteins and gene delivery.**

**The carriers surveyed include
polymeric, proteinaceous and
lipid systems on the
nanoscale, with a focus on
their adaptability for different
cargoes and target tissues.**

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Thanks to the broad coverage of carriers as well as cargoes discussed, every researcher in the field will find valuable information here.

This book is a printed edition of the Special Issue "Bioinspired Catechol-Based

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Delivery
Systems: Chemistry and
Applications" that was
published in Biomimetics
Evolved in a huge number of
different materials and
structures, nature represents
a great inspiration for
scientists and researchers,

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which continuously focuses attention on the development of novel approaches and functional biomaterials to mimic the complex architectures and functions of the human body. Bioinspired engineering is considered

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**today as a valuable tool for
the design of clinically
relevant materials and
structures for regenerative
sciences and, in this direction,
many progresses have been
recently made by the
scientific research in the**

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**biomedical field. This book
aims at collecting some recent
works addressed to the
definition of novel bioinspired
approaches in bioengineering
and biotechnology, presenting
interesting scientific results
and a comprehensive overview**

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**of attracting materials in
research papers and review
articles.**

**Advancement in Polymer-
Based Membranes for Water
Remediation
Engineered Biomimicry
Alternative Medicine**

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**Biomimicry for Aerospace
From Bioinspiration and
Biomimetics to Clinical
Applications**

Drug Delivery Nanosystems

With the recent shift of chemical
fertilizers and pesticides to organic

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agriculture, the employment of microbes that perform significant beneficial functions for plants has been highlighted. This book presents timely discussion and coverage on the use of microbial formulations, which range from powdered or

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charcoal-based to solution and secondary metabolite-based bioformulations. Bioformulation development of biofertilizers and biopesticides coupled with the advantages of nanobiotechnology propose significant applications in

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the agricultural section including nanobiosensors, nanoherbicides, and smart transport systems for the regulated release of agrochemical. Moreover, the formulation of secondary metabolites against individual phytopathogens could be

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used irrespective of geographical positions with higher disease incidences. The prospective advantages and uses of nanobiotechnology generate tremendous interest, as it could augment production of agricultural

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produce while being cost-effective both energetically and economically.

This bioformulation approach is incomparable to existing technology, as the bioformulation would explicitly target the particular pathogen without harming the

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natural microbiome of the ecosystem. Nanobiotechnology in Bioformulations covers the constraints associated with large-scale development and commercialization of bioinoculant formations. Furthermore, exclusive

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emphasis is be placed on next-generation efficient bioinoculants having secondary metabolite formulations with longer shelf life and advanced competence against several phytopathogens. Valuable chapters deal with bioformulation

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strategies that use divergent groups
of the microbiome and include
detailed diagrammatic and pictorial
representation. This book will be
highly beneficial for both experts
and novices in the fields of
microbial bioformulation,

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nanotechnology, and nano-microbiotechnology. It discusses the prevailing status and applications available for microbial researchers and scientists, agronomists, students, environmentalists, agriculturists, and agribusiness professionals, as well

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as to anyone devoted to sustaining
the ecosystem.

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Takes a materials science approach,
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relationships with function across a broad range of biological materials.

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Throughout, valuable contributions

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from top-level scientists illustrate how bionanomaterials could lead to novel devices or structures with unique properties. The first and second part cover the most relevant synthetic and bioinspired nanomaterials, including surfaces

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with extreme wettability properties, functional materials with improved adhesion or structural and functional systems based on the complex and hierarchical organization of natural composites. These lessons from nature are explored in the last

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section where bioinspired materials are proposed for biomedical applications, showing their potential for future applications in drug delivery, theragnosis, and regenerative medicine. A navigational guide aimed at

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advanced and specialist readers, while equally relevant for readers in research, academia or private companies focused on high added-value contributions. Young researchers will also find this an indispensable guide in choosing or

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continuing to work in this stimulating area, which involves a wide range of disciplines, including chemistry, physics, materials science and engineering, biology, and medicine.

Biomimetic Polymers

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On Biomimetics
Bioinspired and Biomimetic
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Handbook of Biomimetics and
Bioinspiration
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Biologically Inspired Technologies
This book includes representative research from the state-of-the-art in the emerging field of soft robotics, with a special focus on bioinspired soft robotics for underwater applications. Topics include novel materials, sensors,

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actuators, and system design for distributed estimation and control of soft robotic appendages inspired by the octopus and seastar. It summarizes the latest findings in an emerging field of bioinspired soft robotics for the underwater domain, primarily

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drawing from (but not limited to)
an ongoing research program in
bioinspired autonomous systems
sponsored by the Office of Naval
Research. The program has
stimulated cross-disciplinary
research in biology, material
science, computational

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mechanics, and systems and control for the purpose of creating novel robotic appendages for maritime applications. The book collects recent results in this area.

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*promising perspectives in
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book brings together the latest
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nanostructured materials and
their potential in designing highly
efficient and personalized drug
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the most well-known applications
of nanostructures in drug delivery
systems Includes novel
opportunities and ideas for
developing or improving
technologies in composites by

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*companies, biomedical industries,
and in related sectors Features at
least 50% of references from the
last 2-3 years*

*Mimicking nature - from science
fiction to engineering reality*

*Humans have always looked to
nature's inventions as a source of*

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inspiration. The observation of
flying birds and insects leads to
innovations in aeronautics.

*Collision avoidance sensors mimic
the whiskers of rodents.*

*Optimization algorithms are
based on survival of the fittest,
the seed-picking process of*

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pigeons, or the behavior of ant colonies. In recent years these efforts have become more intensive, with researchers seeking rules, concepts, and principles of biology to inspire new possibilities in materials, mechanisms, algorithms, and

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*fabrication processes. A review of
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Biomimetics: Nature Based
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biological solutions that provide a
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*actuators as artificial muscles EAP-
based refreshable braille displays
Biomimetic optics from the angles
of biology and plants Biomimicry
of flying birds, insects, and
marine biology Applications of
biomimetics in manufacturing,
products, and medicine Robotics,*

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*including the development of
human-like robots Biologically
inspired design as a tool for
interdisciplinary education The
biomimetic process in artistic
creation The final chapter outlines
the challenges to biomimetic-
related innovation and offers a*

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vision for the future. A follow-up to Biomimetics: Biologically Inspired Technologies (2005), this comprehensive reference methodically surveys the latest advances in this rapidly emerging field. It features an abundance of illustrations, including a 32-page

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engineers and scientists
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biomimicry. Biologically inspired science and technology, using the principles of math and physics, has led to the development of products as ubiquitous as Velcro™ (modeled after the spiny hooks on plant seeds and fruits). Readers will learn to take

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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,

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*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,
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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

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science and engineering

*Introduces bioinspiration,
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edge topics include bio-inspired
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innovative paradigm
shift based on
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sustainability.**

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**Biodiversity is not only
the result of
evolutionary adaption
but also the optimized
solution of an epic
combinatorial chemistry
for sustainability,**

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**because the diversity
has been acquired by
biological processes and
technology, including
production processes,
operating principles,
and control systems, all**

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**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**

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**engineering problems. In
this book, researchers
have contributed cutting-
edge results from the
viewpoint of two types
of industrial
applications of**

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**biomimetics. The first
type starts with
engineering tasks to
solve an engineering
problem using
biomimetics, while the
other starts with the**

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**knowledge of biology and
its application to
engineering fields. This
book discusses both
approaches. Edited by
Profs. Masatsugu
Shimomura and Akihiro**

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**Miyauchi, two prominent
nanotechnology
researchers, this book
will appeal to advanced
undergraduate- and
graduate-level students
of biology, chemistry,**

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**physics, and engineering
and to researchers
working in the areas of
mechanics, optical
devices, glue materials,
sensor devices, and SEM
observation of living**

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matter.

**Repackaged with a new
afterword, this
"valuable and
entertaining" (New York
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**are adapting nature's
best ideas to solve
tough 21st century
problems. Biomimicry is
rapidly transforming
life on earth. Biomimics
study nature's most**

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**successful ideas over
the past 3.5 million
years, and adapt them
for human use. The
results are
revolutionizing how
materials are invented**

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**and how we compute, heal
ourselves, repair the
environment, and feed
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**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**

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**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**

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**and pipe dreams,
Biomimicry is must
reading for anyone
interested in the shape
of our future.**

**Bioinspired materials
can be defined as the**

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organic or inorganic materials that mimic naturally occurring substances. With applications in a number of fields such as biomedical, chemical,

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**mechanical, and civil
engineering, research on
the development of
biologically-inspired
materials is essential
to further advancement.
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**Bioinspired Materials
Engineering provides
insight on fabrication
strategies for
bioinspired materials as
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**and prospective
applications.**

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research on bioinspired
processes and the nano-
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**mechanical aspects of
biologically-inspired
materials, this timely
publication is an ideal
reference source for
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**students in the fields
of materials science and
engineering,
nanotechnology,
biotechnology, and
biomedical materials
science.**

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The term biomimetic is comparatively new on the chemical scene, but the concept has been utilized by chemists for many years. Furthermore, the basic idea of making

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**a synthetic material
that can imitate the
func tions of natural
materials probably could
be traced back into
antiquity. From the dawn
of creation, people have**

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probably attempted to duplicate or modify the activities of the natural world. (One can even find allusions to these attempts in the Bible; e. g. , Genesis

30.) The term "mimetic" means to imitate or mimic. The word "mimic" means to copy closely, or to imitate accurately. Biomimetic, which has not yet

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entered most dictionaries, means to imitate or mimic some specific biological function. Usually, the objective of biomimetics is to form some useful

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**material without the
need of utilizing living
systems. In a similar
manner, the term
biomimetic polymers
means creating synthetic
poly mers which imitate**

**the activity of natural
bioactive polymers. This
is a major advance in
polymer chemistry
because the natural
bioactive polymers are
the basis of life**

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itself. Thus, biomimetic polymers imitate the life process in many ways. This present volume delineates some of the recent progress being made in this vast

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**field of biomimetic
polymers. Chemists have
been making biomimetic
polymers for more than
fifty years, although
this term wasn't used in
the early**

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investigations.

**Bioinspired Sensing,
Actuation, and Control
in Underwater Soft
Robotic Systems
Biomimicry
Living Machines**

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**Industrial Biomimetics
Nature-Based Innovation
Bio- and Bioinspired
Nanomaterials**

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"Alternative Medicine -
Update" is a collection

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of reviewed and relevant research chapters, offering a comprehensive overview of recent developments in the field of alternative medicine. The book

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comprises single
chapters authored by
various researchers and
edited by an expert
active in the
alternative medicine
research area. All

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chapters are complete in themselves but united under a common research study topic. This publication aims at providing a thorough overview of the latest

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research efforts by international authors on alternative medicine, and open new possible research paths for further novel developments.

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Biomimetics, in general terms, aims at understanding biological principles and applying them for the development of man-made tools and technologies. This

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approach is particularly
important for the
purposeful design of
passive as well as
functional biomaterials
that mimic
physicochemical,

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mechanical and
biological properties of
natural materials,
making them suitable,
for example, for
biomedical devices or as
scaffolds for tissue

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regeneration. The book
comprehensively covers
biomimetic approaches to
the development of
biomaterials, including:
an overview of naturally
occurring or nature

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inspired biomaterials;
an in-depth treatment of
the surface aspects
pivotal for the
functionality; synthesis
and self-assembly
methods to prepare

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devices to be used in mineralized tissues such as bone and teeth; and preparation of biomaterials for the controlled/ sustained release of bioactive

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agents. The last part reviews the applications of bioinspired materials and principles of design in regenerative medicine such as in-situ grown bone or cartilage as

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well as the biomimetic
techniques for soft
tissue engineering. The
comprehensive scope of
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Biomedical Engineering.
Biomimetic and
bioinspired membranes
are the most promising
type of membrane for
multiple usage
scenarios, including

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commercial separation applications as well as water and wastewater treatment technologies. In recent years, aquaporin biomimetic membranes (ABMs) for

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water purification have raised considerable interest. These membranes display uniquely favorable properties and outstanding

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performances, such as
diverse interactions,
varied selective
transport mechanisms,
superior stability, high
resistance to membrane
fouling, and distinct

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adaptability. Biomimetic membranes would make a significant contribution to alleviate water stress, environmental threats, and energy consumption.

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This first comprehensive
overview of the modern
aspects of
biomineralization
represents life and
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pathways are the hot
topics in many
disciplines and this
holds especially true
for biomineralization.

Here, the editors --
well-known members of

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associations and
prestigious institutes
-- have assembled an
international team of
renowned authors to
provide first-hand
research results. This

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second volume deals with
biometric model systems
in biomineralization,
including the biomineral
approach to bionics,
bioinspired materials
synthesis and bio-

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supported materials
chemistry, encapsulation
and the imaging of
internal nanostructures
of biominerals. An
interdisciplinary must-
have account, for

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biochemists,
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lecturers in chemistry
and biochemistry,
materials scientists,
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Biomimetics

Bio-Inspired Materials
for Biomedical

Applications

Bioinspired Catechol-

Based Systems: Chemistry
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The solutions to technical challenges posed by flight and space exploration tend to be multidimensional, multifunctional, and increasingly focused on the interaction of systems and their environment.

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The growing discipline of biomimicry focuses on what humanity can learn from the natural world. Biomimicry for Aerospace: Technologies and Applications features the latest advances of bioinspired

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and Other Practical Applications
discusses applications and
practical aspects of biomimetic
design for aerospace and
terrestrial applications and its
cross-disciplinary nature. Part III:
Biomimicry and Foundational

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Aerospace Disciplines covers
snake-inspired robots,
biomimetic advances in
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cooling by bioinspired exergy
management, and surrogate
model-driven bioinspired

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optimization algorithms for large-scale and complex problems.

Finally, Part IV: Bio-Inspired Materials, Manufacturing, and Structures reviews nature-inspired materials and processes for space exploration, gecko-

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inspired adhesives, bioinspired automated integrated circuit manufacturing on the Moon and Mars, and smart deployable space structures inspired by nature. Introduces educational aspects of bio-inspired design

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for novel and practical
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bio-inspired technologies
applicable to the field of
aerospace engineering Provides
an introduction to nature-
inspired design and engineering

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and its relevance to planning and developing the next generation of robotic and human space missions

This book contains contributions from leading researchers in biomechanics, nanomechanics,

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tribology, contact mechanics,
materials science and
applications on various
experimental techniques
including atomic force
microscopy (AFM) for studying
soft, biomimetic and biological

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materials and objects. Biologists, physicists, researchers applying methods of contact mechanics and researchers testing materials using indentation techniques along with many other applied scientists will find

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this book a useful addition to their libraries. Moreover, several reviews in this book are written as introductions to several important and rather sophisticated research areas such as depth-sensing

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indentation, studying of biological cells by AFM probes, mechanics of adhesive contact and contact between viscoelastic (hereditary elastic) solids. The book containing new theoretical models, results of experimental

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studies and numerical
simulations, along with reviews
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contact mechanics in application
to biological systems, would be
beneficial for researchers in
many areas of biology, medicine,

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engineering, mechanics and
biomimetics.

Nanotechnology seeks to exploit
distinct technological advances
controlling the structure of
nanoscale biomaterials at a
nanodimensional scale

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approaching individual molecules and their aggregates or supramolecular structures. The term "nanomedicine" is used to describe those technologies under the umbrella of nanotechnology that have

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therapeutic applications in human health. This book presents recent trends and research achievements in the field of pharmaceutical nanotechnology and advanced drug delivery nanosystems,

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Delivery especially for theranostic purposes. The applications of drug delivery nanosystems considered carriers of active pharmaceutical ingredients (APIs) (e.g., proteins, peptides, and nucleic acids) are analyzed

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on the basis of technology, preparation protocols, and biomedical applications. The book also extensively reports on the principles, design protocols, and applications of nanosystems in drug delivery, imaging, and

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targeting of active molecules of pharmaceutical interest.

Biomimetic engineering takes the principles of biological organisms and copies, mimics or adapts these in the design and development of new materials

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and technologies. Biomimetic Technologies reviews the key materials and processes involved in this groundbreaking field, supporting theoretical background by outlining a range of applications. Beginning with

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an overview of the key principles and materials associated with biomimetic technologies in Part One, the book goes on to explore biomimetic sensors in more detail in Part Two, with bio-inspired tactile, hair-based, gas-

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sensing and sonar systems all reviewed. Biomimetic actuators are then the focus of Part Three, with vision systems, tissue growth and muscles all discussed. Finally, a wide range of applications are investigated

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in Part Four, where biomimetic technology and artificial intelligence are reviewed for such uses as bio-inspired climbing robots and multi-robot systems, microrobots with CMOS IC neural networks

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locomotion control, central pattern generators (CPG's) and biologically inspired antenna arrays. Includes a solid overview of modern artificial intelligence as background to the principles of biomimetic engineering

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Reviews a selection of key bio-
inspired materials and sensors,
highlighting their current
strengths and future potential
Features cutting-edge examples
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induced superomniphobicity, self-cleaning, antifouling, and controlled adhesion. The focus in the book is on the Lotus Effect, Salvinia Effect, Rose Petal Effect, Oleophobic/philic Surfaces, Shark Skin Effect, and Gecko Adhesion. This new edition

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also contains new chapters on the butterfly wing effect, bio- and inorganic fouling and structure and Properties of Nacre and structural coloration.

Global warming, pollution, food and water shortage, cyberspace insecurity,

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over-population, land erosion, and an overburdened health care system are major issues facing the human race and our planet. These challenges have presented a mandate to develop “ natural ” or “ green ” technologies using nature and the

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living system as a guide to rationally design processes, devices, and systems. This approach has given rise to a new paradigm, one in which innovation goes hand-in-hand with less waste, less pollution, and less invasiveness to life on earth.

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Bioinspiration has also led to the development of technologies that mimic the hierarchical complexity of biological systems, leading to novel highly efficient, more reliable multifunctional materials, devices, and systems that can perform multiple

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tasks at one time. This multi-volume handbook focuses on the application of biomimetics and bioinspiration in medicine and engineering to produce miniaturized multi-functional materials, devices, and systems to perform complex tasks. Our

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understanding of complex biological systems at different length scales has increased dramatically as our ability to observe nature has expanded from macro to molecular scale, leading to the rational biologically-driven design to find solution to technological

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problems in medicine and engineering. The following three-volume set covers the fields of bioinspired materials, electromechanical systems developed from concepts inspired by nature, and tissue models respectively. The first

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volume focuses on the rational design of nano- and micro-structured hierarchical materials inspired by the relevant characteristics in living systems, such as the self-cleaning ability of lotus leaves and cicadas' wings; the superior walking ability of

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water striders; the anti-fogging function of mosquitoes' eyes; the water-collecting ability of Namib Desert Beetles and spider silk; the high adhesivity of geckos' feet and rose petals; the high adhesivity of mussels in wet aquatic environments; the

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anisotropic wetting of butterflies' wings; the anti-reflection capabilities of cicadas' wings; the self-cleaning functionality of fish scales; shape anisotropy of intracellular particles; the dielectric properties of muscles; the light spectral characteristics of

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plant leaves; the regeneration and self-healing ability of earthworms; the self-repairing ability of lotus leaves; the broadband reflectivity of moths' eyes; the multivalent binding, self-assembly and responsiveness of cellular systems; the biomineral formation in

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bacteria, plants, invertebrates, and vertebrates; the multi-layer structure of skin; the organization of tissue fibers; DNA structures with metal-mediated artificial base pairs; and the anisotropic microstructure of jellyfish mesogloea. In this volume, sensor and

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microfluidic technologies combined with surface patterning are explored for the diagnosis and monitoring of diseases. The high throughput combinatorial testing of biomaterials in regenerative medicine is also covered. The second volume presents

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nature-oriented studies and developments in the field of electromechanical devices and systems. These include actuators and robots based on the movement of muscles, algal antenna and photoreception; the non-imaging

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light sensing system of sea stars; the optical system of insect ocellus; smart nanochannels and pumps in cell membranes; neuromuscular and sensory devices that mimic the architecture of peripheral nervous system; olfaction-based odor sensing;

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cilia-mimetic microfluidic systems;
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inspired multizone temperature
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cercal system and flow sensing

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abilities; locusts' wings and flapping
micro air vehicles; the visual motion
sensing of flying insects; hearing aid
devices based on the human cochlea;
the geometric perception of tortoises
and pigeons; the organic matter
sensing capability of cats and dogs;

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and the silent flight of rats. The third volume features engineered models of biological tissues. These include engineered matrices to mimic cancer stem cell niches; in vitro models for bone regeneration; models of muscle tissue that enable the study of cardiac

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robots. Taking a systems perspective rather than focusing narrowly on materials or chemistry aspects, Biomimetics: Biologically Inspired Technologies examines the field from every angle. The book contains pioneering approaches to

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biomimetics including a new perspective on the mechanization of cognition and intelligence, as well as defense and attack strategies in nature, their applications, and potential. It surveys the field from modeling to applications and from nano- to macro-

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scales, beginning with an introduction to principles of using biology to inspire designs as well as biological mechanisms as models for technology. This innovative guide discusses evolutionary robotics; genetic algorithms; molecular

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machines; multifunctional,
biological-, and nano- materials;
nastic structures inspired by plants;
and functional surfaces in biology.
Looking inward at biological systems,
the book covers the topics of
biomimetic materials, structures,

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control, cognition, artificial muscles, biosensors that mimic senses, artificial organs, and interfaces between engineered and biological systems. The final chapter contemplates the future of the field and outlines the challenges ahead. Featuring extensive

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Dynamic soft materials that have the

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ability to expand and contract, change stiffness, self-heal or dissolve in response to environmental changes, are of great interest in applications ranging from biosensing and drug delivery to soft robotics and tissue engineering. This book covers the

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state-of-the-art and current trends in the very active and exciting field of bioinspired soft matter, its fundamentals and comprehension from the structural-property point of view, as well as materials and cutting-edge technologies that enable their

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design, fabrication, advanced characterization and underpin their biomedical applications. The book contents are supported by illustrated examples, schemes, and figures, offering a comprehensive and thorough overview of key aspects of

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Focusing on the most advanced materials and technologies, evaluation methods, and advanced synthesis techniques stimuli-responsive polymers, the book is an essential reference for scientists with an interest in drug delivery vehicles. Sections focus on innovation, development and the increased global demand for

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biodegradable and biocompatible responsive polymers and nanoparticles for safe drug delivery. Offers an in-depth look at the basic and fundamental aspects of alternative stimuli-responsive polymers, mechanisms, structure, synthesis and properties Provides a well-defined categorization for stimuli-responsive

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polymers for drug delivery based on different triggering mechanisms Discusses novel approaches and challenges for scaling up and commercialization of stimuli-responsive polymers
Bio-mimicry is fundamental idea "How to mimic the Nature" by various methodologies as well as new ideas or

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suggestions on the creation of novel materials and functions. This book comprises seven sections on various perspectives of bio-mimicry in our life; Section 1 gives an overview of modeling of biomimetic materials; Section 2 presents a processing and design of biomaterials; Section 3 presents various aspects of

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design and application of biomimetic polymers and composites are discussed; Section 4 presents a general characterization of biomaterials; Section 5 proposes new examples for biomimetic systems; Section 6 summarizes chapters, concerning cells behavior through mimicry; Section 7 presents various

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applications of biomimetic materials are presented. Aimed at physicists, chemists and biologists interested in biomineralization, biochemistry, kinetics, solution chemistry. This book is also relevant to engineers and doctors interested in research and construction of biomimetic systems.

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Contemporary research in the field of robotics attempts to harness the versatility and sustainability of living organisms. By exploiting those natural principles, scientists hope to render a renewable, adaptable, and robust class of technology that can facilitate self-repairing, social, and moral--even conscious--machines.

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This is the realm of robotics that scientists call "the living machine." Living Machines can be divided into two entities- biomimetic systems, those that harness the principles discovered in nature and embody them in new artifacts, and biohybrid systems, which couple biological entities with synthetic ones.

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Living Machines: A handbook of research in biomimetic and biohybrid systems surveys this flourishing area of research. It captures the current state of play and points to the opportunities ahead, addressing such fields as self-organization and co-operativity, biologically-inspired active materials, self-assembly and self-

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repair, learning, memory, control architectures and self-regulation, locomotion in air, on land or in water, perception, cognition, control, and communication. In all of these areas, the potential of biomimetics is shown through the construction of a wide range of different biomimetic devices and animal-

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like robots. Biohybrid systems is a relatively new field, with exciting and largely unknown potential, but one that is likely to shape the future of humanity. Chapters outline current research in areas including brain-machine interfaces-where neurons are connected to microscopic sensors and actuators-and various forms

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of intelligent prostheses from sensory devices like artificial retinas, to life-like artificial limbs, brain implants, and virtual reality-based rehabilitation approaches. The handbook concludes by exploring the impact living machine technology will have on both society and the individual, by forcing human beings to question how we

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see and understand ourselves. With contributions from leading researchers drawing on ideas from science, engineering, and the humanities, this handbook will appeal to both undergraduate and postgraduate students of biomimetic and biohybrid technologies. Researchers in the areas of computational

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***self-assembly and
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