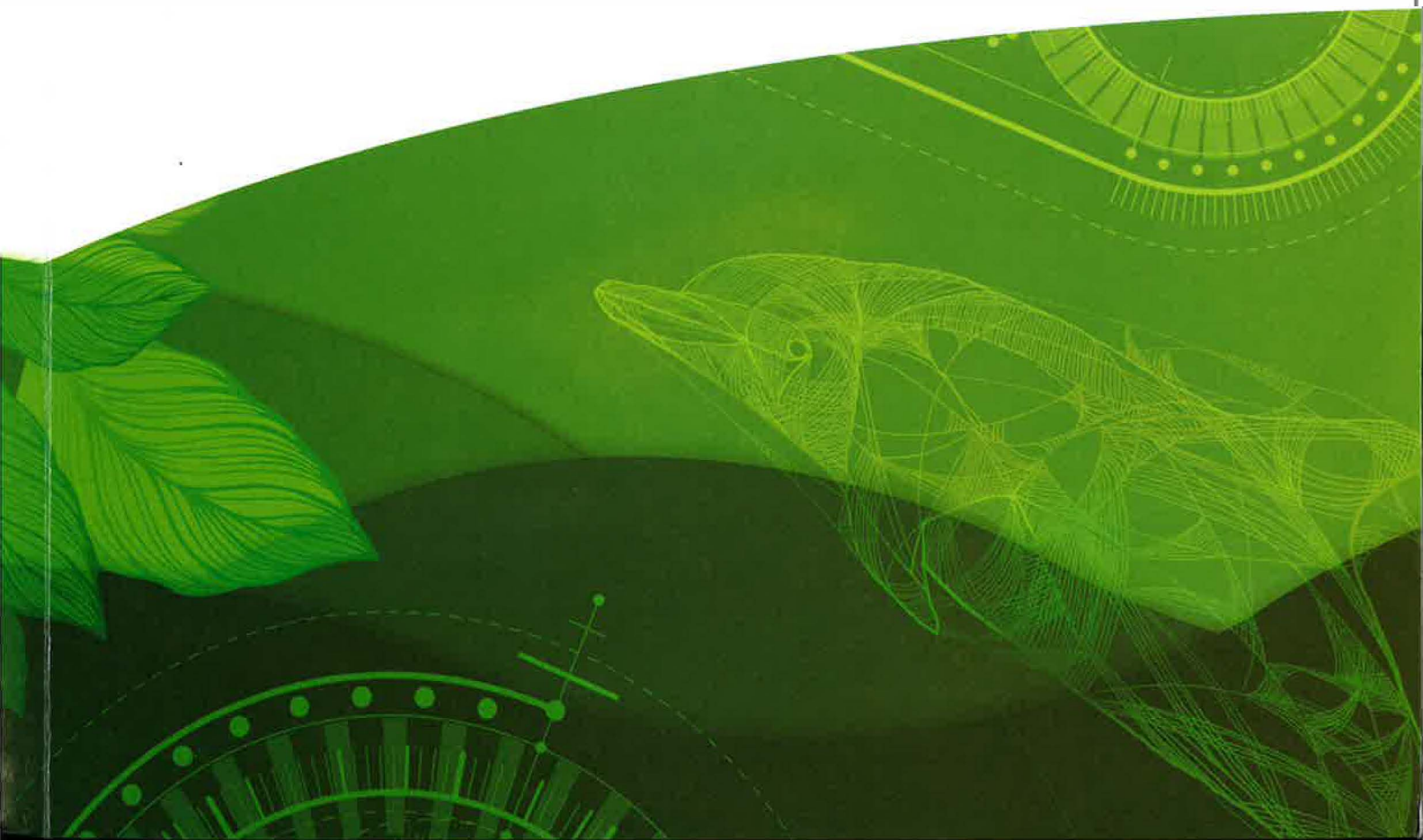




**The 6th International Conference of Bionic Engineering
The International Symposium on Nature-Inspired Technology 2019**

Bionic Innovations for Healthy Development

Abstract Book



The 6th International Conference of Bionic Engineering

The International Symposium on Nature-Inspired Technology 2019

Bionic Innovations for Healthy Development

23-26 September 2019, Changchun

Abstract Book

ICBE2019&ISNIT2019

INTERNATIONAL CONFERENCE OF BIONIC ENGINEERING 2019

INTERNATIONAL SYMPOSIUM ON NATURE-INSPIRED

TECHNOLOGY 2019

ABSTRACT BOOK

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ISSN 1672-6529

Foreword

The joint meeting of 6th International Conference of Bionic Engineering (ICBE2019) and International Symposium on Nature-Inspired Technology 2019 (ISNIT 2019) organized by the International Society of Bionic Engineering (ISBE) and Korean Society of Mechanical Engineers (KSME) is held at Jilin University in Changchun on September 23-26, 2019. This conference aims to establish a closer relationship between scientists and engineers worldwide in the field of bionic engineering. The theme of ICBE2019 and ISNIT2019 is **Bionic innovations for healthy development**, which is geared towards exploring new ideas and accomplishments for the practice of bio-inspired design and manufacture, while offering innovative solutions. Attendees of this conference are invited to present papers related to the combination of biological information and mechanical engineering, materials science, agriculture engineering, rehabilitation and healthcare engineering, robotics, fluid, fabrication, and management *etc.* A broad range of topics and application areas will be devised to reflect the interdisciplinary nature of ICBE and ISNIT.

The main topics of ICBE2019 are as followings.

- Bionic/biological functional structures and surfaces
- Biomaterials & bionic materials
- Bionic machinery
- Management Bionics
- Healthcare engineering
- Biosensors and signal processing
- Robotics, motion systems and artificial intelligence
- Fluid and bionics
- Industrial applications in bionics
- Bio-inspired fabrication and bio-manufacturing

The conference has received over 400 research papers from delegates of more than 30 countries and regions. The present book selects 384 abstracts including 7 plenary speeches and 56 keynote papers. The conference proceedings of full papers will be in electronic format within the conference materials package.

Professor Luquan Ren

Conference Chair of ICBE2019
Jilin University, China

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Paper ID: K05

Biomimetics of functional shadow plant surface structures

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Abstract

To elucidate the function of various plant parts for potential biomimetic applications can be complex due to the multifunctional, hierarchical structure of the inspiring creatures. Single organisms of the same plant species look different depending on the environment where they grow. Such plants might have the same genotype, i.e., their internal genetic coding is the same, but their physical appearance, their phenotype, depends on the external conditions. Phenotypic plasticity is a general property of organisms. The surface structures in plants are genetically controlled, and changes in pigmentation and structure may correlate with environmental factors. Very strong are the differences in plant species that have evolved ways to deal with low light conditions, such as deep shade plants in the tropical rainforest. The different phenotypes depend on the conditions in which the shadow plants grow (UV intensity, light intensity, altitude, plant and animal communities in the vicinity, latitude, etc.). The keynote presentation will introduce studies performed on phenotypical variations of shadow plant leaves micro- and nanostructures yielding environment dependent optical effects such as changes in coloration and light reflection / absorption characteristics. Such studies give important insights into the function of the respective micro- and nanostructures and facilitate understanding of the structure-function relationship and related biomimetics. Some of these changes might be pure structural changes (as opposed to chemical changes), and thereby easily transferable to other materials – making use of the biomimetic principle “structure rather than material”. Following a methodology that was developed by Dr. Kerstin Koch and coworkers, the plant surface structures are transferred to stamps (negative imprints) made from polyvinylsiloxane and with these master stamps further transferred to materials such as window color, beeswax, sugar, Carnauba wax and epoxy resin (positive imprints). These structures are then applied to technical surfaces (e.g., solar cells) and the changes in performance measured.

Keywords: *environment dependent biological structures, functional micro- and nanostructures, imprint, shadow plants, stamp, structure-function relationship*

**Organized by: International Society of Bionic Engineering (ISBE)
Korean Society of Mechanical Engineers (KSME)**

Hosted by: Jilin University, China

**Sponsored by: National Natural Science Foundation of China (NSFC)
Jilin Association for Science and Technology**

ISSN 1672-6529



**ICBE2019 & ISNIT2019
24-26 SEPTEMBER 2019
CHANGCHUN, CHINA**