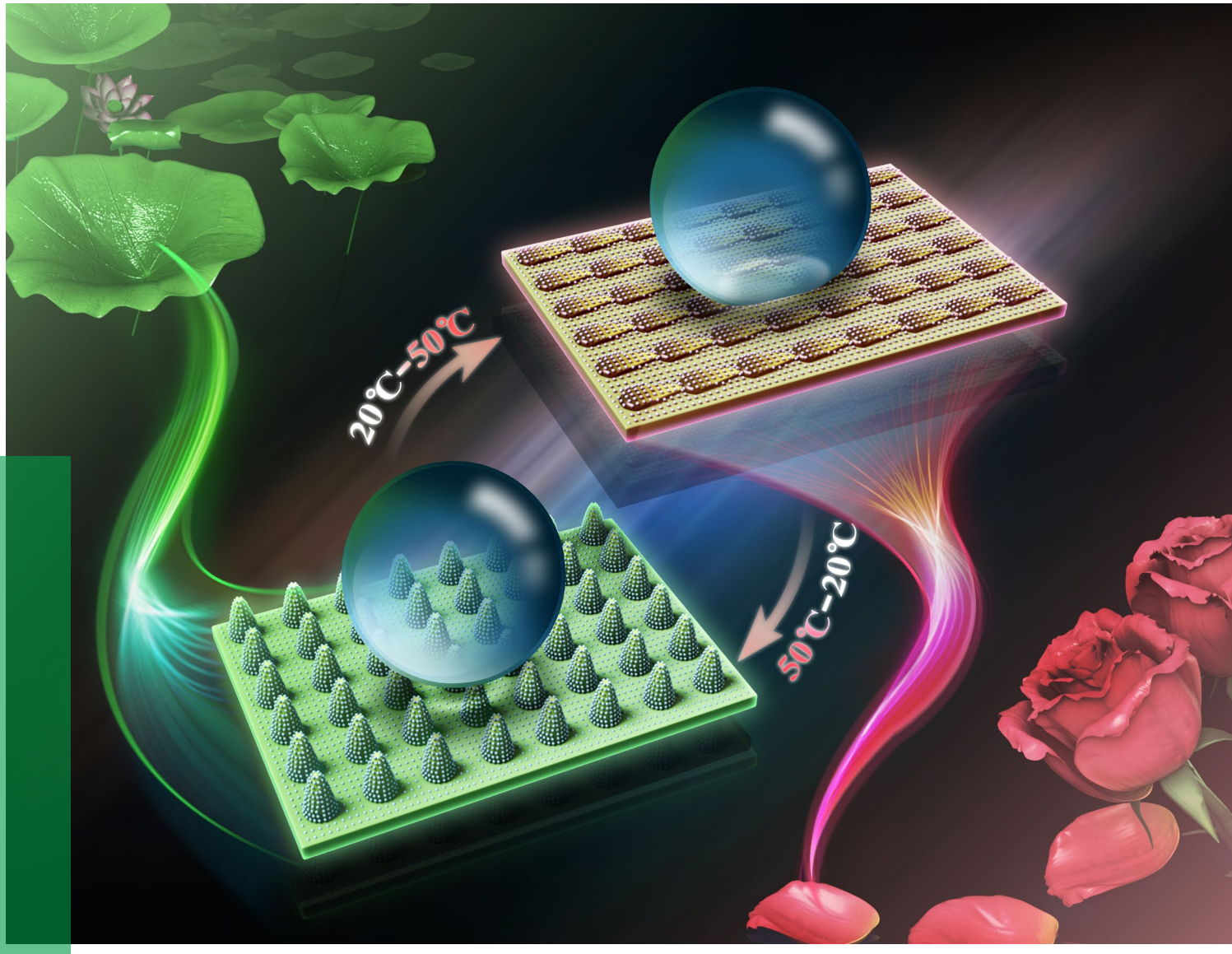
NEWSLETTER

International Society of Bionic Engineering

Volume 9, Issue 4, 2020



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Cover Photo: Shape Memory Superhydrophobic Surface with Switchable Transition between "Lotus Effect" to "Rose Petal Effect".

Thomas Speck

University of Freiburg, Germany

Thomas Speck is since 2006 Full Professor for "Botany: Functional Morphology and Biomimetics" and Director of the Botanic Garden at the Albert-Ludwigs-Univeristy of Freiburg. His institute includes 6 senior scientists, 4 postdocs, 12 PhD-students, typically 10 bachelor- & master-Students, 4 technicians, 2 administrative staff and 12 gardeners. Thomas Speck studied biology/biophysics at the University of Freiburg (Diploma 1986 / PhD 1990) and received 1996 the habilitation and venialegendi for botany & biophysics. After a visiting professorship at the University of Vienna he was offered professorships at the Humboldt University Berlin and at the University Freiburg where he worked as Associate Professor for "Botany" and Director of the Botanic Garden from 2002-2006. After declining a Full Professorship and the Directorship of the Botanic Garden at the Freie University Berlinhe took over his current position.

Thomas Speck is a Spokesperson of the Cluster of Excellence "Living, Adaptive, and Energy-autonomous Materials Systems (livMatS)" at the University of Freiburg, Deputy Executive Directorof the Freiburg Center for Interactive Materials and Bio-Inspired Technologies (FIT), and Scientific Member of the Materials Research Centre Freiburg (FMF). He is Spokesperson of the Competence Network "Biomimetics" in Baden-Württemberg, Member of the Scientific Advisory Board of the "State Agency for Lightweight Constructions Baden-Württemberg",and Vice-Chairperson of the "Society for Technical Biology and Bionics".

Fig. 1: Snap traps of the waterwheel plant (left) model for the bio-inspired façade-shading system Flectofold © PBG Freiburg & ITKE Stuttgart

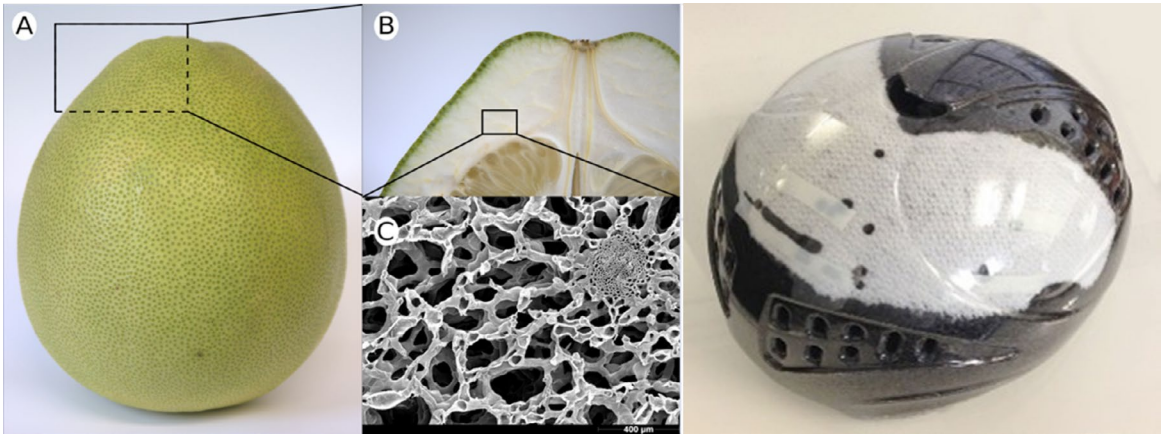

Fig. 2: The highly damping pomelo peel (left) concept generator for the protecting padding of a riding helmet (right) © PBG Freiburg & UVEX Group

From 2014-2019 he was Co-speaker of the Collaborative Research Center-SFB/TRR 141 "Biological Design and Integrative Structures", from 2003-2009 President of the Society of Botanic Gardens Germany, and from 2010-2014 Chairman of the "Bionic Competence Network BIOKON".

His main research interests include (1) bio-inspired materials and surfaces (e.g. self-repairing, damping, fibrous compound and (anti-)adhesive materials), (2) bionic architecture, (3) biomechanics, functional morphology and evolution of functional traits in plants, (4) movements plant organs, and (5) teaching bionic knowledge in Botanic Gardens.

He received several scientific awards, among others the Gips-Schüle Research Award, three times Materialica Design+Technology Gold Awards, two Techtextil-Innovation Prizes and the Zander Medal of the Society of Botanic Gardens. He directed >100 R&D-projects on bionic research, among those >30 with direct industrial funding. Thomas Speck is co-inventor in 10 patents on bioinspired shock-absorbing pallets, self-repairing materials, façade-shading systems, sensor-modules for washing machines, fiber-reinforced compounds and axle carriers.

Thomas Speck is (co-)editor of several scientific books and journals. He has published >300 scientific articles in peer reviewed journals & books and >200 conference papers in the fields of bionics, functional morphology, biomechanics, evolutionary biology and palaeobotany.

Fig. 3: The Technical Plant Stem (center) an ultra-lightweight fibrous compound structure with two of its biological models giant reed (left) and horsetail (right) © PBG Freiburg & ITV Denkendorf

Qinghai Yang

Research Institute of Petroleum Exploration & Development (RIPED), China

Dr. Qinghai Yang received his PhD from Automation Institute of Chinese Academy of Sciences. He joined ISBE in 2009 as a founding member. After graduation, he has been working on the combination of bionics and petroleum engineering, and participated in the foundation of China's first specialized research department on petroleum engineering bionics in 2009. He published more than 20 papers as the first author or corresponding author and got 12 authorized invent patents. These papers and patents have been applied in bionic foam metal, non-smooth surface expansion cones, and bionic vibration wave communication in oilfields.

At present, oil and gas exploration and development is shifting from conventional resources to unconventional resources. The engineering technology faces more complex and severe downhole environment, such as high pressure, high temperature and complex fluids. Against the background, he focuses on the research of wellbore control engineering, which is a very important link in the production of oil & gas.In wellbore control engineering, he focuses on information acquisition and transmission, bionics surface treatment and wellbore detection and processing. Information acquisition and transmission are mainly to simulate and realize the functions of biological information acquisition, data processing and inter-biological information communication and collaboration. Bionic surface treatment is to simulate the biological surface structure on the surface of treated objects, so that better surface performance can be obtained. Wellbore detection and processing is to realize the free movement

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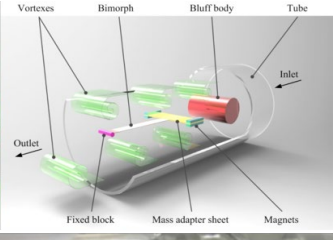
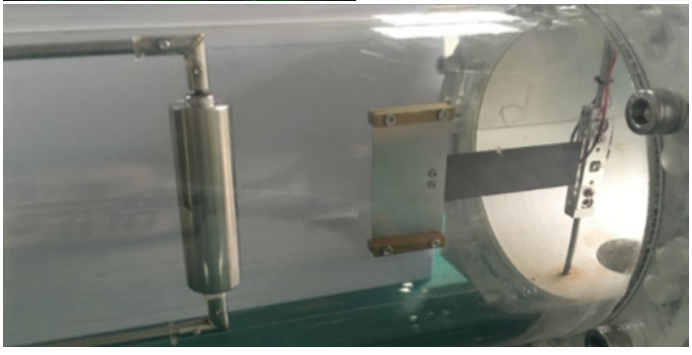




College of Biological and Agricultural Engineering, Jilin University, China

Jilin University is a national key comprehensive university under the direct administration of Ministry of Education in China, located in Changchun, Jilin Province. It was founded in 1946.In 2017, it was rated as one of the universities for building world-class universities in the “Double World-class Initiative”.

As one of Jilin University’s colleges, Jilin University’s College of Biological and Agricultural Engineering (CBAE) can be traced back to Changchun Institute of Automobile Tractor， which was initially founded in 1955. Over the past 60 years, it evolved from the two majors of Changchun Institute of Automobile Tractor --- Tractors and Agricultural Mechanization to College of Biological and Agricultural Engineering. Currently, CBAE is composed of four departments which are Agricultural Engineering Department, Bionic Science and Engineering Department, Packaging Engineering Department and Agricultural and Forestry Economy Management Department.

Leaded by Professor Luquan Ren，Academician of Chinese Academy of Science, the college establishes an experienced and innovative teaching and scientific team. At

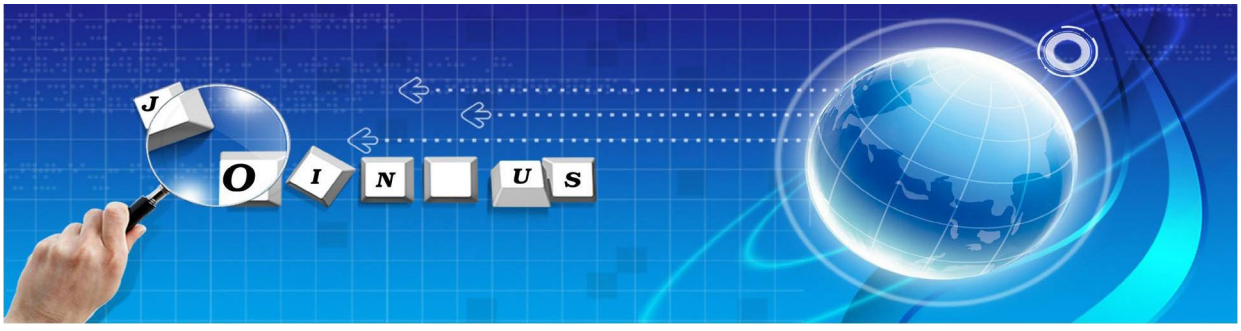
of detection instruments and the analysis and processing of wellbore detection through the engineering simulation of biological function.

Bionics research has a long way to go from basic theories to engineering applications. It is hoped that many innovations in bionics in recent years can play an important role in engineering. As an enterprise scientific researcher, he has always welcomed close cooperation with all walks of life.


present, there are totally 137 faculty members at CBAE, including 36 full professors, 31 associate professors, and 25 Ph.D. supervisors. More than 88% of the teachers hold Ph.D. degrees, and about 43% of the teachers have abroad experience.

CBAE has established a high-level talent training system from bachelor-master-doctor degree. Currently, there are 930 students enrolling in CBAE. Among them, 585 are undergraduate students, 212 are graduate students, 129 are doctoral students, and 3 are overseas students.

CBAE has a high level of scientific research capability. Many key provincial and ministerial-level laboratories and research bases are instituted at CBAE. Among them, the Key Lab of Bionic Engineering of Ministry of Education (MOE) is the only one key lab to engage in research on the bionic engineering and established by the Ministry of Education. The research of CBAE is divided into six main directions, including: Mechanical Bionics Theory and Technology; Agricultural Engineering Bionics and Terrain Mechanical System; Agricultural Mechanical Intelligence and Machine Tools Innovation; Agrobilogical Environment Control and Energy Saving Technology; Agricultural Products Transformation and Value-added and Agricultural Informatization Engineering; and Agricultural Engineering System Analysis and Management Engineering. Recent years, CBAE has carried out various researches, and has produced fruitful achievements.



Welcome the representatives from the 8 countries including Lebanon, Jordan, Egypt, Mauritius, Serbia, Hungary, Montenegro and Ecuador joined the ISBE in 2020. Until now, the members of the Society has distributed in **70 countries** around the world and Taiwan, China.

By becoming a member of the ISBE you can communicate with more academic elites and enjoy a variety of benefits. Members of the Society are free of charge. It is our hope that we can establish and develop the ISBE together. We welcome your application for membership, online at: http://www. isbe-online.org/

Welcome to Join ISBE !

Celebration activities of the 10th anniversary of the ISBE were held

On October 17-19, the celebration activities of the 10th anniversary of the ISBE were held during the Symposium on Bionic Science and Engineering in Weihai, China. Nearly 200 ISBE members from more than 60 universities attended the symposium, which include Tsinghua University, Zhejiang University, Huazhong University of Science and Technology, Beihang University, Nanjing University of Aeronautics and Astronautics, Jilin University and some other research institutions and enterprises.

Prof. Luquan Ren, academician of Chinese Academy of Sciences, standing vice-president of the ISBE, delivered an opening speech. Professor Jianqiao Li, General Secretary of the ISBE, expressed gratitude to the support of members. Prof. Thomas Stegmaier, President of the ISBE, Prof. Marc Weissburg and Prof. Chris D. Rudd, Vice-Presidents of the ISBE, all sent the video congratulations.

During the symposium, the ceremonies for excellent members as well as Beijing and Weihai Secretariats' establishment were held.

The celebration activities such as the Forums of Youth Commission and Enterprise Committee, the preparatory meeting of Education Working Committee, the seminar of Journal of Bionic Engineering, the online meetings of Da Vinci Index and the Executive Board of Directors were also held. Da Vinci China Index (2000-2019) and Bionics International Network (Phase II) were

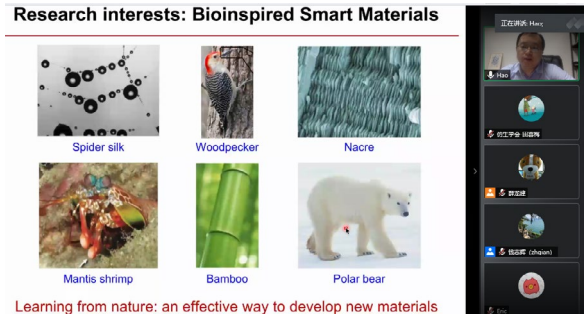
officially released. With the influence of Covid-19, the ISBE Specialist Short Courses 2020 lectured by Prof. Marc Weissburg from Georgia tech, US and the Second Academic Forum on "Frontiers in Bionic Engineering" presented by Prof. Li Wen from Beihang University were organized online.

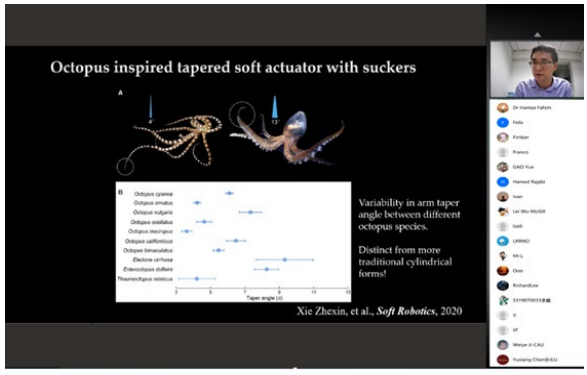
On the occasion of the 10th anniversary of the Society, congratulations from founding members, honorary members, and individual members around the world were received, which all expressed the best wishes and great expectations to the society.

This symposium is a grand academic event which get the attention and support from universities, scientific research institutes, government departments and enterprises. Its success not only expresses the current research achievements in bionic engineering but also provides a platform for delegates to communicate and cooperate with each other. This should give a major push towards the development of bionic engineering worldwide. The society will start a new chapter on healthy and rapid development as well.

Online Academic Forums on "Frontiers in Bionic Engineering"

Online academic forums on “Frontiers in Bionic Engineering” organized by the ISBE were held via VooV Meeting (outside China) and Tencent Meeting (within China) respectively on 27 August 2020 and 18 October, 2020.





Prof. Hao Bai from the State Key Laboratory of Chemical Engineering of Zhejiang University and Prof. Li Wen from the School of Mechanical Engineering and Automation, Beihang University were invited to share their team's latest research results and experience.

"Frontiers in Bionic Engineering" online academic forum is a series of academic exchange activities initiated by the Youth Commission of ISBE. The current second forum demonstrated the latest research highlights and progress of marine bio-inspired soft robotics. The activity gained attention and support of specialists, scholars and graduate students, and received enthusiastic reactions.

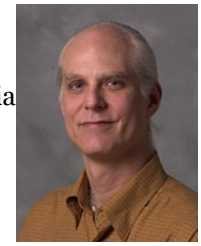
Workshop on transdisciplinarity between biology and engineering

Julian Vincent, Heriot-Watt University, UK

I have been working on an approach to generate bionic solutions to technical problems. The method is based on trade-offs, commonly used to describe or define a problem. In practise, a problem in engineering is described in terms of a trade-off and the biological literature searched for the same trade-off. When you see how biology resolves the trade-off, that resolution can be used to solve the engineering problem. The technique is closely allied to analogical thinking but is much more precise.

I have put together a “kit” for a workshop to test the idea. It formed the basis of several workshops I conducted after the ISBE conferences. The kit will be available to download from the ISBE website. It will contain a short slide presentation with tutor notes, a number of projects with reference biological papers to help the analysis, and a framework to help with the classification of the trade-offs. I hope that this will form the basis of a group of members of the ISBE who will assist in the development of the approach. Currently much of this can be done by computer, but the system is not completed and I want to try the ideas out.

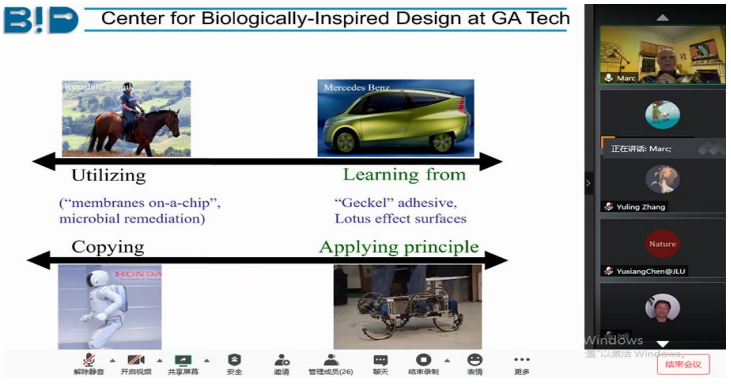
Specialist Short Courses 2020



ISBE Specialist Short Courses 2020 were successfully held online via tencent meeting/voov meeting on October 17-24 as one of the celebration activities of the 10th anniversary of the ISBE. The courses were presented by the vice-president of the ISBE, Prof. Marc Weissburg from Georgia Institute of Technology of USA. More than 30 graduates and undergraduates registered for the courses.

During the two sessions, Prof. Marc Weissburg had systematically introduced how to solve the engineering problem using biologically inspired-design (BID) method. The courses gave attendees a basic understanding of useful techniques and best practices to find biological solutions, the effective ways to evaluate the match between particular biological models and the problem being considered.

Prof. Marc Weissburg, the Co-Director of the Center for BID at Georgia Tech, has taught and practiced BID for 15 years. He has designed and assessed BID teaching methods, and worked with scientists, architects, and major companies to develop novel technologies to solve complex human challenges ranging from better fiber products to sustainable industrial systems organization.



Third International Bionic Innovation Competition (IBIC) to be held in 2022

The Third International Bionic Innovation Competition (IBIC) will be held in 2022. It will be organized every three years since 2019. ISBE is calling for the sponsorship to the competition now. Welcome to sponsor the IBIC 2022 and promote the development of the Bionic Engineering dicipline.

The competition is geared to engage more awareness and commitment in Bionics, to spread the spirit, idea and methodology of bionic research, and to inspire innovative science and technology for the human future.

19 members are granted the honorary title of Excellent Members, ISBE

On the occasion of the 10th anniversary of ISBE, in recognition of the individual members who have made contributions to ISBE and made academic achievements on bionic engineering, the honorary title of Excellent Member is set up to encourage members to extensively participate in the academic activities and further promote the development of the Society.

After the evaluation of the Executive Board of Directors, there are 19 members from 15 countries granted the honorary title of Excellent Members. The name list is as follows:

Iain Anderson
University of Auckland, New Zealand

Wilhelm Barthlott
University of Bonn, Germany

Bharat Bhushan
Ohio State University, USA

Marco Ceccarelli
University of Rome Tor Vergata, Italy

Benard Chirende
University of Mpumalanga, South Africa

Mihai Chirita
University of Medicine and Pharmacy, Romania

Ille C. Gebeshuber
Graz University of Technology, Austria

Michael R. King
Vanderbilt University, USA

Poramate Manoonpong
University of Southern Denmark, Denmark

Carlo Menon
Simon Fraser University, Canada

Ana Moita
University of Lisbon, Portugal

Hoon Cheol Park
Konkuk University, South Korea

Rashid Qaisrani
Department of Agriculture and Water Resources, Australia

Lei Ren
University of Manchester, UK

Vilas M. Salokhe
Kaziranga University, India

Thomas Speck
University of Freiburg, Germany

Chengwei Wu
Dalian University of Technology, China

Longjian Xue
Wuhan University, China

Qinghai Yang
Research Institute of Petroleum Exploration & Development (RIPED), China

Prof. Giuseppe Carbone was appointed as new Editor-in-Chief of Robotica Journal

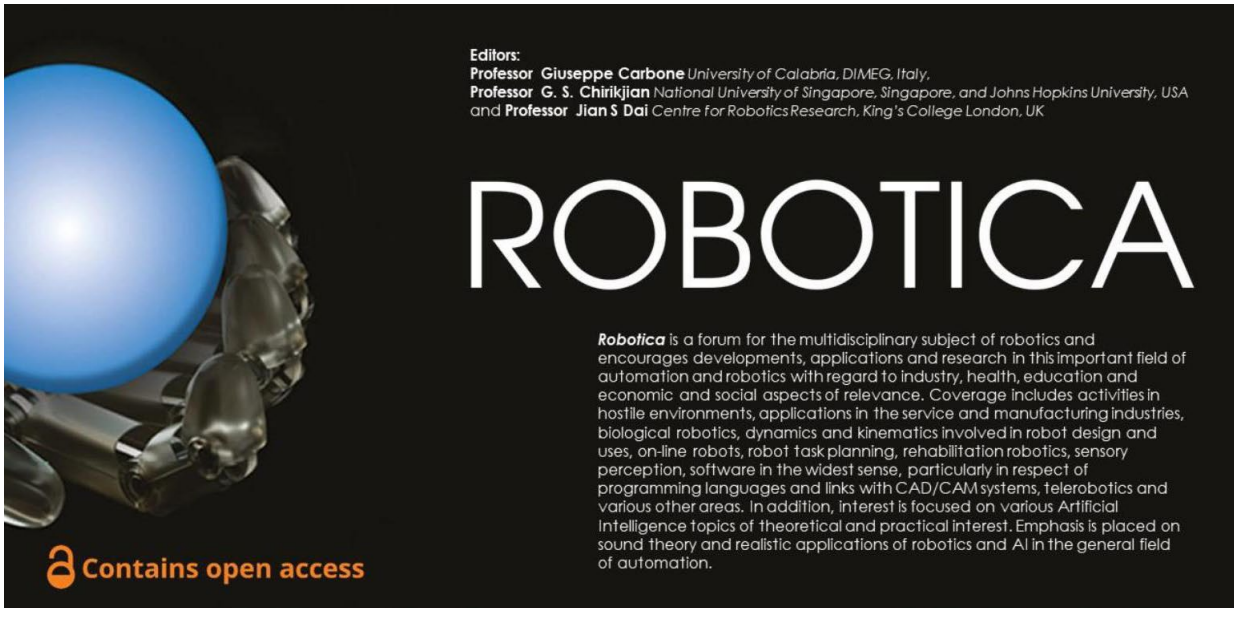
Prof. Giuseppe Carbone
Member of the Board of Directors, ISBE
Chair IFToMM TC Robotics and Mechatronics
DIMEG, University of Calabria, Italy
giuseppe.carbone@unical.it
https://www.researchgate.net/profile/Giuseppe_Carbone

Prof. Giuseppe Carbone, member of ISBE board of Directors was appointed as new Editor-in-Chief of Robotica Journal, which is widely recognized as one of the first journals covering multidisciplinary aspects of robotics internationally.

Robotica was established in 1983 by Cambridge University Press. Since then it has been listed in all main indexing frames, such as Scopus, and Web of Science. Amidst this period of unprecedented growth of the robotics field, Cambridge University Press has invited two co-editors to take a shared Editor-in-Chief role. The two new Editor-in-Chiefs are Prof. Jian S. Dai, of King' College London, UK, and Prof. Giuseppe Carbone, of the University of Calabria, Rende, Italy.

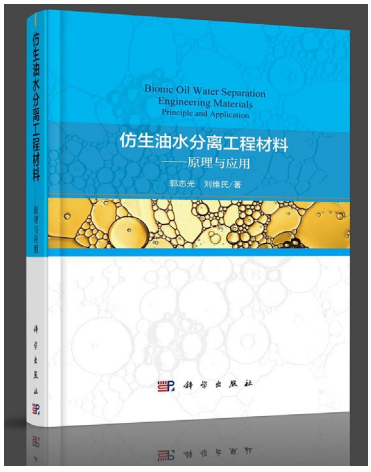
It is a great opportunity to increase the international visibility of ISBE community and, accordingly, invite all ISBE members and the related community to engage with Robotica Journal by contributing your valuable research and/or even by applying to join the editorial board.

Full news can be found at
https://www.linkedin.com/posts/activity-6734127457705697280-eEPk
https://www.cambridge.org/core/journals/robotica



New Book: Bionic Oil Water Separation Engineering Materials Principle and Application

Authors: Weimin Liu and Zhiguang Guo



Oil/water separation is an important pursuit because of increasing worldwide oil pollution. Based on the author's long-term scientific research, this book is a systematic presentation of the development of biomimetic oil/water separation engineering materials. There are 8 chapters in the book: an overview of the layered and emulsion separation system; the basic theory of solid wettability; the natural superwetting surface used for oil/water separation; filter-type oil/water separation by regulating the surface wetting; absorption-type oil/water separation by constructing block materials with special wettability; and responsive oil/water separation materialstoward a certain stimulus.Furthermore, numerous sophisticated nanostructures, lots of analysis methods, as well as novel characterization are comprehensively presented in this book. Finally, the author summarizes the biomimetic oil/water separation engineering materials, and proposes the development trend in the future.

Call for Newsletter Submissions

Have you new ideas or related subjects in the fields of Bionics, that you would like to see?

We'd like to include it in our upcoming newsletter.

Feel free to contact us and share your ideas.

Email: gyue@isbe-online.org

Tel/ Fax: +86-431-85166507

Address: C508 Dingxin Building, Jilin University, 2699 Qianjin Street, Changchun P. R. China

Case Study at ISBE Website

Call for Case Study Submissions

ISBE is calling for case study submissions now.
You can contact with Ximei Tian for the template of case study. Your kindness and consideration will be appreciated.
We look forward to receiving your submissions!
Email: xmtian@isbe-online.org
Tel: +86-431-85166507

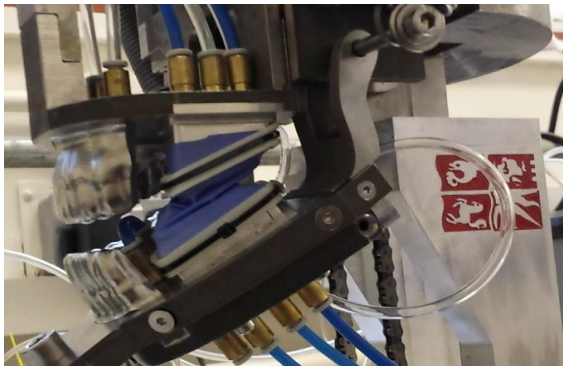
Robot Jaws shows Medicated Chewing Gum could be the Future

Kazem Alemzadeh, University of Bristol, UK

Medicated chewing gum has been recognised as a new advanced drug delivery method but currently there is no gold standard for testing drug release from chewing gum in vitro. New research has shown a chewing robot with built-in humanoid jaws could provide opportunities for pharmaceutical companies to develop medicated chewing gum.

The aim of the University of Bristol study, published in IEEE Transactions on Biomedical Engineering, was to confirm whether a humanoid chewing robot could assess medicated chewing gum. The robot is capable of closely replicating the human chewing motion in a closed environment. It features artificial saliva and allows the release of xylitol the gum to be measured.

The study wanted to compare the amount of xylitol remaining in the gum between the chewing robot and human participants. The research team also wanted to assess the amount of xylitol released from chewing the gum.

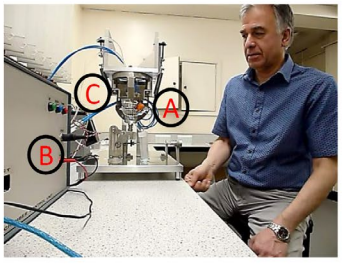


A close up of the humanoid chewing robot

The researchers found the chewing robot demonstrated a similar release rate of xylitol as human participants. The greatest release of xylitol occurred during the first five minutes of chewing and after 20 minutes of chewing only a low amount of xylitol remained in the gum bolus, irrespective of the chewing method used.

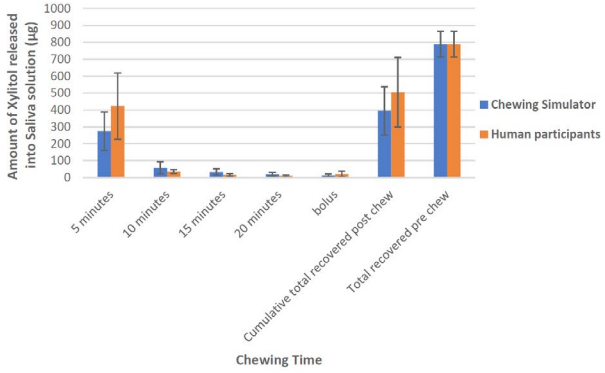
Learn more: https://www.bristol.ac.uk/news/2020/july/chewing-robot.html

This research was released at StudyFinds.org, IEEE.org, Healthline.com, WashDent.com, Dovepress.com, Bristol.ac.uk etc.



Humanoid chewing robot with artificial oral environment consisting of the custom-built simulator (A), the custom-built control box (B), and the temperature calibration bath (C).

Human participant chewing xylitol containing gum



Shape Memory Superhydrophobic Surface with Switchable Transition between "Lotus Effect" to "Rose Petal Effect"

Yanlong Shao, Jie Zhao*,Zhihui Zhang*, LuquanRen, Key Laboratory of Bionic Engineering, Ministry of Education, Jilin University, China

Prof. Zhihui Zhang *Prof. Jie Zhao*

Superhydrophobic surface with tunable wettability has attracted particular interests, due to its unique advantages in manipulating the status of water stay and roll-off. Compared with traditional strategies such as controlling the surface chemistry, intelligently regulating surface roughness is more challenge, even though it can bring more fascinating functions. Nowadays, considerable works have been devoted to superhydrophobic surface with controlled liquid adhesion properties, but most of them were dependent on different substrates with varied roughness. It still remains a great challenge to develop a surface integrated with transformable liquid adhesion.

Inspired by both rose petal and lotus leaves,Prof. Zhihui Zhang and Jie Zhao's groups at Jilin University recently reported a smart superhydrophobic surface that can reversibly convert between the Cassie-Baxter and the Cassie impregnating states, by adjusting surface micro/nanostructures, upon thermal-triggered shape memory effect. The results have been published on Chem. Eng. J (https://doi.org/10.1016/j.cej.2019.122989).

In this work, the original superhydrophobic surface with intact micro/nanostructure arrays,

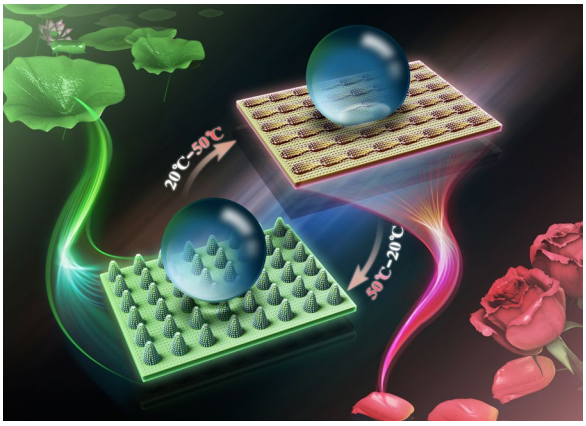


Fig.1 Schematic of the smart superhydrophobic surface

with significantly high contact angle (CA) ~154 ± 2° and low roll-off angle ~3 ± 1°, exhibits extraordinary low water adhesion, whereas the superhydrophobic surface with compressed microstructure demonstrates high water

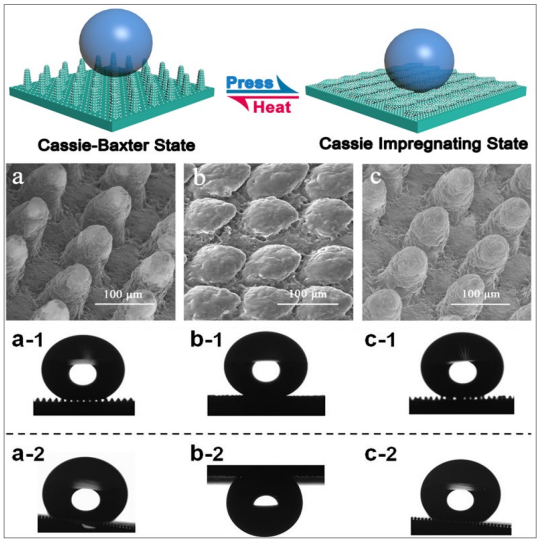


Fig.2 Changes in surface morphology during the compressing/recovering process and their related shape of water droplets on the surfaces: static water contact angles (a1, b1 and c1), roll-off angles (a2, b2 and c2).

CA(~150 ± 1°) but a much higher roll-off angle (~180°) (Fig.2). In response to the thermal-triggered shape memory effect, the surface switchable wettability transition between lotus leaf and rose petal effects can be easily realized by controlling their surface morphologies. The drop dynamical impact and the self-cleaning tests (Fig.3) confirmed the switchable superhydrophobic properties between water sticking and super-repellency. Benefiting from the reliable shape memory effect of the polymeric substrate, the structured SMP assay surface displays a multiply switchable super-wettability, revealing a great potential for rewritable liquid patterns, controlled droplet transportation.

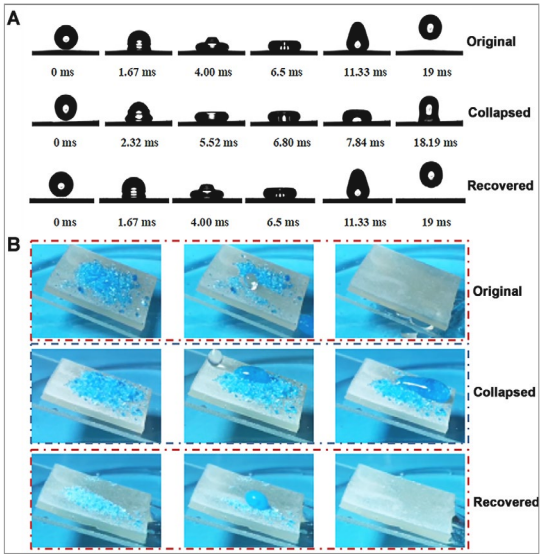


Fig.3 A) Drop dynamical impacting behaviours displayed by the selected snapshots of a droplet vertically impacting on horizontal surfaces. B) Self-cleaning process on the sample surfaces with a15° tilting angle.

Bionic unmanned information acquisition system - "NPU Pigeon" - achieved 48 minutes of endurance

Bifeng Song, Northwestern Polytechnical University, China

The "NPU Pigeon" unmanned aircraft system developed by the Institute of New Concept Aircraft Design of Northwestern Polytechnical University is a portable information acquisition system, which has successfully completed the performance tests of endurance. The "NPU Pigeon" in a fully-system state could perform autonomous flight according to the set route. It maintains real-time and continuous image transmission throughout the whole flight. The endurance of continuous autonomous flight reached 48 min 13 s, breaking the previous record of 32 min of continuous autonomous flight created by the same team. In addition, the "NPU Pigeon" aircraft system has also performed continuous automatic mission flight according to the scheduled route. The tested distance of mission flight is greater than 2 km. If the system is in standby mode and real-time continuous image transmission on the ground, it can keep working for more than 40 minutes.

Autonomous Online Adaptation of a Walking Robot under Bioinspired Adaptive Locomotion Control

Potiwat Ngamkajornwiwat[1,2], Jettanan Homchanthanakul[3], Pitiwut Teerakittikul1, Poramate Manoonpong[2,3,4,*]
1King Mongkut's University of Technology Thonburi, Thailand; 2Nanjing University of Aeronautics andAstronautics, Nanjing, China; 3Vidyasirimedhi Institute of Science and Technology(VISTEC), Thailand
4University of Southern Denmark, Odense, Denmark

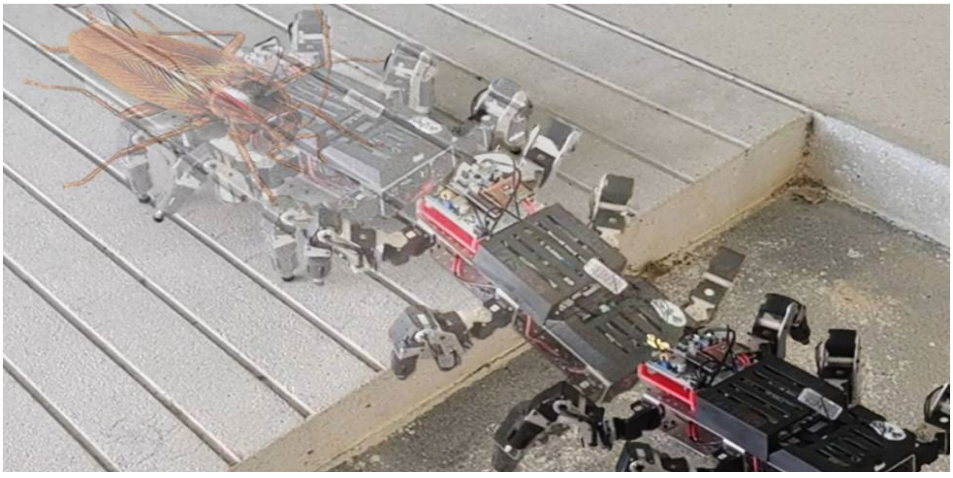


Figure 1: Autonomous online adaptation of an insect-like walking robot under bioinspired adaptive locomotion control. The robot can quickly change its gait to effectively climb down the high step.

Poramate Manoonpong

Recently, IEEE ACCESS published a paper entitled "Bioinspired Adaptive Locomotion Control System for Online Adaptation of a Walking Robot on Complex Terrains". This work, in collaboration between the Bio-inspired structure and surface engineering research group in China and the Biorobotics research groups in Thailand and Denmark, proposes autonomous onlineand self-adaptive locomotion control inspired by biological control systems. The control is derived from an integration of modular neural locomotion control (MNLC) and an artificial hormone mechanism (AHM). While the MNLC can generate various gaits through its neural modulatory input, the AHM, which replicates the endocrine system, adapts to unexpected environmental changes during walking on different complex terrains. The control approach is transferred to an insect-like hexapod robot with 18 degrees of freedom. Through real robot experiments, we successfully demonstrate real-time online adaptations of the robot in the real world on different unknown terrains (Figure 1). The control method does not require several learning trials to adapt its locomotion as usually done in classical machine learning. Instead, it can continuously adapt robot locomotion online within a few seconds, thereby providing better performance compared to other machine learning-based control techniques.

The detail content is referred to: Ngamkajornwiwat, P., Homchanthanakul, J., Teerakittikul, P., Manoonpong, P. (2020) Bioinspired Adaptive Locomotion Control System for Online Adaptation of a Walking Robot on Complex Terrains, IEEE Access, DOI: 10.1109/ACCESS.2020.2992794.

Bio-inspired Liquid Gating Membrane-based Catheter with Anti-coagulation and Positionally Drug Release Properties

Chunyan WANG, Shuli WANG, Hong PAN, Lingli MIN, Huili ZHENG, Huang ZHU, Gang LIU, Weizhong YANG*, Xinyu CHEN, and Xu HOU* , Xiamen University, China

Recently, Xu Hou's group has proposed a bio-inspired liquid gating membrane-based catheter with self-adaptive in tube size, anti-coagulation and positionally drug release properties on Science Advances [6(36), eabb4700].

Catheters are thin flexible tubes that can be inserted in the body, creating channels for the passage of fluids or the entry of surgical devices, and are extensively used in daily medical treatments. However, the existing catheter materials continue to encounter many problems, such as thrombosis, single functionality, and inadaptability to environmental changes. Inspired by blood vessels, which are adaptive in tube sizes and with special mass transfer pathways on vascular walls, a self-adaptive liquid gating membrane-based catheter with anti-coagulation and positionally drug release properties was designed. The multifunctional liquid gating membrane-based catheter significantly attenuate blood clot formation and can be used as a general catheter design strategy to offer various drugs positionally releasing applications to comprehensively enhance the safety, functionality and performance of medical catheters' materials.

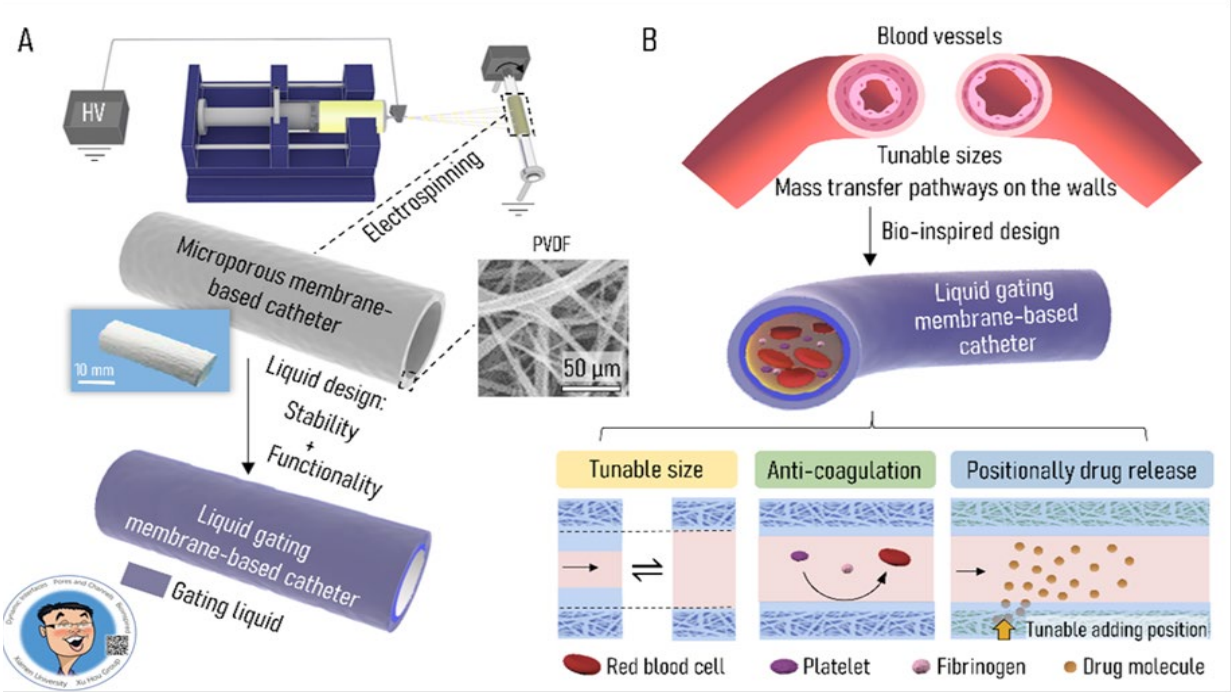


Fig. 1. Design and preparation of bio-inspired liquid gating membrane-based catheter

3D-Printed Facet Optics: Novel Adjustable Technical Optics Inspired by Compound Eyes

Ille C. Gebeshuber, Vienna University of Technology, Austria

Sometimes ideas need time to come to life. More than 10 years ago, in 2009, Dr. Manfred Drack, a theoretical biologist, shared with me the idea of new optics inspired by the compound eyes of animals, and built a prototype by hand. It consisted of two wooden frames holding metal grids and 900 metal tubes fitted with glass fibers.

The optical properties of this prototype were amazing: Principles like no focusing needed on objects and an always achievable maximum depth of focus were biomimetically transferred from the inspiring organisms. Also new technical features like an adjustable field of view per pixel and a new zooming feature were added.

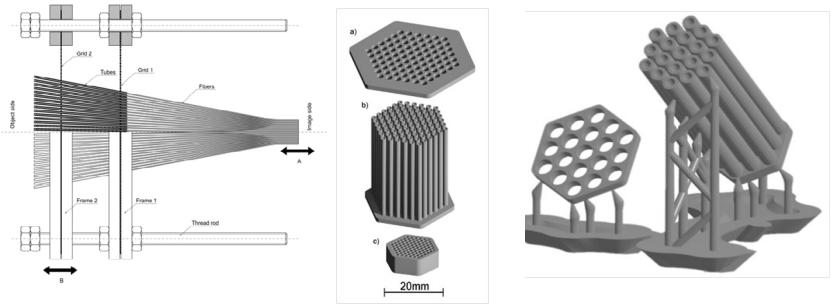
But the improvement of the first prototype was too difficult until my two smart young physics engineering students, Bernhard Ettinger and Xander Berger, suggested to use 3D prototying. Thanks to the support of Peter Purgathofer and Florian Holzner from the Human Computer Interaction Group of the Institute for Design and Assessment of Technology at the Technical University of Vienna a new model could be printed.

This new facet optics can be used as camera and microscope, on uneven surfaces and to construct novel computer screens with a camera integrated in the matrix.

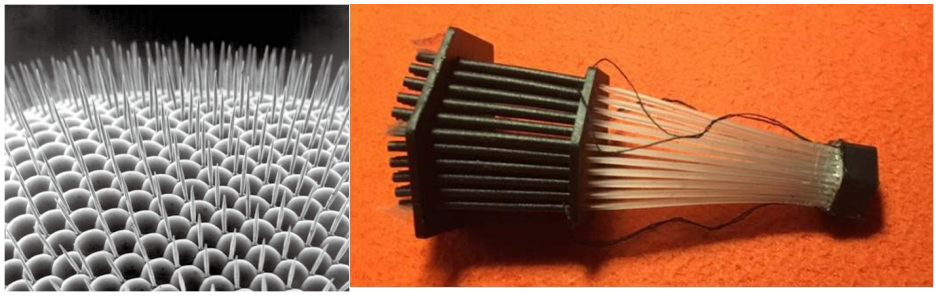
The article is open access and can be downloaded from https://www.frontiersin.org/articles/10.3389/fmats.2020.00199/full

Reference:

Drack M, Berger A, Ettinger B and Gebeshuber IC (2020) 3D-Printed Facet Optics: Novel Adjustable Technical Optics Inspired by Compound Eyes. Front. Mater. 7:199. doi: 10.3389/fmats.2020.00199



Left: Schematic of Prototype I, made from wood and metal. Middle and right: 3D-printed facet optics



Left: Compound eye (Source: Wikipedia). Right: 3D printed prototype

For this analysis, Web of Science (WOS) Database was taken as the source of publications. Data were tracked on Nov 23 2020, and the keywords tracked included biomimicry, biomimetic, biomimetics, biomimic, bio-inspired, bioinspired, bionic, nature-inspired, biologically inspired, bioinspiration, bio-inspiration, and biomimicking.

The Top 10 Highly Cited Papers in the Field of Biomimetics

1. Self-Assembled Graphene Hydrogel via a One-Step Hydrothermal Process

ACS NANO, 2010
Corresponding: Shi, Gaoquan, Tsinghua University, China.
Areas: Chemistry; Science & Technology - Other Topics; Materials Science
Cited: 2375

2. Functional Supramolecular Polymers

SCIENCE, 2012
Corresponding: Stupp, S. I., Northwestern University, USA
Areas: Science & Technology - Other Topics
Cited: 2017

3. Applications of metal-organic frameworks in heterogeneous supramolecular catalysis

CHEMICAL SOCIETY REVIEWS, 2014
Corresponding: Zhang, Li, Sun Yat Sen University, China
Areas: Chemistry
Cited: 1842

4. Organic Photoredox Catalysis

CHEMICAL REVIEWS, 2016
Corresponding: Nicewicz, David A., University of North Carolina at Chapel Hill, USA
Areas: Chemistry
Cited: 1766

5. Bioinspired self-repairing slippery surfaces with pressure-stable omniphobicity

NATURE, 2011
Corresponding: Aizenberg, Joanna, Harvard University, USA
Areas: Science & Technology - Other Topics
Cited: 1702

6. Reconstituting Organ-Level Lung Functions on a Chip

SCIENCE, 2010
Corresponding: Ingber, Donald E., Harvard University, USA
Areas: Science & Technology - Other Topics
Cited: 1697

7. The Whale Optimization Algorithm

ADVANCES IN ENGINEERING SOFTWARE, 2016
Corresponding: Mirjalili, Seyedali, Griffith University, Australia
Areas: Computer Science; Engineering
Cited: 1624

8. Design, fabrication and control of soft robots

NATURE, 2015
Corresponding: Rus, Daniela, MIT, USA
Areas: Science & Technology - Other Topics
Cited: 1593

9. Bioinspired structural materials

NATURE MATERIALS, 2015
Corresponding: Wegst, Ulrike G. K., Dartmouth College, USA
Areas: Chemistry; Materials Science; Physics
Cited: 1564

10. Teaching-learning-based optimization: A novel method for constrained mechanical design optimization problems

COMPUTER-AIDED DESIGN, 2011
Corresponding: Rao, R. V., Sardar Vallabhbhai National Institute of Technology, India
Areas: Computer Science
Cited: 1445

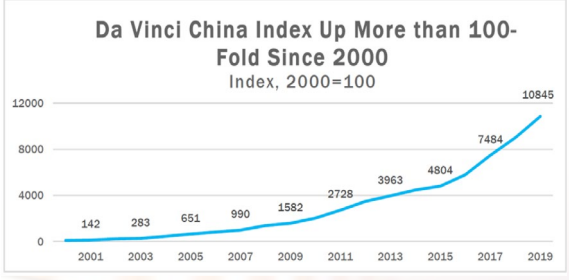
(By ISBE Secretariat)

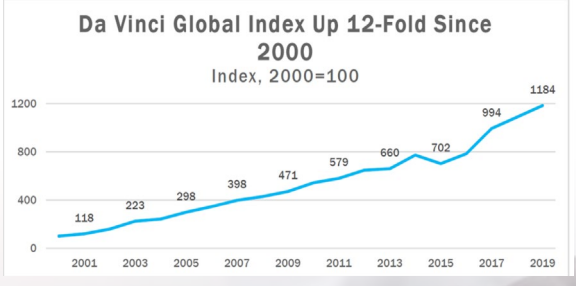
Da Vinci China Index ™ 2000-2019 Report

Key Laboratory of Bionic Engineering, Jilin University, China
Fermanian Business & Economic Institute, Point Loma Nazarene University, USA

The Da Vinci China Index™ climbed to another all-time high in 2019, jumping more than 20% on top of an identical gain in the prior year. The Index documents China's impressive growth in the field of Bionics over the past two decades. The Index has expanded from 100 in 2000 to 10,845 in 2019, representing more than a 100-fold increase. In contrast, while Bioinspiration has grown internationally, the Da Vinci Global Index™ has posted a much more modest 12-fold expansion.

For more: https://isbe-online.org/?ui=english&mod=info&act=view&id=4119





ICCAR 2021 Call for Papers

2021 The 7th International Conference on Control, Automation and Robotics (ICCAR 2021) will take place at Singapore during April 23-26, 2021. On the theoretical side, this conference features papers focusing on intelligent systems engineering, distributed intelligence systems, multi-level systems, intelligent control, multi-robot systems, cooperation and coordination of unmanned vehicle systems, etc. On the application side, it emphasizes autonomous systems, industrial robotic systems, multi-robot systems, aerial vehicles, underwater robots and sensor-based control.

For the first time ever, ICCAR affords the delegates unparalleled opportunities to interact and network with qualified professionals from throughout the world. We are looking forward to welcoming you at the garden City-Singapore.

ICCAR wishes to encourage academic excellence for young people in this field. Therefore, the organizing committee initiated several awards to raise the importance of academic achievement in our future professionals. Know more about the prize.

More information: http://iccar.org/index.html (Provided by ISBE Secretariat)

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Prof. Robert Riener, ETH Zurich, Switzerland (Cybathlon)
Prof. Giuseppe Carbone, University of Calabria, Italy (Robotics)

mesrob2021.org

(Provided by Giuseppe Carbone, Italy)

About The Conference

Theme: Applications of Prominent Trends in the Field of Biomaterials

Welcome all renowned personalities to Biomaterials-2021 !!!

PAGES extends our immense pleasure and honor to invite all researchers, scholars, medical professionals and students to attend **Global Conference on Biomaterials** scheduled on **June 24-26, 2021** in **Frankfurt, Germany**. The main objective of conference is focusing on the recent advances in biomaterials research and development progressing across the globe and highlight the significant research work accomplished in the areas of biomaterials science and engineering.

The highlights of the conference include keynote forum by prominent scientists, together with informative and inspiring talks from eminent researchers in this field. Video and poster presentations, exhibitions, workshops and post-conference social events all tend to be fruitful contributions to find new research strategies and make new and lasting connections with professionals from industry and academic backgrounds.

Biomaterials-2021 provides a unique platform for world-wide researchers to express their diverse ideas and inspire more cooperation. We hope this conference will witness invaluable scientific discussions and parallel sections that will contribute to future innovations in biomaterials science and engineering.

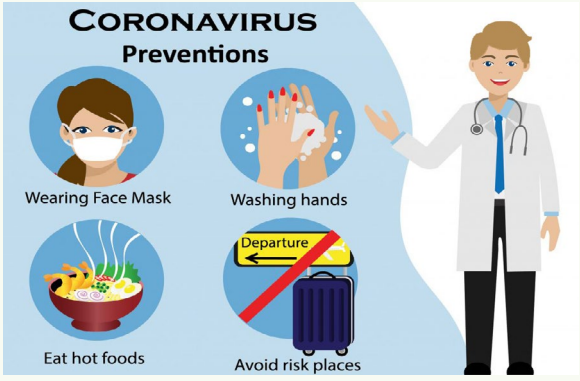
For more: https://www.pagesconferences.com/biomaterials-conference/

(Provided by ISBE Secretariat)

Health Reminder

Since the COVID-19 outbreak, ISBE would like to kindly remind all the members to follow these steps help to prevent the spread of the virus:

- Practice social distancing
- Wear face mask
- Wash your hands often
- Eat hot food
- Avoid risk places



We are confident this challenging period will pass, everything will be better than ever. Wish everyone a good health!

Newsletter

ISBE Newsletter

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ISBE NEWSLETTER

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