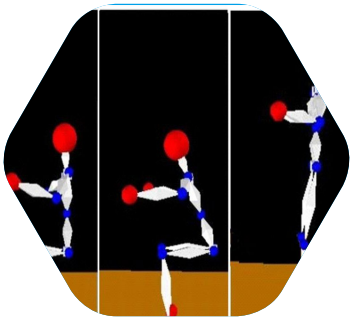
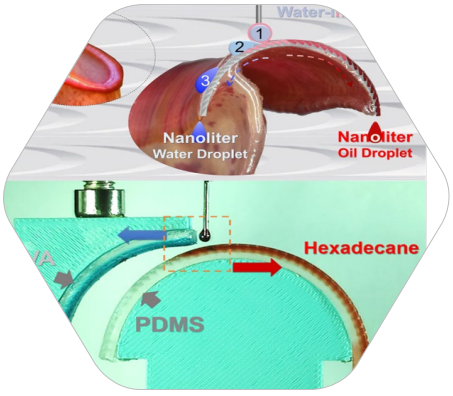
Newsletter

International Society of Bionic Engineering

Volume 7, Issue 1, 2018





Contents

Poramate Manoonpong

Vice-Chairman of the Youth Commission of the ISBE

Dr. Poramate Manoonpong received his Ph.D. in electrical engineering and computer science from the University of Siegen, Germany, in 2006. He currently holds several positions including an Associate Professor of Embodied AI & Robotics at the University of Southern Denmark (SDU), and a Professor of School of Information Science & Technology at Vidyasirimedhi Institute of Science & Technology (VISTEC), Thailand. In 2017, he was elected in Young 1000 Talents and recently appointed as a Professor of Neuro-Robotic Technology at Nanjing University of Aeronautics and Astronautics (NUAA) where he will establish his research group to work on the NEUTRON: “NEUrorobotic Technology for advanced Robot mOtorcoNtrol” project funded by the Young 1000 Talents Program of China. As author or coauthor, he has published over 100 publications in major scientific journals such as Nature Physics, IEEE Trans. Cybern., PLoSComput. Biol., and Sci. Rep. He has been PI or co-PI of 13 funded projects.

His central research agenda is "to understand how brain-like mechanisms and biomechanics can be realized in artificial agents (like biologically-inspired robots) so they can become more like living creatures in their level of performance". To achieve this, he combines embodied AI, bio-inspired robotics, and neurorobotics aspects for his investigation and development.

Major contributions of Dr. Manoonpong and his team include the development of generic modular neural control, memory, and learning mechanisms for complex walking robots (Fig. 1). These neural mechanisms combine five important aspects: 1) neuromechanical control (neural control with an adaptive muscle model), 2) adaptive forward models (efferent copy), 3) short-term memory, 4) multiple time scales of synaptic plasticity (long-term memory), and 5) predictive (anticipatory) control. The neural mechanisms can generate biologically-inspired complex behaviors, like adaptive natural movements, efficient locomotion over difficult terrains, leg damage compensation, proactive behaviors, memory-guided behaviors, and goal-directed navigation learning. This novel neural development provides flexible, transferable solutions to other systems (e.g., a drone, a snake-like robot, a wheeled robot, or an orthosis system) and gives a better understanding of the general control, memory, plasticity, and predictive principles in embodied neural sensori-motor function for complex behavior generation.

Besides the development of neural

mechanisms, he and his colleagues proposed a novel approach that exploits the interaction between a passive anisotropic scale-like material (e.g., shark skin) and rough surfaces to enhance locomotion efficiency of a robot walking on inclines (Fig. 2). This technique opens up a new way of achieving energy-efficient robot locomotion.

His research interests include embodied artificial intelligence, machine learning for robotics, bio-inspired robotics, biomechanics, neural locomotion control, neurodynamics, learning/plasticity, embodied cognitive robotics, lower-limb active orthosis and exoskeleton control, brain-machine interface, human-machine interaction, and service/inspection robotics. More details of his research can be found at http://manoonpong.com

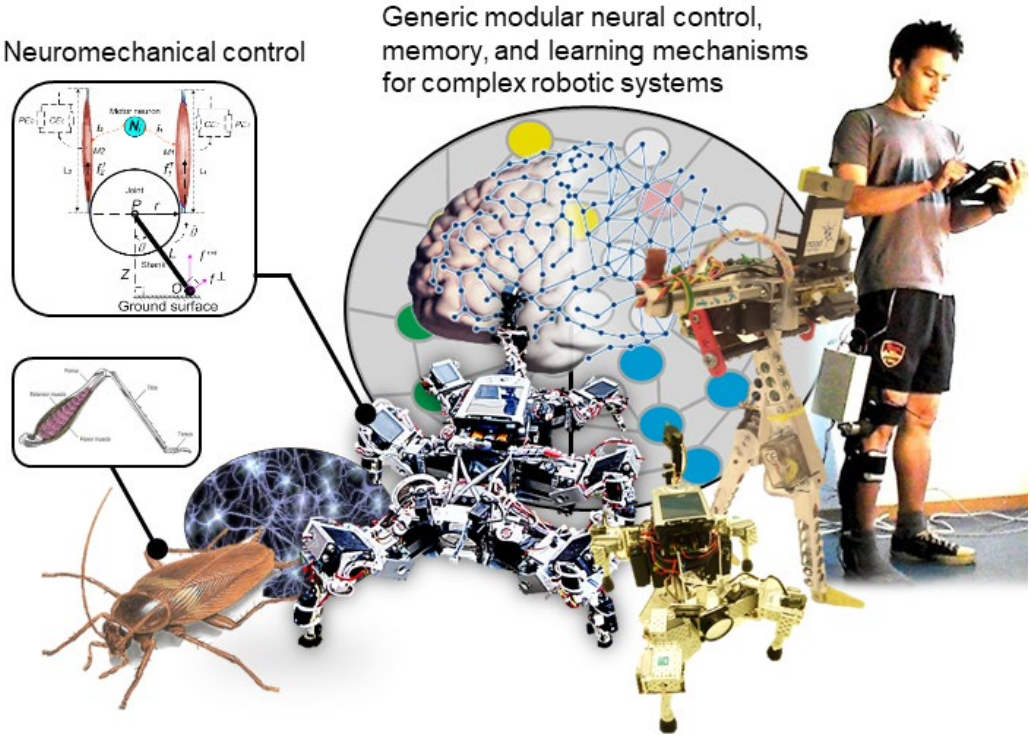


Fig. 1: The development of generic modular neural control, memory, and learning mechanisms for complex robotic systems. The neural mechanisms are based on the functions of biological neural systems.

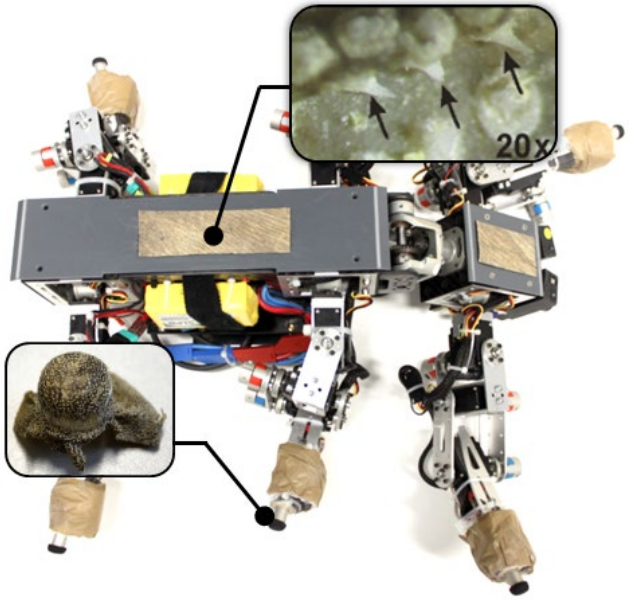


Fig. 2: The exploitation of frictional anisotropy from a scale-like material (e.g., shark skin) for energy-efficient robot locomotion. The material can be attached to the belly of the robot or formed as robot shoes.

Jianjun WANG

Institute of Chemistry, Chinese Academic of Sciences (ICCAS)

Prof. Dr. Jianjun WANG obtained his Ph.D degree at the University of Mainz (Germany) in 2006. In May 2007, he became a project leader at Max-Planck Institute for Polymer Research after seven months of postdoctoral research at the same Institute. Since 2010, he has been a professor at the Institute of Chemistry, Chinese Academic of Sciences (ICCAS). And he has also been a professor at the University of Chinese Academy of Sciences (UCAS) since 2015. Dr. Wang's current research interest focuses on the molecular level understanding and controlling of ice formation.

Ice formation is ubiquitous and is essential for practical applications in food, pharmaceutical, and chemical industries. However our understanding of ice formation remains unsatisfactory. In the last few years, Dr. Wang first revealed the Janus effect of antifreeze proteins (AFPs) on ice nucleation, and proposed that the property of interfacial water is critical for controlling ice formation as shown in the Figure below. Inspired by AFPs, Dr. Wang constructed some model materials for regulating ice nucleation and growth and shape of ice crystals, by which he enhanced the molecular mechanism of ice formation in collaboration with theoreticians. Meanwhile, he employed the materials invented in his laboratory for the cryopreservation of cells and tissues. Also Dr. Wang first utilized recrystallized ice crystals as templates for the preparation of porous material. As the process of ice recrystallization is kinetically stable, the size of the pores these materials can be adjusted. Furthermore, he constructed interface materials with ultra-low ice adhesion so that ice can be shed by action of wind or gravity.

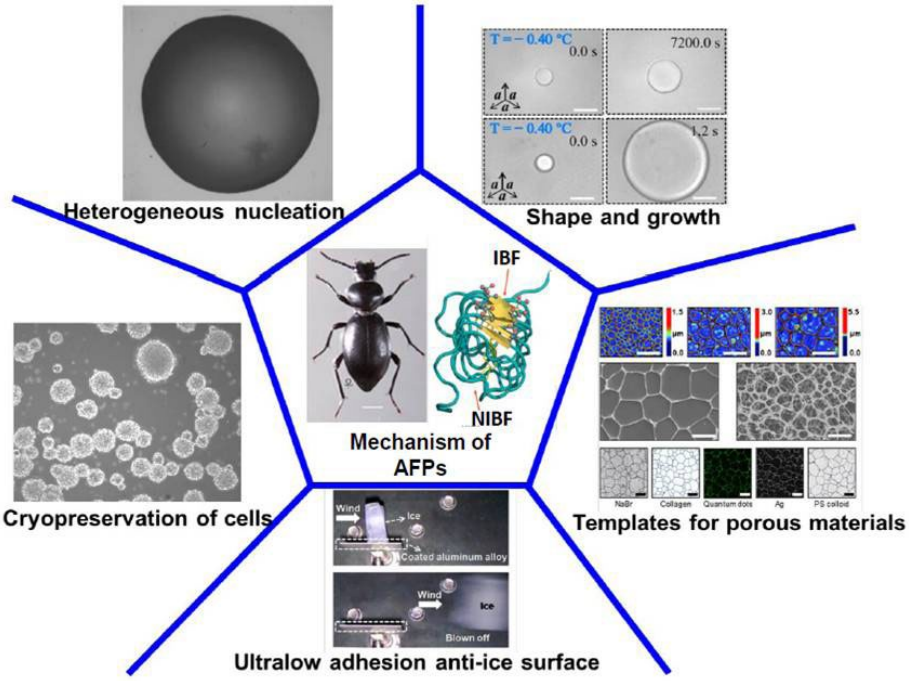


Figure overview of research in Prof. Jianjun Wang's group

ISBE Group visits Point Loma Nazarene Univresity, USA

On December 13-16,2017 the delegation consisting of 3 persons led by Professor Jianqiao LI, the General Secretary of ISBE paid a visit to Fermanian Business & Economic institute, Point Loma Nazarene Univresity, USA (FBEI).

In Fermanian Business & Economic institute, Prof. Daniel Bothe, Dean, Fermanian School of Business, Prof. Lynn Reaser, Chief Economist of FBEI, and other delegates from biology college and Office of Global Studies attended the meeting. The two sides made an in-depth exchange of views on the cooperation of Da Vinci Index.

The two sides discussed the possibilities, approaches and fields of future cooperation on Da Vinci Index. Prof. Lynn Reaser and Prof. Jianqiao LI signed the agreement on behalf of both groups, and made a basic plan for the future work.

The Da Vinci Index 2.0 is the updated version of the original Da Vinci Index, which was created by the Fermanian Business & Economic Institute and launched in 2011. This comprehensive database uses advanced methodology and information to measure activity in the field of bioinspiration in the U.S., monitoring four areas of data: number of scholarly articles, number of patents, number of grants, and dollar value of grants.

University of Nottingham celebrated in New Year Honours

Professor Chris Rudd, Country representative of ISBE, Pro-Vice Chancellor and Provost and CEO, University of Nottingham Ningbo Campus (UNNC) has been recognised by the Queen in the New Year Honours.

Professor Rudd has been appointed an Officer of the Order of the British Empire (OBE) for his services to Higher Education and Sino-British Cooperation.

Professor Rudd has developed an international reputation as a material scientist and has led UNNC as Provost since 2015.

Alongside his academic success in developing patented lightweight structures and synthetic bone replacements he has played an integral role in furthering both Nottingham and the UK's relationship with China.

Outside his leadership role, he has devoted significant time to fundraising both in the UK—where he has been a notable member of a team raising over £2m through cycling challenges for charitable causes and in China – where he has led fundraising initiatives for a new library at UNNC, an innovation fellowship and a scheme to recruit international scholars to the university.

On learning of his award Professor Rudd said "The Nottingham-China bridge relies on the efforts of many committed individuals on both sides. I feel proud and rather humble to accept this honour on behalf of a highly committed and extraordinarily hard-working transnational team."

Ille C. Gebeshuber - Austrian of the Year 2017

Our board of directors member Prof. Ille C. Gebeshuber, head of TU BIONIK, the Centre of Excellence in Biomimetics at the Vienna University of Technology, Austria, was elected Austrian of the Year in the category research. This is a great boost for bionic engineering in Austria. ISBE congratulates!

Ille C. Gebeshuber with her Austria'17 award.

Austrian of the Year 2017 Ille C. Gebeshuber with the CEOs of the Austrian Research Promotion Agency FFG, Henrietta Egerth und Klaus Pseiner.

The 2nd International Symposium on Bionic Science and Technology for the Belt and Road


The 2nd International Symposium on Bionic Science and Technology for the Belt and Road, sponsored by the Ministry of Industry and Information Technology of China was held in Nanjing, China on December 13-17, 2017. The symposium was organized by Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing Lishui District Government, and International Society of Bionic Engineering (ISBE). The Chairman was Prof. Zhendong Dai.

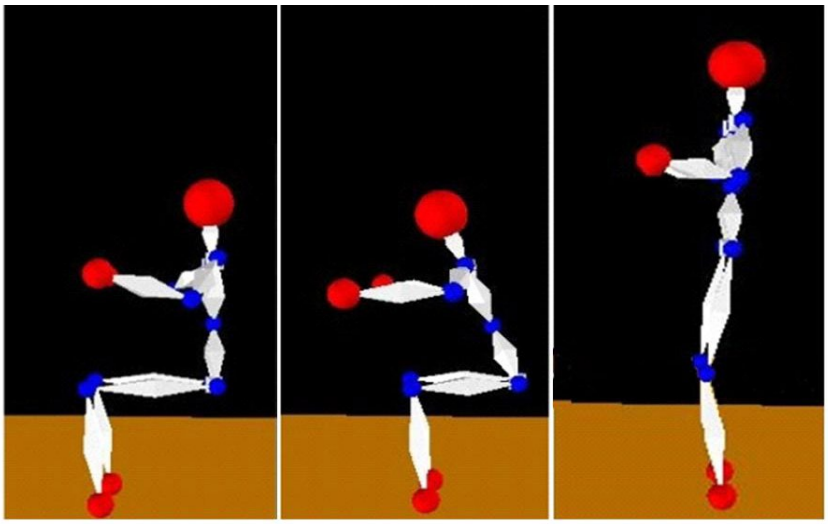
More than 80 representatives from nine countries and regions including Thailand, Singapore, Philippines, Denmark, Israel, Malaysia, India, Australia and China attended the symposium. They showed their latest scientific and technical achievements on biomimetics and exchanged points of view in related fields. The symposium provided a world-class platform for sharing scientific and technical communication, plus a unique opportunity for networking amongst scholars and professionals in the field of biomimetics.

During the symposium, national and regional scientists along the Belt and Road discussed and brainstormed how they can best contribute to the needs of the biomimetics development, what mechanisms and modes of cooperation shall adopt, what the priority areas of cooperation will be, and how to best align the cooperation opportunities for mutual benefits and interest. They agreed to establish a long-term effective Belt and Road cooperation mechanism that aims to set up an international collaboration network to promote mutual benefit and common development relationship for bionic research and technology transfer.

The great success of the symposium not only promoted the academic exchange among scientists in the field of biomimics, but also facilitated bridge and organize cooperative research and innovation, strategic advice, and capacity building in bionic technology for common benefit.

Functional Design for Customizing Sit-To-Stand Assisting Devices

Pierluigi Rea, Erika Ottaviano* University of Cassino and Southern Lazio, Italy



Standing up refers to the transition from the seating to the standing postures to perform a movement that involves several body segments and requires both voluntary action and equilibrium control during an important displacement of the body Centre of Gravity (COG). This task can be considered very important for people with reduced mobility to achieve minimal independence in Activity of Daily Living (ADL). In this paper, we propose solutions for the homecare of persons with reduced mobility, describing a functional design to customize assisting devices for the Sit-to-Stand (STS). In particular, the support mechanism that generates the requested motion and sustains the body of a person can be synthesized ad-hoc according to the experimental data of the subject. Experimental tests carried out during Sit-To-Stand are used to track and record point trajectories and the orientation of the trunk of an individual, and they are used to design a 1-DOF mechanism able to reproduce the assigned rigid-body motion. A four-bar linkage has been synthesized according to the desired features. Simulation results are reported to illustrate the engineering soundness of the proposed mechatronic solution.

The paper was published in the Journal of Bionic Engineering in January 2018. For more information please visit http://jbe.jlu.edu.cn.

Send an email to ISBE Secretariat

ISBE Secretariat is always calling for news and ideas among our members, if there is any information you would like to include in a future edition of newsletter, please feel free to contact us.

Email: gyue@isbe-online.org

Tel/ Fax: +86-431-85166507

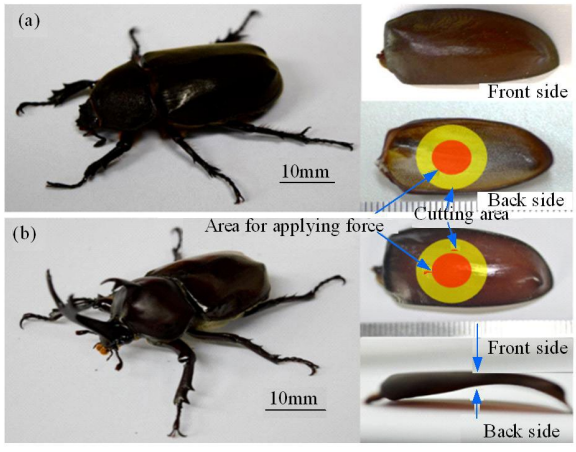
Address: C508 Dingxin Building, Jilin University, 2699 Qianjin Street, Changchun P. R. China

Investigation of Punch Resistance of the *Allomyrina dichotoma* Beetle Forewing

Ngoc San Ha1,2, Vinh Tung Le1, Nam Seo Goo1*
1. Konkuk University, Republic of Korea 2. Swinburne University of Technology, Australia

The punch resistance of the beetle forewing was investigated to address the ability of the forewing against the external force. The punch resistance of the forewing was measured for different sizes and sexes of beetles using a conventional testing method in conjunction with the Digital Image Correlation (DIC) technique. The results showed that the maximum fracture load was measured around 23 N for the female beetle and around 20.2 N for the male beetle in the front-side punch test. Moreover, the fracture load in the front-side punch test was higher than that in the back-side punch test for both male and female beetles. This means that the beetle forewing plays a protection role against external loads. Furthermore, the puncture energy in the front-side punch test for the female beetle (6.91 mJ) was a little higher than that for the male beetle (5.27 mJ). In addition, the DIC results revealed that the first crack occurred along the trachea line and the second crack then appeared in the direction that was perpendicular to the direction of the first crack. This study provides a comprehensive understanding of the mechanical protection properties of the beetle forewing and offers a good lesson for studying lightweight bio-inspired composite material.

The paper was published in the Journal of Bionic Engineering in January 2018. For more information please visit http://jbe.jlu.edu.cn.

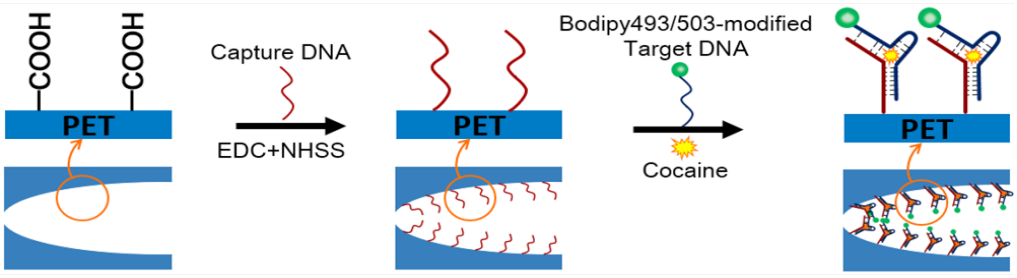


Single Nanochannel-Aptamer-Based Biosensor for Ultrasensitive and Selective Cocaine Detection

Jian Wang, Chengdu University of Technology &Technical Institute of Physics and Chemistry, Chinese Academy of Sciences

Highly sensitive and selective detection of illicit drugs such as cocaine is very important for many areas in the fight against drug trafficking. Recently, Prof. Lei Jiang's team in Technical Institute of Physics and Chemistry, Chinese Academy of Sciences, reported a high-sensitive cocaine sensor based on a single nano channel coupled with a DNA aptamer, and this paper was published in ACS Applied Materials & Interfaces in January 2018.

The single nanochannel-aptamer-based biosensor recognizes cocaine molecules with good selectivity and excellent sensitivity. A linear relationship between target cocaine concentration and output ionic current is obtained in a wide concentration range from 1 nM to 10 μM of cocaine,with the limit of detection down to 1 nM. The sensitivity of our new nanochannel-aptam-



er-based cocaine sensor is better than the other reported cocaine sensors. Based on the high sensitivity, inherent simplicity, and real-time monitoring derived from the designed strategy in this work, the nanochannel-aptamer-based biosensors have practical applications in future drug detections and clinical diagnostics. This study provides a new avenue to develop new nanochannel-aptamer-based biosensors for rapid and ultratrace detection of a variety of illicit drugs.

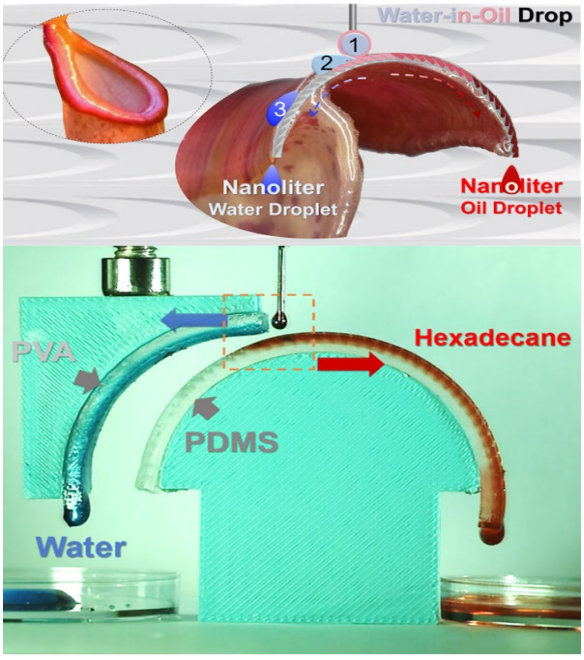
Paper: http://pubs.acs.org/doi/pdf/10.1021/acsami.7b16539

Oil/water separation device inspired by the pitcher plant

Zhichao DONG, Technical Institute of Physics and Chemistry CAS, China

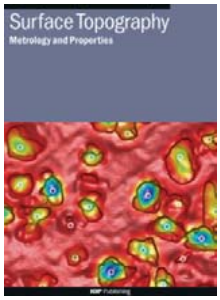
Recently, Dr. Zhichao DONG and colleagues in the Technical Institute of Physics and Chemistry, CAS, Beijing, develop a "go in opposite ways" separation device, which mimics the curved peristome of the "pitcher" of *Nepenthes alata*. This paper has been selected as very important paper in Angewandte Chemie International Edition.

Peristome surface have particularly structured morphologies, which cause water condensing on the surface to spread in a single direction, forming a slippery surface. The plant exploits this as ants lose footing and fall into pitchers for nutrition. This suggests DONG's team an approach to separate oil-water mixtures in a spontaneous way. In the research, peristome mimetic structures at different scales are prepared through 3D printings. Polydimethylsiloxane or polyvinyl alcohol replica adjusts selective liquid transportations on the substrate. Placing these two surfaces facing close



to each other and adding water-in-oil micro-droplets, the water from the droplets moves in one direction along one surface, while the oil passes in the other direction on the facing surface. Using this prototype, it is easy to adjust printing dimensions to construct delicate devices for bioassays and laboratory work, or to fabricate a larger apparatus used for bulk separations in environmental cleanup. (DOI: 10.1002/anie.201706665)

Surface Topography
Metrology and Properties



- New multi-disciplinary surface engineering journal
- Published quarterly
- Fast, rigorous and fair Peer Review
- Scope: metrology, tribology and wear, adhesion, applications in engineering, additive manufacture and bioengineering
- Indexed in Web of Science: first Impact Factor due June 2018
- Indexed in Scopus

Find out more at **iopscience.org/stmp**

Special Issue: Smart Surfaces and Switchable Functionalization

Guest Editors: Hisham A Abdel-Aal[1] & Mohamed El Mansori[2]

[1]Drexel University Mechanical Engineering and Mechanics
[2]Laboratoire de Mécanqiue, Surfaces, Matériaux et Procédés (MSMP-EA7350), Arts et Métiers ParisTech (ENSAM)

Scope So-called tuneable or switchable response smart surfaces are surfaces capable of tuning the level of their response based on a combination of surface geometry and material design. Tuning enables control of the functional pathway of the surface. Examples include self-healing surfaces, smart tribological surfaces, tuneable and switchable superhydrophobic/hydrophilic and oleophobic/oleophilic surfaces, stimuli responsive surfaces, and surfaces for thermal management and boiling control. This special issue aims to address the design, performance, modelling and characterization of smart and switchable surfaces. Comparisons between design methodologies and papers that address the standardization of the surfaces and propose a vision toward large-scale implementation are especially welcome.

How to submit

Go to https://mc04.manuscriptcentral.com/stmp-iop and select 'Special Issue Article' as the article type, then 'Smart Surfaces and Switchable Functionalization' from the list of special issues.

Submission deadline: 2 November 2018. Accepted papers will be published immediately.

Contact: Dr Ian Forbes Publisher, *Surface Topography: Metrology and Properties*
ian.forbes@iop.org

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2018 International Workshop on Bionic Engineering (IWBE2018)

June 13-15, 2018 Tel Aviv, Israel

Organizers: International Society of Bionic Engineering
Technion-Israel Institute of Technology
Israel Biomimicry Organization

This conference aims to provide an international forum for scientists, engineers and entrepreneurs around the world who are working in the field of bionic engineering and biomimetic design and also for dissemination of information and knowledge exchange in biomimetics and bionic engineering. A broad range of topics and application areas will be devised to reflect the interdisciplinary nature of this conference, and the unique interface of academy and industry.

Authors are invited to submit abstracts covering, but not limited to, the following areas:

Biomimetic surfaces; Biomimetic materials; Machinery biomimetics; Bionic fluid; Sensors and signal processing; Robotics, motion systems and artificial intelligence; Energy systems; Sustainable biomimetic innovations; Biomimetic design methodologies; Industrial applications in biomimetics: products and technologies

Submission email: Yael@biomimicry.org.il

Important Dates:

~~Abstract submission: 1 Feb 2018~~

~~Notification of accepted abstracts: 15 Feb 2018~~

~~Full paper submission: 15 Mar 2018~~

Notification of accepted full papers: 15 Apr 2018

Early bird Registration deadline: 20 Apr 2018

Contact: Yael@biomimicry.org.il

More information, Please visit: http://www.isbe-online.org/?ui=english&mod=info&act=view&id=2618

Asia-Pacific ISTVS Conference 2018

Organized by: INTERNATIONAL SOCIETY FOR TERRAIN-VEHICLE SYSTEMS (ISTVS)

ISBE will organize a Bionics Session at ISTVS 10th Asia-Pacific Regional Conference

July 11-13, 2018, Kyoto, Japan

Conference Theme: "Knowing Tradition & Promoting Innovation"

Conference Sessions:

Terramechanics, terrain/soil-wheel/tire/track interaction, modeling and characterization
Advances in mobility, energy transfer, efficiency, ground vehicle dynamics, safety
Land locomotion, off-road vehicles, operation snow and ice
Agricultural, forestry, construction and mining equipment and vehicles
Mobile robotics for ground applications, planetary and exploration, other environments
Innovative system designs for terrain and road-vehicle applications
Application of bionics engineering to terramechanics

Conference Calendar:

Day 0 (Tue, July 10, 2018)	BOD Meeting, Registration, Ice Breaker Party
Day 1 (Wed, July 11, 2018)	Opening Ceremony, Keynote Speech, Oral Session, Banquet
Day 2 (Thu, July 12, 2018)	Technical Visit & Sightseeing
Day 3 (Fri, July 13, 2018)	Oral Session/Poster Session, Closing Ceremony

Submission Schedule:

~~Abstract Due~~	~~January 11, 2018~~
~~Full Paper Due~~	~~March 1, 2018~~
Report of Review Result	April 11, 2018
Final Conference Paper Due	May 11, 2018

For more information please visit the conference website at https://www.apistvs2018.org/

Organized by: American Society of Agricultural and Biological Engineers (ASABE)

ISBE will organize a Bionics Session at ASABE 2018 Annual International Meeting.

ASABE 2018 presents a forum to expand awareness of current industry trends, promote and acknowledge innovations in design and technology, and provide opportunities for professional development – all with a focus on the economic, political and societal impacts facing the industry. Join us for 4 days this summer in Detroit!

ASABE is seeking abstracts for the following technical communities:

Applied Science & Engineering
Energy Systems
Ergonomics, Safety & Health
Education, Outreach & Professional Development
Information Technology, Sensors & Control Systems
Machinery Systems-Bionics Engineering for Agricultural Automated Systems
Natural Resources & Environmental Systems
Plant, Animal, and Facility Systems
Processing Systems

DETROIT - With an energy and vitality that are hard to resist, Detroit is America's great comeback city. In recent years, billions have been invested into revitalizing downtown Detroit. A transformed riverfront, bustling nightlife, diverse dining, championship sports teams and a packed lineup of festivals and events make metro Detroit an exciting destination. The newly remodeled and renovated Cobo Center has been transformed into a world-class convention and meeting center. Throughout the $279 million renovation, Cobo has been operating at 100 percent capacity and is ready to host the ASABE Annual International Meeting. Be a part America's great comeback city.

www.asabemeetings.org

The 2nd International Youth Conference of Bionic Engineering

IYCBE 2018

7 - 9 November 2018, Odense, Denmark

http://iycbe2018.sdu.dk/

Scope: To meet the demand of the bionic scientists for academic communication, the 2nd International Youth Conference of Bionic Engineering (IYCBE2018) will be held on 7th-9th November 2018 in Odense, Denmark. This conference will be supported by the International Society of Bionic Engineering (ISBE), the Youth Committee of International Society of Bionic Engineering, and Frontiers in Neurorobotics and organized by University of Southern Denmark, Nanjing University of Aeronautics & Astronautics, Jilin University, and Lanzhou Institute of Chemical Physics, Chinese Academy of Sciences. The objective of this interdisciplinary conference is to provide an international forum for youth or outstanding scientists and engineers around the world who are interested in the field of bionic science and engineering. All aspects of bionic science and engineering and application areas are welcome, including, but not limited to, the following topics:

Related topics:

Bionic Engineering: Bio-inspired Robotics, Bio-inspired Sensors and Actuators, Bio-inspired Energy Storage, Bio-inspired Flexible Electronics, Bio-Inspired Solar Cells, Biomimetic Engineering, Embodied Artificial Intelligence and Neurorobotics, Mechanics

Bionic Science: Functional Morphology, Musculoskeletal Systems, Biomechanics, Biological Interface and Functionalization, Biomimetic Materials, Biomimetic Structures, Biomimetic Surfaces, Biomimetic Design Methodologies, Bionic Fluid, Biological Systems, and Brain-Inspired Computing and Neuromorphic Systems.

Important dates:

- Abstract Submission Deadline: 1st June 2018
- Notification of Acceptance: 20th August 2018
- Camera Ready Submission: 20th September 2018
- Early Registration: 20th September 2018
- Conference: 7th-9th November 2018

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Newsletter

ISBE Newsletter

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ISBE NEWSLETTER

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