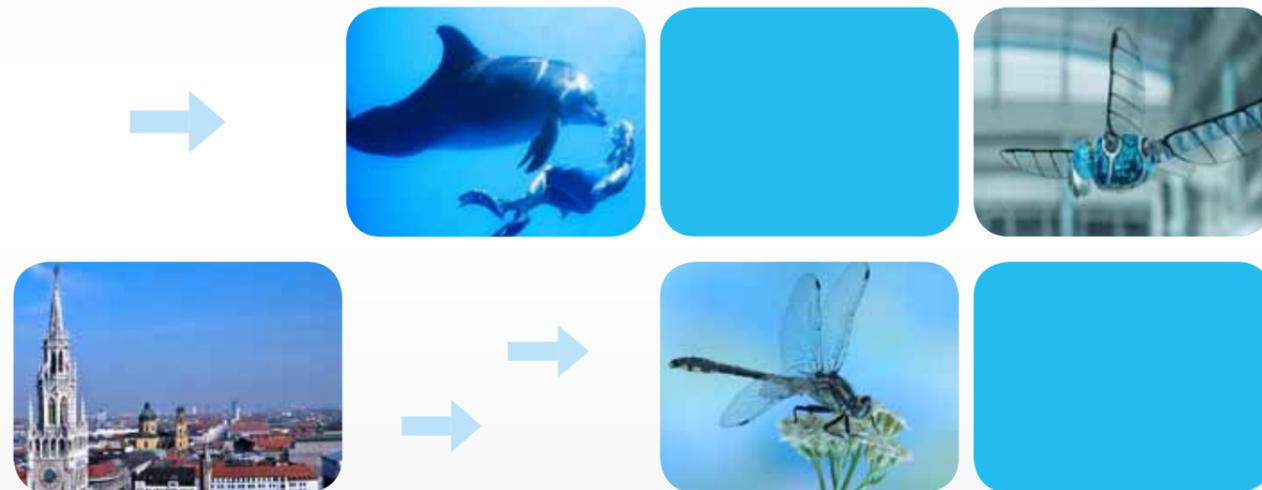


# Newsletter

## International Society of Bionic Engineering



# ISBE

## NEWSLETTER ISBE

# December 2014

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#### ISBE Newsletter

Sponsored by the International Society of Bionic Engineering (ISBE)

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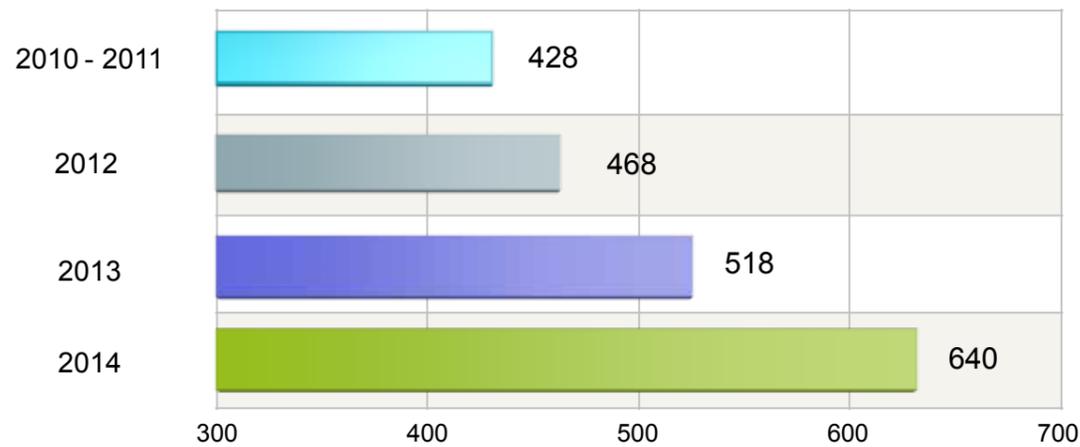
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# Membership

The International Society of Bionic Engineering (ISBE) is an educational, non-profit, non-political organization formed in 2010 to foster the exchange of information on bionic engineering research, development and application.

ISBE membership is open to those who have manifested a continuous interest in any discipline important to bionic engineering research as evidenced by work in the field, original contributions and attendance at meetings concerning bionic engineering research.



GROWTH OF THE MEMBERSHIP

ISBE is made up of 640 Individual Members coming from 43 different countries and 6 continents of the world. There are two classes of Members: Individual Member and Corporate Member.



MEMBERSHIP DISTRIBUTION

## Thomas Stegmaier

Born and grown up in Germany in the Swabian area. Thomas Stegmaier studied mechanical engineering at the University of Stuttgart in the main topics of control technologies and construction of textile machines. During the study he was interested in other disciplines such as agriculture, biology and has interest in forest science.



During his first job as an engineer he was in charge of R&D for environmental protection at the Institute of Textile Research and Process Engineering in Denkendorf (south of Germany), followed by his PHD in coating of yarns. In 1999 he started to setup a network in bionics in the south of Germany. Powered by two universities (Freiburg and Tübingen) it is a success story and many good scientific and industrial work results have developed through this cooperation.

He is active member of the networks in Germany for bionics BIONIKON and BIONIKON international. In 2008 he was elected as one of the two vice presidents of the International Society of Bionic Engineering (ISBE) with the intention to build the bridge between the two worldwide bionic networks.

Parallel he acquired responsibility at the institute for different research teams with experts in physics, chemistry, process engineering and textile technology. These teams develop materials, systems and machines for industrial application of fiber based materials, surface treatment and envi-

ronmental technologies.

With support of these teams and in close cooperation with biology-oriented teams from different universities he is leading bionic developments from the first idea to innovations. The following list gives a small overview in this work:

- With new technologies in nano science the R&D work for micro- and nanostructured surfaces results in self-cleaning textiles based on the knowledge on the Lotus leaf. Meanwhile innovative awnings are successful on the market with this super hydrophobic self-cleaning property, figure 1 Self cleaning textile: water droplet take up red particles and leave a cleaned track.
- Based on solar thermal functions learned from the fur of the polar bear, new flexible solar thermal collectors were constructed. A fully equipped demonstration building with a roof of a flexible textile solar collector was set into motion with an innovative seasonal thermal storage system, figure 2. Polar bear pavilion: Solar thermal collector in the roof developed by textiles and foils.
- Fiber-reinforced structures in plant stems with hollow structures give ideas for lightweight pultruded composites for e.g. the aircraft industry.



Figure 1



Figure 2

figure 3. fiber reinforced pipe with hollow structures based on a plant axis.

- Keeping air in a fiber structured surface enables the reduction of friction and drag resistance between a hard body to water which can be highly useful for boats or for pipes, figure 4. Air keeping surface on a textile: silver shine indicates the reflection of light in the border from liquid to fiber surface.

- The idea of energy independent liquid transport was inspired from the liquid transport in trees using osmose pressure, capillary forces and tensile tension. First applications are



Figure 4

in a pre-developed stage for innovative irrigation systems in agriculture.

- Oil bees show highly-absorbable hairy

structures to gain for oil from flowers and gave ideas and input for new filter media in separation of oil-water emulsions in industrial processes and for oil accidents on water, figure 5. special highly open nonwoven keeping oil droplet like the leg of an oil bee.



Figure 3

In close cooperation with partners from the industry his intension is to bring the bionic



Figure 5

developments into market. Basic research often is connected to technical questions from industrial partners.

The result of this bionic research is published in national and international magazines. Radio interviews and television periodically report to the bridge of bionic between biology and technology.

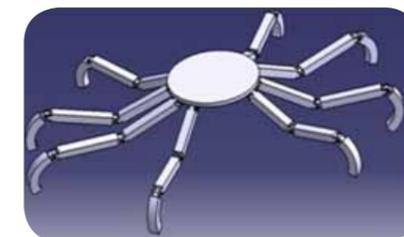
## Jianqiao Li

As the Ph.D supervisor of the Key Laboratory of Bionic Engineering of Ministry of Education, Jilin University, and co-chairman of Degree Council for Biological & Agricultural Engineering, Jilin University, P. R. China, Professor Jianqiao Li got his Ph.D degree at Jilin University of Technology in 1993, and was awarded the title of professor three years' later. He served as Deputy Director and Director of Key Laboratory of Bionic Engineering of Ministry of Education, Jilin University from 2000 to 2012. During the tenure, Professor Li studied at Kansas State University (USA), Nottingham



Trent University (UK), and Nottingham University (UK) as a visiting scholar.

Jianqiao Li's areas of specialization are terrain machinery system and biomimetic theory, with the focus devoted to the analysis and control of terrain machinery system, including biomimetics theory and technology on reducing resistance of the soil-engaging components of terrain machinery, biomimetic theory and technology on anti-adhesion of the soil-engaging components of agricultural machinery, soil dynamics on the interface adhesion system between soil and solid, and simulation of dynamic process on the adhesion interface system between soil and solid. The simulation and preparation research for lunar soil carried out by Professor Li's team greatly contributed to China's first lunar rover, namely "Jade Rabbit".



Since 2007, Professor Li has undertaken over 15 scientific research projects at national, provincial and ministerial level, including one sub-item supported by National Raise Project three projects supported by National Natural Science Foundation of China (including one key project), one sub-item supported by National High Technology Research and Development Program(863), one sub-item supported by International Scientific Collaborative Project, one sub-item supported by National Defense Key Project, and two special projects supported by Aerospace Science and Technology Corporation.



Professor Li has been honored with various awards and prizes e.g. the second award of National Technological Innovation and National Teaching Achievement award. During the past years, professor Jianqiao Li has applied for 10 invention patents, authorized 2 software copyrights, published more than 100 papers in high-level journals and given invited reports at more than 20 International Conferences. He is also the founding General Secretary of ISBE, and contributes a lot to its establishment and development.

### WRITE TO US



### 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 the future edition of newsletter, please feel free to contact us.

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Address: 1202 Administrative Building, Jilin University, 2699 Qianjin Street, Changchun 130012, P. R. China

# News and Events

## Symposium on Agricultural Bionic Engineering and Technology was held



During September 16 - 17, 2014, the Symposium on Agricultural Bionic Engineering and Technology was held in Beijing, P. R. China. The Symposium was co-sponsored by the International Society of Bionic Engineering (ISBE) and the International Commission of Agricultural and Bio-systems Engineering (CIGR).

Over one hundred representatives around the world attended the symposium, respectively from UK, Germany, Japan, Australia, South Africa, India, Thailand among others. Twenty invited lectures were given at the symposium. The topics covered biological and agricultural engineering, mechanical bionic design, biomaterials, bionic walking machinery, bio-inspired algorithms, bionic surface,

etc. The symposium provided a favorable opportunity for the exchange of agricultural bionic engineering research achievements, and offered a platform for representatives to communicate and cooperate with each other. It played an important role to promote the development of Agricultural Bionic Engineering at an international and interdisciplinary level.



## Workshop on Review and Future Perspective Bionic Engineering was held

Workshop on Review and Future Perspective Bionic Engineering organized by the ISBE was held in Beijing on September 18, 2014. Professor Timothy Simalenga from the Centre for Coordination of Agricultural Research and Development for Southern Africa chaired the workshop.

Prof. Vilas Salokhe from Kaziranga University (India), Dr. Thomas Stegmaier from ITV Denckendorf (Germany), Prof. Jianqiao Li from Jilin University (China), Prof. Yuying Yan from the University of Nottingham (UK), Prof. Zhiwu Han from Jilin University (China), Prof. Shujun Zhang from University of Gloucestershire (UK), and Dr. Lei Ren from the University of Manchester (UK) had reports at the workshop.

The topics including bionic design, bionic materials, mechanical bionics, fluid bionics, electronic bionics, and bionic robot, etc were discussed during the workshop. The attendees made further exploration of the research methods and future perspectives of bionic engineering discipline. It played a positive role to promote academic exchanges and development of bionic engineering around the world.



### Biomimetic Workshop 2014

The Workshop on the Basic Methods of Biomimetic Engineering was held in Jilin University, P. R. China on September 22-23, 2014. The workshop was sponsored and organized by the In-

ternational Society of Bionic Engineering (ISBE), co-sponsored by the Key Laboratory of Bionic Engineering, Ministry of Education, Jilin University and presented by Prof. Julian F.V. Vincent who is a famous professor on Bionics and the president of ISBE.

Nearly 40 scholars and postgraduates attended the workshop. The workshop not only provided good opportunities for attendees to learn the basic methods and skills of biomimetics but also established a platform for academic exchanges and communications. It was a memorable event to popularize bionic science, spreading its ideas and accelerating the pace of academic research and development.

# FELLOW MEMBERSHIP

Fellow members refer to those who have made great achievements in the field of Bionic Engineering and significant contributions to the development of the ISBE.

The Fellow Members will have been members of ISBE for at least three years, and the number of which shall account for no more than 3 percent (3%) of the total of Individual Ordinary Members. The Board of Directors is in charge of the evaluating.

The nomination of fellow membership was started in June, 2014. Several individual members submitted their applications. The evaluation meeting was held in this September in Beijing, P. R. China. The Executive Board of Directors gave their evaluation results according to the "Fellow Membership Regulation". Here is the fellow members of ISBE granted in 2014.

Marc Weissburg  
(Georgia Institute of Technology, USA)  
Minjun Kim  
(Drexel University, USA)  
Wenjian Wu  
(National University of Defense Technology, China)  
Yuying Yan  
(Nottingham University, UK)  
Zhiwu Han  
(Jilin University, China)

ISBE secretariat is also welcoming the nominations for fellow membership in 2016. You may visit ISBE website for more details: <http://www.isbe-online.org/?mod=info&act=view&id=38>.



Marc Weissburg  
Georgia Institute of Technology, USA



Minjun Kim  
Drexel University, USA



Wenjian Wu  
National University of Defense Technology, China



Yuying Yan  
Nottingham University, UK



Zhiwu Han  
Jilin University, China

## Bionic Engineering Award

The International Society of Bionic Engineering (ISBE) honors and encourages excellent members who make great progress in bionic engineering field, and to further promote the development of bionic discipline.

1) Bionic Engineering Outstanding Contribution Award: Two winners, each one will be awarded 30,000 RMB;

2) Bionic Engineering Outstanding Youth Award: Two winners aged under 40 years old, and each one will be awarded 10,000 RMB.

3) Outstanding Student Award: Two winners aged under 30 years old, and each one will be awarded 5,000 RMB.

Award Committee has been established in April following the guidelines of Award Measures, and the nominations will be assessed equally on the nominee's merits and eligibility. The final

result will be announced at the 5th International Conference of Bionic Engineering (ICBE2016) when the winners will be presented with the certificate and monetary award.

### Sponsor

Bionic Engineering Award in 2016 is donated by Prof. Luquan Ren, Member of Chinese Academy of Sciences (CAS), P. R. China and Standing Vice President of ISBE. The award



is sponsored by the members of ISBE voluntarily to reward the members who make outstanding contributions to bionic engineering research. It is presented at the International Conference of Bionic Engineering held every three years.

## Welcome to ISBE Website

The revised website of ISBE was successfully released in November, 2014 with the support of Executive Board of Directors and the continuous effort of the office of secretariat, ISBE.

The objective of the website is to keep members informed with the latest news, events, resources and academic trends and further promote the development of bionic engineering discipline. Warmly welcome you to visit the new website and give us your suggestions.



<http://www.isbe-online.org/>

# Biomimetic Design for Well Being and Empowerment

by Ille C. Gebeshuber, Malaysia

From June 12 - 14, 2014, the international conference “Design for Sustainable Well Being and Empowerment” took place at the premier Indian tertiary education and research institution, the Indian Institute of Science (IISc Bangalore). About 250 participants from all over the globe were discussing the following topics:

Perceptions of well-being and empowerment, normative approaches in design for well-being, sustainability and well-being, individual versus collective well-being and empowerment, role of ethics in design, pedagogical design tools, novel design methodologies/ frameworks/ methods/ pedagogy, adaption and evaluation of design methodologies/ frameworks/ methods for well-being and empowerment, design & innovation for sustainability, successful design & innovation: role of stakeholders, extending design, grass-root innovations and the role of design in the



path from invention to innovation.

Ille C. Gebeshuber, physics professor at the National University of Malaysia and the Vienna University of Technology in Austria, Europe, and member of the ISBE board of directors, was invited to IISc to give a keynote at this event and share her views and approaches in a panel discussion and virtual jungle expeditions. In her keynote address “Bridging theory to practice: Biomimetic nanoscience and nanotechnology to design for society”, Prof. Ille treated global challenges for humankind and how to address them with new ways of doing engineering, sorting and accessing human knowledge and educating future generations.

Of specific interest in the presentation was our current and future ways of dealing with resources, manufacturing and transport. Biomimetic nanoscience and nanotechnology are important emerging fields that increasingly influence our daily lives. Learning from biomineralisation for example might inspire a new way of mining and manufacturing: more than 70 different minerals are produced by organisms, at ambient conditions, with the help of proteins rather than high temperature.



Prof. Ille C. Gebeshuber in the KL Butterfly Park, ready to investigate functional structural colours in butterflies and moths.

Biominerals are interesting from the material perspective, but even more so concerning structure-based functionalities such as superior toughness and strength. Intriguing examples for biomineralisation are hydrated silica shells produced by diatoms (“glass-making” algae), magnets with atomic precision produced by magnetotactic bacteria and organisms that accumulate Gold from seawater and produce nanocrystals of this precious element.

Learning from structural colours might remove pigments and additional coloration layers from our products: tiny structures in organisms (size: on the order of the wavelength of visible light, i.e. some hundreds of nanometers) play with the light and thereby generate colours via physical phenomena such as scattering and multilayer reflections. As opposed to pigment coloration, such structural colours do not bleach and can furthermore be functionalised (i.e. made reactive to external stimuli such as temperature, gas concentration, electrical voltage), for exciting applications in technology, medicine and the arts – all without pigments made from potentially toxic chemicals.

As Prof. Ille mentioned, in functioning ecosystems (as opposed to our current human society) there is no rich and no poor. Resources are locally available for all, and are harvested and processed in benign ways that result in products that, when at the end of their lifespan, may serve as food or fertiliser for the others. Biomimetic inspiration that transfers the established integrative approach of living nature regarding structure, functionality and beauty to artefacts (technology and products) promises great advancement for design to positively support well-being for the underprivileged.

Ille took faculty, MSc and PhD students from mechanical engineering and product design as well as kids with ages up to 14 years old on various educational biomimetic expeditions to wilder parts of the IISc campus, which had been untouched for decades. Off the beaten paths, the participants were watching, looking and learning from materials, structures and processes in living nature regarding transfer of the lessons learnt to their respective fields and interests.



Prof. Ille C. Gebeshuber in the Malaysian rainforest, with a rare Rafflesia plant in full bloom.

If we compress the history of the Earth on one year, life would appear in mid-February, and the industrial revolution would take place two seconds before midnight on the 31st of December. Since the industrial revolution, things turned for the worse. Species extinction

due to habitat destruction and fragmentation, pollution from our way of manufacturing and transporting things around, and very poor waste management are just some examples of our activities that changed things for the worse. Current development and growth activities (when it comes to economy) are adverse to living nature. Prof. Ille C. Gebeshuber suggested we all sit back and take our time, and deeply think about how we could start a completely new, revolutionary, disruptive way of doing things, in collaboration with life around us, and then step back these “two seconds” and start anew. It is doable, and necessary, given the huge damage that has arisen until now due to activities of modern, technological human societies. Our knowledge in bionic engineering and in nanoscience and nanotechnology, which work on the same scale as the language of life and are similarly powerful, will support us in developing and establishing a new, sustainable way – for the well-being of all.

# Academics

## Research and development of a biomimetic legged robot

Stefan Landkammer<sup>1</sup>, Daniel Schneider<sup>1</sup>, Matthias Altstadt<sup>1</sup>, Peter Hess<sup>1</sup>, Rüdiger Hornfeck<sup>1</sup>

<sup>1</sup>bionicum research, 3D-Visualisierungszentrum,  
Nuremberg Institute of Technology -Georg Simon Ohm, Germany

\*stefan.landkammer@th-nuernberg.de

**A** biomimetic research for developing fluidically driven leg actuators as well as a semi-automatic approach for legged robot navigation is being carried out at the Nuremberg Institute of Technology, Germany.

and to find new approaches for user interaction of a biomimetic spider robot. On the other hand research is done on novel fluidic actuators inspired by the spider leg. Both should be combined in a mobile system by end of the project.

### Biomimetic research on fluidic joints...

An antagonistic fluid system consisting of hydraulic joint extension and muscular flexion provides the animal the incomparably lightweight and powerful legs for dynamic locomotion. Interdisciplinary investigations on this biomechanical functional principle have been done to gain a basis for transferring these physical advantages into a technical application. Therefore structural and multibody simulations as well as prototype tests and evaluations of manufacturing possibilities have been carried out to develop novel biomimetic actuators for an implementation in robotic systems.

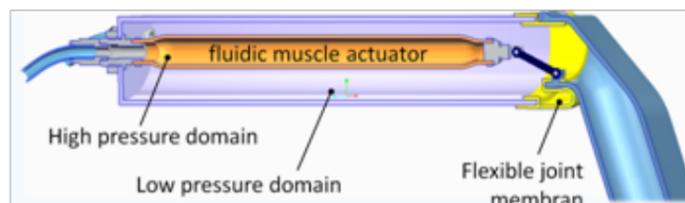


Figure 2: Biomimetic joint actuators.

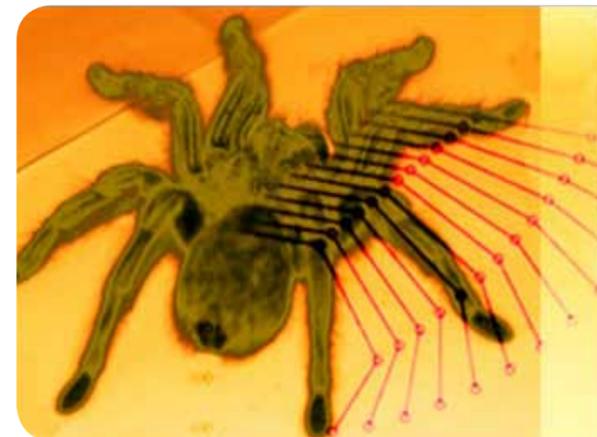


Figure 1: The "OHM-Krabbler" project - development of a novel bio-inspired walking robot.

Urban Search And Rescue (USAR) robots often deal with applications in rough environment. Biological research shows that spiders have an excellent locomotion system which enables them to climb and walk on nearly every terrain. Therefore it is worth to take a closer look on the physiological mechanisms. On the one hand, the approach of the Nuremberg Institute of Technology is to improve the mobility

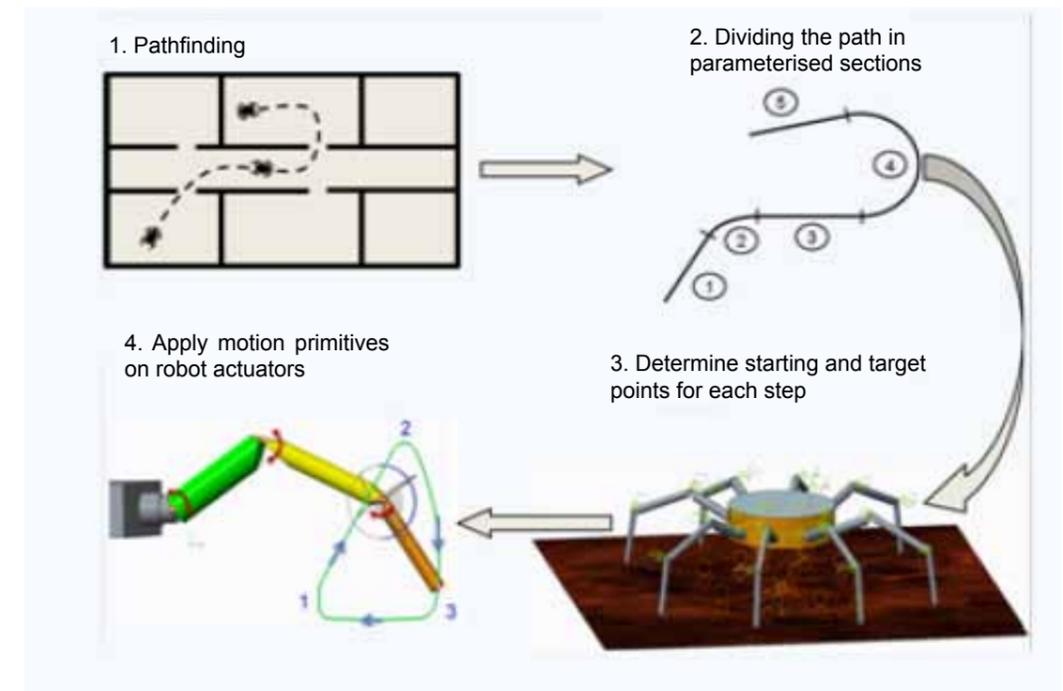


Figure 3: From path finding to motion primitives.

Figure 2 shows a technical adaptation of the spider joint mechanism. During operation, a stiff exoskeleton with a flexible joint membrane is permanently filled with fluidic pressure. The expansion of the membrane creates the default extension torque of the joint. In addition to this, a fluidic muscle, with higher pressure, is integrated into this "low pressure domain" and connected to the following limb. Filling the muscle leads to a contraction and generates retraction forces for joint flexion. Thus, the biomimetic actuator can be operated by the counterplay of low pressure fluidic joint extension and actively controlled muscular flexion. After optimization of this novel and dynamic operating principle, the actuators will be integrated into the biomimetic spider robot system. Furthermore, the project includes the transfer of the spider's biological locomotion principle into the semi-autonomous mobile robot system.

### ...meets an intuitive user interface...

An intuitive user interface is being developed for enabling interaction with the robot to ensure opera-

tion in an uneven terrain or a field of debris. Therefore, environment detection is used to enable the robot to recognize tasks. Due to the knowledge of the identified surrounding, an entire path can be determined to reach the desired destination fast and secure. This path defines the interface to the control concept and is forwarded to the robot's control system.

### ...combined with an innovative control concept

As illustrated in Figure 3, the mentioned path will be divided in separate parameterised sections. This way, the deviation between the desired path and the actual position of the robot can be minimized.

Since there is a certain amount of those sections, motion primitives can be implemented for each of them a priori. Thus, a stable behavior of locomotion is expected. The section-based information about localization enables the realization of odometry for legged robots with less effort compared to other sensor and control concepts.

# An Experimental Analysis of Human Straight Walking

by Marco Ceccarelli University of Cassino and South Latium, Italy

Experiments on human walking were carried out by using Cassino tracking system (CATRASYS) which is a passive cable-based measuring system. This system is adopted because it is capable of both pose and wrench measurements with fairly simple monitoring of operation. By using experimental results, trajectories of a human limb extremity and its posture have been analyzed; forces that are exerted against cables by the limb of a person under test have been measured by force sensors as well. Furthermore, by using experimental tests, modeling and characterization of the human straight walking gait have been proposed.

CATRASYS is composed of a mechanical part, an electronics/informatics interface unit, and a software package, Fig 1 a). The mechanical part consists of a fixed base, which has been named as Trilateral Sensing Platform, and a moving platform, which has been named as end-effector for CATRASYS. The two platforms are connected by six cables, whose tension is maintained by pulleys and spiral springs that are fixed on the fixed

base. In order to obtain the information of poses and wrenches, six position transducers  $T_i$  ( $i=1...6$ ) and six force sensors  $C_i$  ( $i=1...6$ ) have been used, as shown in Fig. 1a). In addition, six amplifiers  $A_i$  ( $i=1...6$ ) are used for amplifying the input signals from the position transducers and force sensors and then transmitting the amplified signals to the electronic interface unit, namely NI-DAQ data acquisition board. In the experimental system, position transducer is PT101; force sensor is OIML R60 C3; amplifier is digital weight transmitter; data acquisition board is NI USB-6210, Fig.1 b).

When in use, the end-effector of CATRASYS is a moving platform that is operated as a coupling device since it connects the cables of the six transducers to the extremity of a moving system through the 3-2-1 configuration, as shown in Fig. 1b). For the characterization of human locomotion proposed in this paper, the end-effectors are two ropes, which are attached to human limbs through a 3-3 configuration as in Fig. 1b).

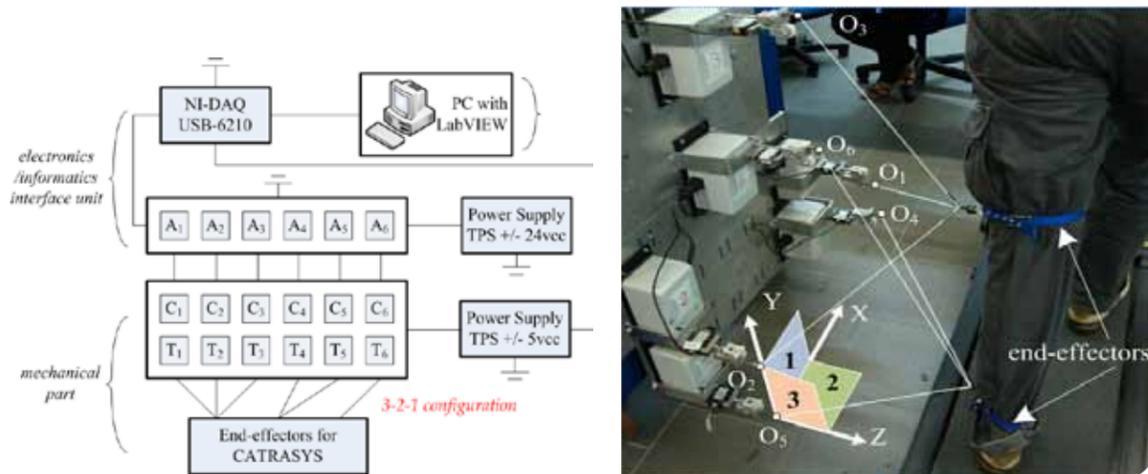


Fig. 1 A measuring system CATRASYS: a) a scheme (A1 to A6 are amplifiers; T1 to T6 are cable transducers; C1 to C6 are force sensors); b) the experimental setup.

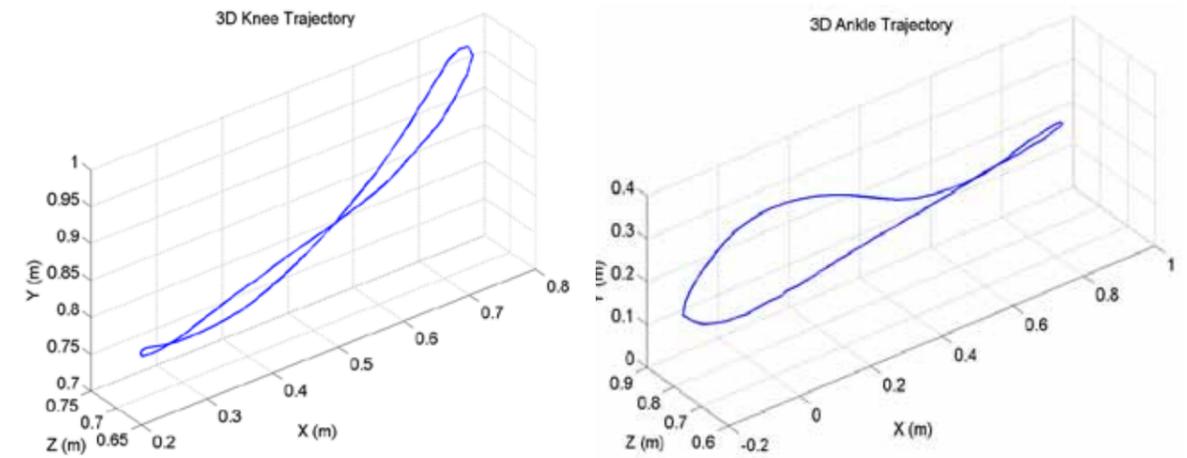


Fig. 2 Trajectories obtained after statistical elaboration as referring to the experiment carried out in Fig. 2b): a) a trajectory of the knee point; b) a trajectory of the ankle point

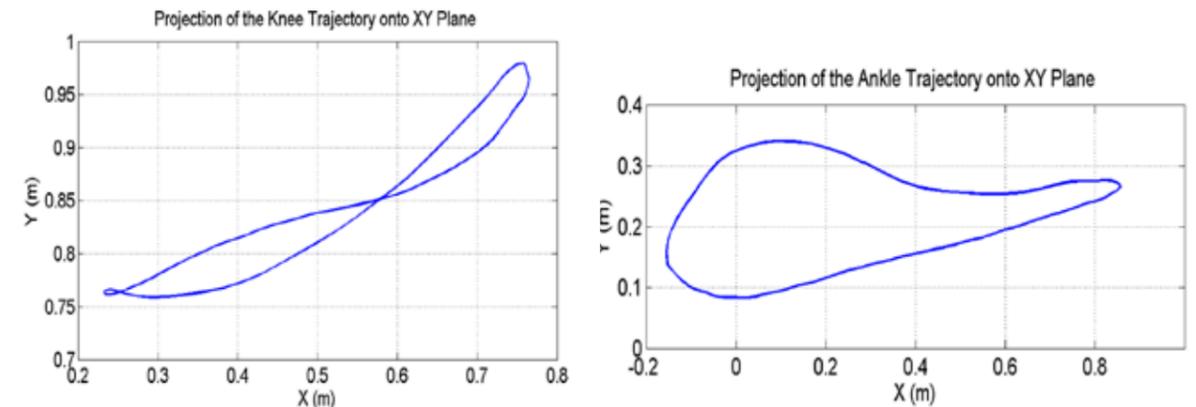


Fig. 3 A characterization model of the projections of trajectories in sagittal plane for the significant parameters that can be identified through a test as in Fig. 2b): a) knee point; b) ankle point

With the experimental setup illustrated in Fig.1 lab tests of human typical straight walking mode have been performed on a commercial treadmill. Figs. 2a) and 2b) show 3D trajectories of the knee point and ankle point in Cartesian coordinates, respectively. From the figure, it can be observed that human walking is not a two-dimensional

movement but a three-dimensional movement, with a small movement in lateral direction. This is because people need to adjust his/her COG (centre of gravity) in lateral direction in order to keep balance while walking. Four arrows in the plots indicate the moving direction of each trajectory.

## The Hydraulic Mechanism of the Unfolding of Hind Wings in *Dorcus titanus platymelus* (Order: Coleoptera)

by Jiyu Sun, Mingze Ling, Bharat Bhushan and Jin Tong

In most beetles, the hind wing is thin and fragile; when at rest, they are held over the back of the beetle. When the hind wing unfolds, it provides the necessary aerodynamic forces for flight. In this paper, we investigate the hydraulic mechanism of the unfolding process of the hind wings in *Dorcus titanus platymelus* (Order: Coleoptera). Figure 1 shows the venation and cross section of hind wing of *Dorcus titanus platymelus*. The wing unfolding process of *Dorcus titanus platymelus* was examined using high speed camera sequences (400 frames/s), and the hydraulic pressure in the veins was measured with a biological pressure sensor and dynamic signal acquisition and analysis (DSA) during the expansion process. It was found that the total time for the release of hydraulic pressure during wing folding is longer than the time required for unfolding. The pressure is proportional to the length of the wings and the body mass of the beetle. It was found that the peak pressures correspond to two main cross-folding joint expansions in the hind wing (Figure 2). It can deduce that blood pressure in the veins of the hind wings increased until overcame the spring mechanism of resilin, at which point the hind wings straighten. These observations strongly suggest that blood pressure facilitates the extension of hind wings during unfolding.

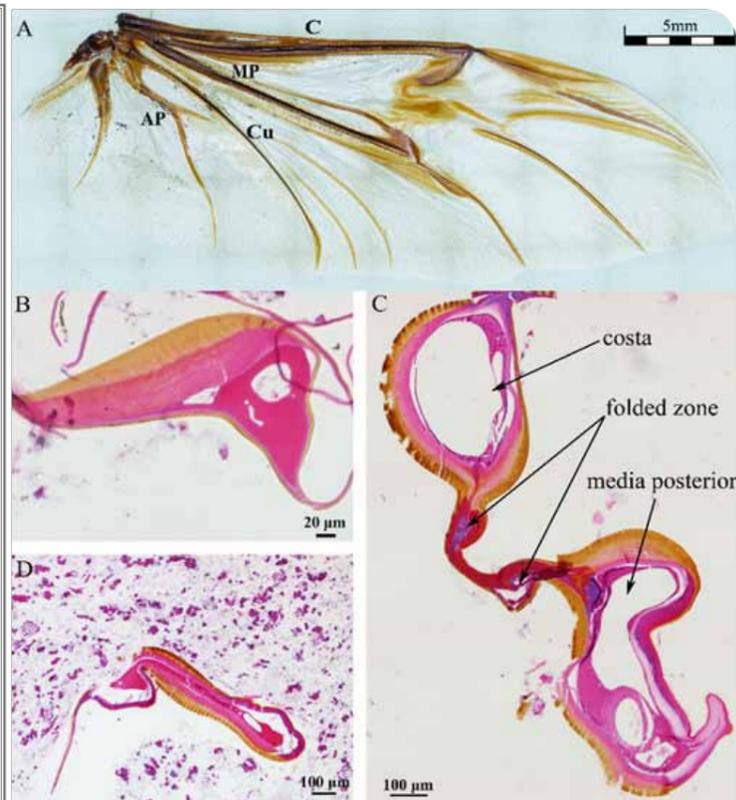


Figure 1: (A) shows the venation of hind wing of *Dorcus titanus platymelus*; The crosssections of (B) the root, (C) the folded zone and (D) the tail of costa (40×) by inverted fluorescence microscope where C is costa, MP is media posterior, Cu is cubitus, and AP is anal posterior. The vein cavity is regularly.

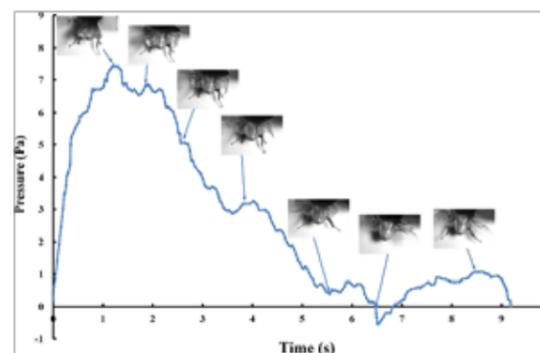


Figure 2: The change in blood pressure in the veins of the hind wings with time. The photos captured with a high-speed camera show the relationship of the unfolding actions of the hind wings with fluctuations in blood pressure.

## Upcoming Activities

### 2015 International Workshop on Bionic Engineering (IWBE 2015)

October 14-16, 2015, Beijing, P. R. China



The 2015 International Workshop on Bionic Engineering (IWBE 2015) will be held in Beijing, China, October 14-16, 2015. The workshop aims to provide a forum for researchers in bionic engineering from around the world to share their ideas and latest results. The theme of IWBE 2015 is “The Progress and new Challenges of Bionic Functional Structures and Surfaces”. The host city Beijing, also known as Peking, is the capital of the People's Republic of China and the country's cultural, political and educational center.

#### Topics of Interest

IWBE 2015 particularly encourage the submission of papers in the following areas, but not limited to:

- Fundamental understanding of function mechanism of animals and plants
- Bionic inspirations from animals, plants, microorganisms
- Bionic inspirations from biological material, structure and physiology
- Bionic intelligent and behavior for artificial systems
- Intelligent materials or surfaces design and fabrication
- Applications of bionic technology in ecology/medical/infrastructure/energy etc.

**Important Dates**

Jul. 31, 2015 Deadline for Abstract Submission  
 Aug. 20, 2015 Acceptance notification  
 Sept. 15, 2015 Deadline for Final Contribution  
 Oct. 14-16, 2015 Workshop in Beijing, China

**Submission & Contact**

All abstracts are invited to be submitted by email to jun\_cai@buaa.edu.cn or chenhw75@buaa.edu.cn.

The abstract should focus on the motivation, major results and conclusions with 400-500 English words and single-spaced style.



**Workshop Schedule**

Oct. 14 Registration  
 Oct. 14 18:30 Welcome dinner  
 Oct. 15 Workshop lectures  
 Oct. 16 Workshop lectures  
 Oct. 16 14:00-18:00 Poster, technical visit to selected bionic research labs at Beihang University

**Registration fee**

	US Dollars	Chinese Yuan
Regular	200	1000
Student	100	600
Accompanying	100	600

Note: Only on-site registration is available. The registration fee covers two-day lunch and dinner, and also workshop materials.

**Advisors**

Julian F V Vincent, Professor  
 University of Oxford, UK  
 Ren Luquan, Professor & Member of CAS  
 Jilin University, P. R. China  
 Jiang Lei, Professor & Member of CAS  
 Beihang University (BUAA), P. R. China

**Organizer**

Zhang Deyuan, Professor  
 Beihang University, P. R. China

**Secretary**

Cai Jun, Professor, Deputy Dean  
 Beihang University, P. R. China  
 Huawei Chen, Associate Professor  
 Beihang University, P. R. China

**Sponsors**

International Society of Bionic Engineering  
 Beihang University, P. R. China  
 Jilin University, P. R. China  
 National Natural Science Foundation of China



# Sino-German Conference 2015

## CALL FOR PARTICIPANTS

**ABOUT THE CONFERENCE**

The Sino-German Symposium on Biomimetics: From Animal Sensory Systems to Locomotion will be held in Munich, Germany during the period from June 12th to 16th of 2015. The symposium will be funded by the Sino-German Science Center, and co-organized by Technical University of Munich, Nanjing University of Aeronautics and Astronautics and Chengdu Institute of Biology, Chinese Academy of Sciences and the International Society of Bionic Engineering.

The purpose of the conference is to bring together researchers to present and share their ideas and latest works related to the biomimetics. About 15 Chinese delegates and 25 German delegates will be selected by the academic committee to attend the conference.

**PARTICIPATION FEES**

Participation fees of 15 Chinese delegates who are chosen by the academic committee according to their CVs and presentation abstracts evaluation will be funded by Sino-German Science Center, which cover boarding and lodging, traveling and registration fees, etc. Others are welcome to attend the conference too, their registration fees will be covered by the conference, while the expense on traveling and boarding have to be paid by themselves.

**SUBMISSIONS**

Anyone who is interested in the conference needs to submit CV (Curriculum Vitae) and the abstract of presentation (the template can be founded at ISBE website), which should be written in English and describe the original work. The Chinese delegates should also submit their Chinese CVs (for application to Sino-German center).

**TOPICS OF INTERESTS**

The topics of this symposium will include but not limit to:  
 (1) Biomaterials and interfaces;  
 (2) Sensing and sensory integration;  
 (3) Biorobotics.

June 12-16, 2015  
 Munich, Germany



**CONFERENCE CHAIRS**

Prof. Leo Hemmen (Germany)  
 Prof. Zhendong Dai (China)  
 Prof. Yezhong Tang (China)

**CONTACT**

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# The 5th International Conference of Bionic Engineering (ICBE'16)

21 - 24 June, 2016, The University of Nottingham, Ningbo, China

## CALL FOR PAPERS

The 5th International Conference of Bionic Engineering organised by the International Society of Bionic Engineering (ISBE) will be held in Ningbo at the University of Nottingham Ningbo (UNNC) campus, 21 – 24, June 2016. This conference aims to provide an international forum for scientists and engineers around the world who are working in the field of bionic engineering, 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.

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

- Biomechanics
- Bionic structures
- Biomimetic materials
- Biomimetic Surfaces
- Fluids flow and drag reductions
- Nature inspired designs
- Industrial applications in biomimetics
- Sensors and signal processing
- Energy systems
- Robotics, motion systems and artificial intelligence

### Scientific Advisory Committee:

Julian Vincent	Oxford University, UK
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Prof. Yuying Yan (Conference Chair)
Prof. Michael George (Co-Chair)
Prof. Jianqiao Li (ISBE)
Prof. YJ Lin (UNNC)

### Sponsors:

International Society of Bionic Engineering (ISBE)  
University of Nottingham, UK  
University of Nottingham Ningbo, China  
Jilin University, China  
Royal Society, UK  
National Natural Science Foundation of China

### Important Dates:

Abstract submission:	12 June 2015
Notification of accepted abstracts:	12 July 2015
Full paper submission:	30 September 2015
Notification of accepted full papers:	20 December 2015
Early bird Registration deadline:	20 March 2016

Please check on the official website of ISBE (<http://www.isbe-online.org/?mod=info&act=view&id=930>) regularly for any update about the conference, or contact Prof. Yuying Yan for any inquiries at [yuying.yan@nottingham.ac.uk](mailto:yuying.yan@nottingham.ac.uk).



# ICBBE 2015 : XIII International Conference on Biological and Biomimetic Engineering



## Conference Objectives

The ICBBE 2015: XIII International Conference on Biological and Biomimetic Engineering aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results about all aspects of Biological and Biomimetic Engineering. It also provides the premier interdisciplinary and multidisciplinary forum for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns, practical challenges encountered and the solutions adopted in the field of Biological and Biomimetic Engineering.

## Call for Submissions

We encourage you to contribute to and help shape the conference through paper submissions. For the technical research track, we invite high quality submissions of papers describing original and unpublished results of conceptual, constructive, empirical, experimental, or theoretical work in all areas of Biological and Biomimetic Engineering. The conference solicits contributions of full-length papers, short papers, posters and abstracts, that address the themes and topics for the conference, including figures, tables and references of novel research material. Please review the submission and formatting instructions carefully. Submissions that do not comply with the instructions and size limits will be rejected.

## Important Dates

Paper submissions	June 3, 2015
Notification of acceptance	July 3, 2015
Final paper submission and authors' registration	August 3, 2015
Conference Dates	December 3 - 4, 2015

For more information, please visit <https://www.waset.org/conference/2015/12/penang/ICBBE>.

## ISBE NEWSLETTER

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