IST AUSTRIA
Institute of Science and Technology

NEWSLETTER

6th edition | August 2013

Supporting our Scientists: a new facility and a donor at the Scientific Service Units

Following our mission - to provide scientists with state-of-the art equipment, support and technical knowledge, we expanded our Service Units to include a new Electron Microscopy Facility with cutting-edge sample preparation and imaging instrumentation. High-tech imaging methods can now be used by researchers at IST Austria, allowing them for example to study the tissue and cell ultrastructure and the immunolocalization of proteins.

On June 20, the Miba Machine Shop was inaugurated, honoring the generous donation by the Miba AG. Our Miba Machine Shop supports all scientists in designing custom-made mechanical and electronic installations, equipment, and lab devices.

The Scientific Service Units will continue to develop in step with the needs of our scientists. We are looking forward to meeting the upcoming challenges!

Roland Gansch | Head of Scientific Service Units

EVENTS

Conferences

The 38th **International Symposium on Mathematical Foundations of Computer Science (MFCS)** will be held at IST Austria from August 26-30. The series of MFCS symposia, organized in rotation by the Czech Republic, Poland, and Slovakia since 1972, has a long and well-established tradition. This year's symposium will, for the first time, take place outside these three countries.

The 11th conference on **Computational Methods in Systems Biology (CMSB 2013)** will be held at IST Austria from September 23-25. This conference is an opportunity to hear about latest research on the analysis of biological systems, networks, and data, and brings together computer scientists, biologists, mathematicians, engineers, and physicists interested in a systems-level understanding of biological processes.

OPEN CAMPUS 2013

A powerful research party

On June 8, approximately 1'000 people took the opportunity to visit the IST Austria campus. Scientists of IST Austria set up research islands and organized lab tours to present their work hands-on, inviting visitors to ask questions and perform their own experiments. The Miba Machine Shop was open to visitors, and showed the possibilities of this high-tech workshop.

At the official opening, IST Austria President Thomas Henzinger expressed his gratitude to the region's people for their neighborly friendliness and their continuous interest in the development of the research institute. Special thanks went to the firefighters of Maria Gugging, who supported the Open Campus in spite of their efforts of stemming the floods that affected the region in the previous days. Henzinger also announced that IST Austria would donate the proceeds from the sale of food and drink to those affected by the recent floods. In total, 3'500 Euro were donated to the city of Klosterneuburg.

The opening was followed by the award ceremony for the winners of the IST Austria school competition. This year's competition was about "Discover forces". Supported by their teachers, students from the region were asked to study the forces of nature and contribute questions in the form of images and movies. All answers can be found at IST Austria's facebook page for schools (in German): www.facebook.com/ist.schule.

EVENTS

Graduation

On June 3, **Sooyun Kim** was awarded his PhD title at the IST Austria graduation ceremony. Professors Peter Jonas and Jonathan Bollback presented Sooyun Kim with sash, pin, and diploma folllowing speeches by Tom Henzinger and Kurt Mehlhorn. The ceremony was accompanied by the newly formed IST Austria choir.

SCIENCE INDUSTRY TALK 2013

Enabling Synergies

Hermann Hauser put it bluntly: "You have no history of 800 years – that is your advantage." This was one of many suggestions stated at this year's Science Industry Talk, jointly organized by the Association of Austrian Industries (IV) and IST Austria under the title "Partners in Innovation: Synergies between Industry and Basic Research" on June 4. Other speakers apart from the Anglo-Austrian venture capitalist Hauser (Co-founder of Amadeus Capital Partners) were Hermann Kopetz, Co-founder of the Austrian spin-off TTTech (specialized in Real-Time Systems), Horst Domdey, Managing Director of BioM Biotech Cluster Development GmbH in Martinsried, and Sriram Rajamani, Assistant Managing Director of Microsoft Research India.

In his words of welcome, IST Austria's Managing Director Georg Schneider focused on case studies for the successful transfer from scientific findings to industrial application. Therese Niss, president of the Young Industry within the IV, stressed the importance of an increased interaction between these fields. In his concluding remarks, Federal Minister for science and research, Karlheinz Töchterle, appreciated the intention to develop a spin-off park adjacent to the campus.

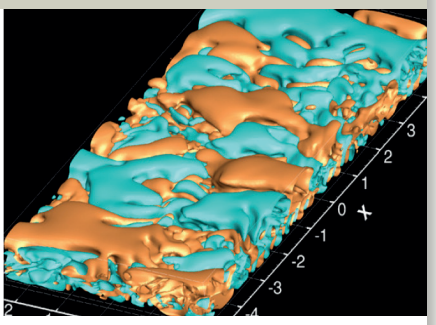
SCIENCE AT IST AUSTRIA

Physics

Björn Hof

In a PNAS publication, IST Austria professor Björn Hof has unravelled the mystery surrounding drag reduction through polymer addition, showing that a previously unknown type of fluid motion is at play. In turbulent liquids, a reduction of drag is most efficiently achieved by adding small amounts of long chain polymers to the liquid. This trick is used in oil pipelines, sewage, heating and irrigation to minimize friction losses. Empirical data has shown there to be a limit to the possible reduction of drag, the so-called Virk's asymptote. However, how the addition of polymers reduces drag and where its limit comes from is not understood in detail yet. Employing both experimental and numerical approaches, Björn Hof and his collaborators showed that surprisingly a new type of turbulence is involved.

The Reynolds number provides a measure of how turbulent a fluid is, while the Weissenberg number is a measure of the viscoelastic properties of a fluid. Recently, it has been demonstrated that a new type of disordered motion can even arise at vanishing Reynolds numbers if Weissenberg numbers are large, so-called "elastic turbulence". Björn Hof and collaborators studied flows at high Reynolds numbers where turbulence



up to now was believed to arise form inertial effects only. While the addition of polymers at first reduced the levels of ordinary turbulence, when a critical concentration was surpassed surprisingly the elastic stresses gave rise to a new type of disordered motion, dubbed elasto-inertial turbulence (EIT). Hence the elastic polymer molecules subdue Newtonian turbulence on the one hand (and reduce the drag) but eventually they trigger EIT. The researchers were able to explain Virk's asymptotic drag limit as the characteristic friction scaling of this new type of motion. While EIT is possibly related to elastic turbulence, it occurs in a different regime where Reynolds numbers are several orders of magnitude larger. The researcher also showed that EIT can arise in intermediate regimes where no turbulent motion was believed to be possible.

Elasto-inertial turbulence | Samanta D et al., 2013 | PNAS, doi: 10.1073/pnas.1219666110

MIBA MACHINE SHOP

On June 20, IST Austria's in-house electronic and mechanical workshop was inaugurated. The workshop now carries the name Miba Machine Shop to honor Miba AG's generous donation of 350'000 Euro to IST Austria. The Miba Machine Shop is one of six Scientific Service Units at IST Austria, providing scientists with modern equipment and efficient service to enable research at internationally competitive levels.

The CEO of Miba AG, Peter Mitterbauer, explained the motivation for the donation: "The basis for our success from a small workshop to one of the leading technology companies in Austria is continued development. Therefore, the topics of research and development are of great importance in the Miba AG. Within our company, we focus on applied research. We are aware that crucial impulses for this are based on excellent basic research. With our support, we would like to also set a signal for the research and industry location Austria."

GREEN BUILDING

Lab Building East, IST Austria's second laboratory building, received the European Commission's GreenBuilding Award, which acknowledges buildings for their **energy-saving efforts**. Lab Building East, built using eco-concrete and designed according to passive house standards, is equipped with photovoltaic elements on its roof, thermal activation of building structures, sun protection, "free cooling", energy-saving LED lighting, and more. Through all measures, a reduction in carbon emissions compared to similar buildings of around 2'160 tons in the next 20 years is achieved.

JUNGE KURIE

The Austrian Academy of Sciences (ÖAW) has elected **Christoph Lampert** and **Michael Sixt**, Assistant Professors at IST Austria, into the Junge Kurie, the chapter of young scientists within the Academy. The decrees were bestowed upon them on May 15, 2013, with Federal President Heinz Fischer and Federal Minister for Science and Research Karlheinz Töchterle attending the festive meeting of the ÖAW. Christoph Lampert focuses on computer vision and machine learning, while Michael Sixt studies the molecular and mechanical principles of cell motility.

SCIENCE SLAM

Tom Ellis, PhD student in Nick Barton's group, won the Science Slam Vienna.

Tom Ellis convinced the audience with an entertaining and witty 6 minute talk, also impressing listeners with his command of German. Showing remarkable knowledge of local cuisine, Tom explained his research on evolutionary genetics using snapdragons. He was then crowned Science Slam Champion by Elisabeth Freismuth as representative of Federal Minister Karlheinz Töchterle. Congratulations!

COLLOQUIUM SPEAKERS

PAST SPEAKERS (MAY-JUNE): **Martin Feinberg,** The Ohio State University (May 6) **| Didier Stainier,** University of California, San Francisco (May 13) **| Jack Taunton,** University of California, San Francisco (May 27) **| Andrew Murray,** Harvard University (June 10) **| Thierry Emonet,** Yale University (June 17) **| José Manuel Sanchez Ruíz,** Universidad de Granada (June 24)

The Institute Colloquium series will commence again in the next academic year. Colloquia take place every Monday at 4pm in the Raiffeisen Lecture Hall. The Institute Colloquium has an interdisciplinary flavor and is meant to be of general interest to the research community of IST Austria as well as that of Vienna and surroundings.

SELECTED RECENT PUBLICATIONS

Dyrk1A is dynamically expressed on subsets of motor neurons and in the neuromuscular junction: Possible role in Down syndrome | Arque G, Casanovas A & Dierssen M, 2013 | *PLoS One* 8(1)

Streamwise-localized solutions at the onset of turbulence in pipe flow | Avila M, Mellibovsky F, Roland N & Hof B, 2013 | *Physical Review Letters* 110(22)

Inference in two dimensions: Allele frequencies versus lengths of shared sequence blocks | Barton N, Etheridge A, Kelleher J & Veber A, 2013 | *Theoretical Population Biology*, in press

Strategy improvement for concurrent reachability and turn based stochastic safety games | Chatterjee K, de Alfaro L & Henzinger T, 2013 | *Journal of Computer and System Sciences* 79(5), 640-657

Beyond Dataset Bias: Multi-task Unaligned Shared Knowledge Transfer | Tommasi T, Quadrianto N, Caputo B & Lampert CH, 2013 | *LNCS ACCV* 7724

Sex differences in host defence interfere with parasite-mediated selection for outcrossing during host-parasite coevolution | Masri L, Schulte RD, Timmermeyer N, Thanisch S, Crummenerl LL, Jansen G, Michiels NK & Schulenburg H, 2013 | *Ecology Letters* 16(4), 461-468

Learning quadratic receptive fields from neural responses to natural stimuli | Rajan K, Marre O & Tkacik G, 2013 | *Neural Computation* 25, 1661-1692

Altruism can evolve when relatedness is low. Evidence from bacteria committing suicide upon phage infection | Refardt D, Bergmiller T & Kümmerli R, 2013 | *Proceedings of the Royal Society B* 280(1759)

The effect of one additional driver mutation on tumor progression | Reiter J, Bozic I, Allen B, Chatterjee K & Nowak M, 2013 | *Evolutionary Applications* 6(1), 34-45

Density Games | Novak S, Chatterjee K & Nowak M, 2013 | *Journal of Theoretical Biology* 334, 26-34

Coalescent simulation in continuous space | Kelleher J, Barton N & Etheridge A, 2013 | *Bioinformatics* 29(7), 955-956

Structural Counter Abstraction | Bansal K, Koskinen E, Wies T & Zufferey D, 2013 | *LNCS TACAS* 7795, 62-77

Holding on and letting go: Cadherin turnover in cell intercalation | Morita H & Heisenberg CP, 2013 | *Developmental Cell* 24(6), 567-569

Developmental refinement of vesicle cycling at Schaffer collateral synapses | Rose T, Schönenberger P, Jezek K & Oertner TG, 2013 | *Neuron* 77(6), 1109-1121

Scale invariance at the onset of turbulence in couette flow | Shi L, Avila M & Hof B, 2013 | *Physical Review Letters* 110(20)

A full list of publications from IST Austria can be found at publist.ist.ac.at.

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