



# NEWSLETTER

7th edition | November 2013



IST Austria hires young researchers as Assistant Professors, giving them full independence as well as the promise of promotion to Professor if they succeed to make their mark within the international scientific community. It is a pleasure to congratulate Michael Sixt on his promotion to Professor after going through a thorough evaluation by international experts. Michael has proven to be a world-class scientist and excellent group leader, having expanded the frontiers of human knowledge in cell biology and contributed significantly to the development of the Institute. This is also a milestone for IST Austria, as it is the first promotion of an Assistant Professor to Professor.

We are also welcoming 29 new PhD students, a record intake of our graduate school. Six PhD students have been awarded scholarships, supported through generous donations by Steven Heinz and the OMV. Such donations are an important indicator for our success, and I am grateful to Steven Heinz and the OMV for their trust in the quality of our education and research.

Thomas A. Henzinger | President, IST Austria

## AWARDS

### Prizes for Evolutionary Biologists

The German National Academy of Sciences **Leopoldina awarded the Mendel Medal to Nick Barton**, evolutionary geneticist and professor at IST Austria. The Academy honors Barton's preeminent scientific work in the field of population genetics and his contribution to the study of evolution. His research and study of the spatial subdivision of populations significantly contributed to our understanding of how species adapt, and how they split into new species. Since 2008, Barton has been Professor at IST Austria; he has received several awards, including the Darwin-Wallace Medal of the Linnean Society of London and the Darwin Medal of the Royal Society of London. **Sylvia Cremer**, Assistant Professor at IST Austria, received this year's **Walther-Arndt Prize** of the German Zoological Society for her research on the social immune system of ants. The prize, commemorating Walther Arndt, biologist and victim of the Nazi regime, is awarded every two years for outstanding scientific work in zoology.

## CAREER



### Michael Sixt - Promotion to Professor

Michael Sixt has been promoted from Assistant Professor to Professor. The cell biologist is the first to have undergone a tenure evaluation, which is compulsory according to IST Austria's tenure track model. At IST Austria, promising young scientists are offered positions as Assistant Professors, working as independent group leaders. After up to seven years, the Professorial Committee - chaired by Olaf Kuebler from ETH Zurich - decides on the promotion to Professor with an unlimited contract. The decision is primarily based on an external evaluation by international referees judging scientific achievements, including training, supervision and mentoring of PhD students and postdocs.

Michael Sixt aims to understand the molecular and mechanical principles of cell motility at the cellular and tissue levels. Currently, he uses leukocyte migration as a model for studying how the cell's internal skeleton produces

force to deform the cell, and how this force is transmitted to the surrounding tissue to propel the cell forward. This research should not only provide information regarding cell motility in immune cells, but may aid in the understanding of migration by other cell types, including malignant cancer cells.

Michael Sixt studied medicine at the Friedrich-Alexander University of Erlangen-Nürnberg, where he performed his predoctoral studies at the Institute of Experimental Medicine and finished his MD in 2002. Before he joined IST Austria in 2010, Sixt was Junior Group Leader at the Max Planck Institute of Biochemistry in Martinsried. Sixt has been awarded an ERC Starting Grant and the START prize by the Austrian Science Fund FWF both in 2011, an HFPS grant and the Ignaz L. Lieben-Prize by the Austrian Academy of Sciences (ÖAW) in 2012, was elected member of the "Junge Kurie" of the ÖAW and received the European Biophysical Societies Association (EBSA) Young Investigator Medal in 2013.

## FUNDRAISING

### Heinz and OMV PhD scholars at IST Austria

This fall, 29 new students enrolled at IST Austria's Graduate School, bringing the total number of students at IST Austria to 81. Six of the new students received a special honor at the very beginning of their scientific career, as they were selected as named scholars. Their study will be financially supported by two donors to IST Austria over the next three years.

As of this year, Steven Heinz, co-founder of Lansdowne Partners and Managing Director of Lansdowne Partners Austria GmbH, supports IST Austria's scholarship program with € 120'000. The oil and gas company

OMV has been supporting IST Austria, and in particular young researchers at IST Austria since 2008 with a donation of € 1 Mio.

The six student scholars come from five different countries and span all the disciplines represented at IST Austria: Roshan Prizak, who studied Electrical Engineering at IIT Bombay, and Ximena Contreras, who studied genomic sciences at National Autonomous University of Mexico, are Heinz scholars. Kristof Huszar (Mathematics at Eötvös Loránd University Budapest and Ruprecht-Karl University Heidelberg), Damaris Guerrero (Neurobiology at NAU Mexico), Isabella Tomanek (Molecular Microbiology at the University of Vienna) and Alexander Zimin (Applied Mathematics at Yaroslavl State University RU and Central European University in Budapest) were awarded OMV scholarships. The six promising doctoral students were chosen by a jury consisting of IST Austria postdocs, based on their achievements during their undergraduate studies.



## GRANTS



### ERC Advanced Grant for Laszlo Erdős

Mathematician Laszlo Erdős, Professor at IST Austria, has been awarded an Advanced Grant by the European Research Council

(ERC). This is the 13th ERC grant for the IST Austria faculty of 29 professors. The grant for Erdős, who works on the mathematics of disordered quantum systems and matrices, is funded with € 1.75 Mio for five years.

In his project, Laszlo Erdős will tackle the universality of the random matrix theory (RMT), which reaches back to the 1950s. Trying to calculate the spacings of energy levels of nuclei in heavy atoms, Eugene Wigner proposed to replace the intractable quantum model by a much simpler matrix, in which numbers are filled in at random. This allowed Wigner to reproduce the statistics of the energy level spacings in uranium. Although experimental data leave no doubt that Wigner's substitution is correct, the reason why it works is not fully understood.

In his project, Laszlo Erdős asks whether Wigner's reduction is justified with mathematical rigour. Extending RMT to other physical systems, Laszlo Erdős intends to move the simplified random matrix model back towards the original object of research from physics. He asks whether the random matrix model is also underlying other physical models, and whether the "intermediate" approaches he develops may be used to mathematically solve other long-standing questions in physics, such as the metal-insulator transition in the Anderson model. The mathematical ideas and tools developed as part of Erdős' work will extend RMT.

Laszlo Erdős studied mathematics at the Loránd Eötvös University in Budapest, and earned his PhD at Princeton University in 1994. He held positions at ETH Zurich, the Courant Institute and the Georgia Institute of Technology. Erdős took up a chair in Applied Mathematics at the LMU Munich in 2003 and joined IST Austria in 2013.

## GRADUATIONS

In the past months, two graduate students successfully completed their studies at IST Austria: Damien Zufferey, PhD student in the Henzinger group, passed his thesis defense on August 19, and Pedro Camphino, PhD student in the Heisenberg group, defended his thesis on October 3. Pedro will take up a postdoc position at IGMBC Strasbourg in 2014. Damien is the first student to finish his PhD who did not transfer to IST Austria with a professor from a previous institution. He joined the Henzinger group in 2009 to work on his thesis on the verification of dynamic message passing programs. Damien has already moved to a postdoc position at MIT, where he now works at the Computer Science and Artificial Intelligence Laboratory in the group of Martin Rinard.

## ACHIEVEMENTS

One of the things that unite the postdocs of IST Austria is that they have performed excellent research before joining IST Austria. This is shown again by recent prizes for and publications by postdocs. Mateusz Sikora received a prize for the best PhD diploma in 2012 by the Institute of Physics of the Polish Academy of Sciences for his thesis in theoretical physics focusing on theoretical models of protein unfolding, as well as an EMBO long-term fellowship grant to support his work in the Heisenberg lab. Marjon de Vos published her thesis project on genetic stand-stills in evolution, done at FOM Institute AMOLF, Amsterdam, in PLoS Genetics in June. In his PhD thesis, Alvaro Ingles Prieta developed a method that digs up fossil protein structures to reveal how they evolved; his work was published in Structure on August 8. Anna Staron received one of three thesis awards by the Association of General and Applied Microbiology in Germany, for her work on bacterial sigma factors.



## IST LECTURE

On October 10, 130 people were all ears in the Raffeisen Lecture Hall, listening to Bruce Levin's IST Lecture on adaptive immunity in bacteria. In a captivating talk, Bruce Levin presented the results of modeling and experiments done to explore the upside and downside of CRISPR-Cas immunity. Levin considered the nature of and factors imiting arms race between bacteria and phage, and put forth a hypothesis to account for the extraordinary diversity in the existence, number and function of CRISPR-Cas systems within and between species of bacteria and archaea.



## CELL BIOLOGY

How cells can "find out" precisely which position they have in the embryo is the subject of a study that appeared in PNAS in October, with Gašper Tkačik as coauthor. Cells in a developing embryo have no direct way of measuring their physical position; however, this "positional information" is essential for correct development. The researchers took up the task of putting "positional information" onto a firm basis using information theory. Their results show that the patterns of gap gene expression in the fruitfly embryo provide enough information to specify every cell's position with a relative error as low as 1%. This quantitatively demonstrates that all the required patterning information along the long embryo axis can be encoded by the gap genes. The researchers also find that the gap genes in the fruitfly form an astonishingly efficient code for position.

## SCIENCE FESTIVAL

**Leila El Masri**, postdoc in Sylvia Cremer's group, won the Science Slam held as part of the **Vienna Science Festival**, describing her research on ant immune systems in just five minutes.

Thousands of children and adults also visited IST Austria's stall at the Festival on September 14-16. We welcomed them at our small theme park 'Medical and health care in ant colonies', set up in a huge tent next to the Naschmarkt, and gave insights into collective disease defenses in ant colonies.



## COLLOQUIUM SPEAKERS

FUTURE SPEAKERS (NOVEMBER - JANUARY): **Spencer Barrett**, University of Toronto (Nov 11) | **Tomas Jungwirth**, Institute of Physics, Academy of Sciences of the Czech Republic (Nov 25) | **Kate Carroll**, The Scripps Research Institute (Dec 2) | **Silvia Arber**, University of Basel (Dec 9) | **Emo Welzl**, ETH Zurich (Jan 13) | **Tomas Bohr**, Technical University of Denmark (Jan 20) | **Deborah Gordon**, Stanford University (Jan 27)

## SELECTED RECENT PUBLICATIONS

**Can quantitative and population genetics help us understand evolutionary computation?** | Barton NH & Paixao T, 2013 | *GECCO ACM 2013*, 1573-1580

**Efficient synthesis for concurrency by semantics-preserving transformations** | Cerny P, Henzinger T, Radhakrishna A, Ryshyk L & Tarrach T, 2013 | *LNCS CAV 8044*, 951-967

**Faster algorithms for Markov decision processes with low treewidth** | Chatterjee K & Łacki J, 2013 | *LNCS CAV 8044*, 543-558

**Complete genome sequence of the novel phage MG-B1 infecting bacillus weihenstephanensis** | Redondo RAF, Kupczok A, Stift G & Bollback JP, 2013 | *Genome Announcements* 1(3):e00216-13

**ECHIDNA-mediated post-Golgi trafficking of auxin carriers for differential cell elongation** | Boutte Y, Jonsson K, McFarlane HE, Johnson E, Gendre D, Swarup R, Friml J, Samuels L, Robert S & Bhalarao RP, 2013 | *PNAS* 110(40), 16259-16264

**Environmental dependence of genetic constraint** | de Vos M, Poelwijk FJ, Battich N, Ndika JDT & Tans SJ, 2013 | *PLoS Genetics* 9(6), e1003580

**Liquid surface tracking with error compensation** | Bojsen-Hansen M & Wojtan C, 2013 | *ACM Transactions on Graphics*, Article 68

**Extending continuous maps: Polynomiality and undecidability** | Čadek M, Krčál M, Matoušek J, Vokřínek L & Wagner U, 2013 | *STOC* 595-604

**Three functions of cadherins in cell adhesion** | Maître JL & Heisenberg CP, 2013 | *Current Biology* 23(14), R626-R633

**Accumulation of spontaneous mutations in the ciliate *Tetrahymena thermophila*** | Long H, Paixao T, Azevedo RBR & Zufall RA, 2013 | *Genetics* 195(2), 527-540

**Stable Length Estimates of Tube-Like Shapes** | Edelsbrunner H & Pausinger F, 2013 | *Journal of Mathematical Imaging and Vision* 10.1007/s10851-013-0468

**A full list of publications from IST Austria can be found at [publist.ist.ac.at](http://publist.ist.ac.at).**

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