UPPSALA UNIVERSITET

Tokyo Tech

Plenary speakers and breakout session conveners
3rd Tokyo Tech - Uppsala University Joint Symposium
Uppsala University, Ångström Laboratory
September 12-13, 2016

Eva Åkesson, Prof.
Vice Chancellor,
Uppsala University

Eva Åkesson is a professor of chemical physics. She completed her undergraduate education in chemistry and her doctoral education in physical chemistry at Umeå University. She did her postdoctoral work at the University of Minnesota, USA. She was selected as senior researcher by the Research Council in the field Photochemical reaction mechanisms 1996.
In 1996 she was employed by Lund University, and, besides doing research, she also worked as a teacher and director of studies. During the years 2003-2008 she was Vice-Rector of Lund University with special responsibility for undergraduate education and the Bologna Process. From 2009 to 2011 she was Deputy Vice-Chancellor of Lund University, with special responsibility for basic and advanced level studies issues, quality work, and related internationalization matters.

Johan Tysk, Prof.
Vice-rector for Science and Technology,
Uppsala University

Johan Tysk is professor of mathematics. He studies parabolic PDE's and stochastic differential equations, often in connection with problems in finance. Previously, he has done research in differential geometry. He is Vice-rector of the Disciplinary Domain of Science and Technology from July 1, 2014, and member of the Royal Academy of Arts and Sciences of Uppsala and of the Royal Society of Sciences.

Yoshinao Mishima, Prof.
President,
Tokyo Institute of Technology

Yoshinao Mishima has served as the 21st president of Tokyo Tech since October 1, 2012. He has guided the Institute toward further education and research enhancements through vigorous reforms and increased international partnerships, something he was already deeply involved in as executive vice president for education and international affairs before his inauguration.
A member of the Tokyo Tech faculty since 1981, Mishima held assistant and associate professor posts at the Precision and Intelligence Laboratory before becoming professor at the Department of Material Science and Engineering in the Interdisciplinary Graduate School of Science and Engineering in 1997. He served as dean of the graduate school from 2006 to 2009, director of the Frontier Research Center in 2010, and director of the Solution Research Laboratory in 2011.

Makoto Ando, Prof.
Executive Vice President for Research,
Tokyo Institute of Technology

Makoto Ando assumed office as executive vice president for research at Tokyo Tech in April 2015. Ando earned his bachelor's, master's, and doctoral degrees in engineering from Tokyo Tech in 1974, 1976, and 1979 respectively. After a three-year stint as senior researcher at NTT's Yokosuka Electrical Communications Laboratories, he returned to Tokyo Tech as research associate in the School of Engineering in 1982, where he became associate professor in 1985. Ando was promoted to the position of professor in the School of Engineering in 1995, and became professor in the Graduate School of Science and Engineering in 2000.

Marika Edoff, Prof.
Uppsala University

Marika Edoff is professor and leader of the research of Thin Film Solar Cells at Uppsala University. She is also vice-dean of the faculty of Science and Technology. She obtained her PhD from the Royal Institute of Technology (KTH) in 1997 and started at Uppsala University later the same year. In 2003 she became group leader and she became a professor in 2012.

The research in the Thin Film Solar Cell group is focused on solar cells based on Cu(In,Ga)Se2 and Cu2ZnSn(S,Se)4. The group, which consists of 25 seniors, post-docs, PhD students and one engineer, has a full solar cell lab research line in the Ångström clean room at Uppsala University, where we study both synthesis of materials and devices as well as perform characterization and make theoretical studies. The best devices from our research are above 20 % efficiency for Cu(In,Ga)Se2 solar cells and above 9 % for Cu2ZnSn(S,Se)4.Both these results are among the best results in the world for respective material. Cu(In,Ga)Se2 and Cu2ZnSn(S,Se)4 are both materials with very high absorption coefficients and can be fabricated with methods suitable for high volume production, such as evaporation and sputtering. It is also possible to tailor the absorption edge (bandgap) to fit the solar spectrum. Apart from the solar absorption layers, the group also perform high level research on buffer layers for solar cells, transparent conducting layers with high mobility, back contact passivation and optical properties of solar cells, e.g. plasmonic effects.

Kristina Edström, Prof.
Dean of research,
Uppsala University

Kristina Edström is Professor of Inorganic Chemistry with a special interest in energy storage materials and materials characterization using in situ techniques for studying dynamic phenomena. A special emphasis is on Li- and Na-based batteries. Prof. Edström is head of the Structural Chemistry research group at the Department of Chemistry – Ångström Laboratory, and she is also Dean of Research at the Faculty of Science and Engineering. She acts as a board member of the Swedish Synchrotron MAXIV Laboratory and KIC Innoenergy. She is also a member at large in the Battery Division within the Electrochemical Society, a member of the battery network of excellence in Europe ALISTORE and a member of the Swedish Royal Academy of Engineering Sciences. The research in Prof. Edström's group is presently devoted to development of electrode and electrolyte materials for batteries, especially for Li- and Na-ion, 3D microbatteries, Li-S, Li-O2, and Organicbased Li- and Na-batteries. The group has designed, built, and tested different in situ battery cells for X-ray and neutron diffraction and is currently pushing the development of ambient-pressure surface characterization techniques in collaboration with the Dept. Physics and Astronomy. The group is studying the materials in battery cells and both mechanisms for ion-insertion/extraction in the materials and reactions occurring at the electrode/electrolyte interfaces are of prime interest. For the interpretation of the mechanisms both experimental and theoretical calculations are important and the group consists of a number of scientists with expertise competences ranging from electrochemistry, polymer science, DFT, MD and FEA analysis.

Satoru Fujitsu, Prof.
Tokyo Institute of Technology

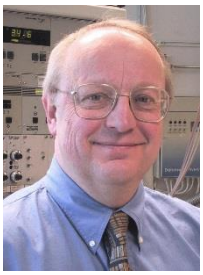
Fujitsu joined Tokyo Institute of Technology as a project manager (Professor) of Hosono FIRST Superconductor Project (Project Leader: Prof. Hideo Hosono) in 2010 which was a big national research project to explore new superconductors and relevant functional materials. The main material of this exploration was the iron based superconductor (IBSC) which was discovered by Hosono group in 2006 and rekindled the research of superconductors worldwide. The discovery of IBSC was accepted with surprise by condensed matter community because iron with a large magnetic moment was widely believed to be the most harmful to emerge superconductivity.

In early 2009, the Japanese Government announced to launch a new large funding program FIRST (Funding Program for World-Leading Innovative R&D on Science and Technology). The aim of the FIRST Program is to advance the kind of leading-edge research and development that will strengthen Japan's international competitiveness while contributing to society and people's welfare through the application of its results. Hideo Hosono's proposal "exploration for novel superconductors and relevant functional materials, and development of superconducting wires for industrial applications" was fortunately selected as one of 30 projects.

The project found several tens of new superconductors by examining ~1000 materials, each of which was chosen by Japanese experts with a background in solid state chemistry. Unfortunately, high Tc material over 77K has not discovered here, but many new superconductors, high Jc superconducting wire of IBSC, new functional materials as active catalysis of C12A7 have been developed, which became to seeds of new research trend and connected to the next research project. All of materials containing unsuccessful results are reviewed in "Science and Technology of Advanced Materials" in 2015.

Denis Gaidashev, Assoc. Prof.
Uppsala University

Denis Gaidashev is a senior lecture and a docent at the Department of Mathematics, UU. He obtained his PhD in 2003 from the University of Texas in Austin, USA in 2003. Denis had visiting positions at the University of Toronto, Canada, KTH, Stockholm, the University of Montreal, Canada, Bergen University, Norway, before settling in Uppsala in 2009.
Denis works in the field of dynamical systems, specifically, renormalization theory and complex dynamics. He has coauthored about 20 publications and participated in several large computational projects.
Outside of academia his interests include sports and amature astronomy.



Claes-Göran Granqvist, Prof.
Uppsala University

Claes G Granqvist is senior professor in solid state physics. His research is focused on new materials for innovative building technology. In particular, the research deals with electrochromic and thermochromic thin films and nanomaterials, which are able to vary their throughput of visible light and solar energy with electrical charge and temperature as control parameters, respectively, so that energy efficient windows and glass facades can be created.

Masaki Hayashi, Assoc. Prof.
Uppsala University

The breakout session "Serious game and human interface" is aiming at making a startup for viable collaboration between the game design in Uppsala University (UU) and the human interface technologies in Tokyo Institute of Technology (TT). The session consists of three parts. First, we have a talk session where researchers from UU and TT will present their recent activities in serious games and human interface technologies, respectively. Then after, we have a demo session where people of TT will present their technologies actually showing their working devices in a free accessing style seminar to have intense discussion on those. Finally, game designers of UU will work out possible game ideas based on the discussion and will make a pitch. Lastly, UU and TT will discuss to find a way to have feasible collaboration in the future.

Andreas Hellander, Assoc. Prof.
Uppsala University

Hellander graduated with a MSc. in Biotechnology Engineering in 2006 and a PhD in Scientific Computing in 2011, both from Uppsala University. After at postdoc at University of California Santa Barbara, he returned to Uppsala as a strategic recruitment within the Swedish strategic research programme eSSENCE. He currently holds a position as Associate Professor and senior lecturer in Scientific Computing.
Hellander leads a computational science and engineering group located at the Division of Scientific Computing at the Department of Information Technology, Uppsala University. With a core in computational systems biology, our team pursues diverse topics ranging from multiscale simulation of gene regulatory networks to cloud computing and the design and implementation of modern computational science and engineering software. We also engage in education in applied cloud computing and data-intensive computations, and in the development of cloud computing infrastructure in Sweden, the SNIC Science Cloud.
A current core interest in the group is to develop new, smart services to help modelers utilize advanced simulation algorithms to explore models under a wide range of conditions (parametric studies). Such computational experiments require very large computational resources and are generators of big data. We are developing tools and techniques to make informed decisions about what data to store where and when, how to optimally stage data based on its potential to be useful to the modeler rather than on more classical metadata, and how to automate this process using modern ICT-infrastructure.

Ane Håkansson, Prof.
Uppsala University

The research within the research programme, Applied Nuclear Physics (http://www.physics.uu.se/research/ applied-nuclear-physics/), comprises four main research fields: 1. Safeguards, fast rectors, fuel diagnostics and back-end. 2. Nuclear reactions, nuclear data and Total Monte Carlo approaches to various nuclear engineering issues, 3. Fusion plasma diagnostics. 4. Ion Physics with material analysis and bio medicine application. In total, the research programme holds about 60 employees.

One area of research relevant for this symposium is today's and the future nuclear power technology e.g. Generation IV and fusion. The research has been developed during twenty-five years with a close collaboration with the Swedish nuclear industry and relevant authorities. In particular the research focus is put on the safety and security aspects of nuclear power utilisation.

Another important task undertaken within the research programme is education. There is extensive education and teaching efforts on all levels; undergraduate, graduate and the unique contract education directed towards personnel in the nuclear industry and authorities. Our unit, Nordic Academy for Nuclear Safety and Security, NANSS (http://www.nanss.uu.se/) is of particular interest here with its broad scope of educational efforts within nuclear power, directed towards an international audience. NANSS coordinates expertise in the Nordic countries and tailor this competence into various courses with focus on, in particular, the non-technical issues of nuclear power safety and security.

Mikael Höök, Assoc. Prof.
Uppsala University

My research intertwines geoscientific knowledge with technical, economic and social research to describe, understand and model how energy systems change over time and how they interact with economy, environment and society. This is primarily done using quantitative modelling. My main focus is fossil fuels, but I also deal with renewable energy technologies and the materials they rely on for construction.

Manabu Ihara, Prof.
Tokyo Institute of Technology

Prof. Ihara attempt to propose and develop next generation solar cells (Plasmonic solar cells, Nanostructures Si solar cells etc.) and solid oxide fuel cells (Direct liquid-fuel fuel cells, H2 storage using electrolysis etc.) using the results from the basic researches, such as analysis of the chemical/electrochemical reaction mechanisms at microscopic view which is a key issue for the improvement of energy conversion, and the development of materials with new properties by making nanostructure and/or by new fabrication processes. A feature of Prof. Ihara's researches is that the both of the elemental energy technologies and an energy system have been developed at the same time. Therefore, he develops an efficient and high functional energy system of "ENE-Swallow" have been developed and demonstrated in Ookayama campus of Tokyo tech.

A Tokyo Tech. team led by Prof. Ihara has added 738 kW solar cells, 105 kW gas engines, and 96 kW lithium ion secondary batteries to the Ookayama Campus at the end of March 2015. The increase in the distributed power generation capability at the Okayama Campus (Tokyo) is being carried out as part of a project to establish an original smart energy system —"ENE-Swallow ver.3" designed by Prof. Ihara. The "Ene-Swallow ver.3" can collaboratively operates with the energy system of the almost totally power self-sufficient 'Environmental Energy Innovation Building' (EEI)—Tokyo Tech's flagship 'energy conscience research facility' that has 650 kW solar cells and 100 kW phosphoric acid fuel cell. The system is highly efficient at driving each distributed power source and controlling the peak cut with a power prediction equation based on the real-time data. Furthermore, in the case of power failure each distributed power source in "Ene-Swallow ver.3" work together to supply electric power to the EEI building, thus self-sustained operation is possible.

Junichi Iijima, Prof.
Tokyo Institute of Technology

MEXT-Ministry of Education, Culture, Sports, Science and Technology – Japan offered proposals on EDGE (Enhancing Development of Global Entrepreneur Program) for public subscription in 2014.

Our project called CBEC (Cross-Border Entrepreneur Cultivating) program has been accepted among overall 13 proposals adopted. Our program has three pillars, Blue – Design Thinking, Yellow – Business Administration and Red – Entrepreneurship Theory. And it has Startup Weekend TokyoTech as the entrance for encouraging students for joining us and Competition as the exit of our program.

In order to make teams like melting pot to keep diversity, we are inviting people from large companies, SMEs from O-ota city, students from Art Universities and foreign universities. Our approach is not traditional Discovery-oriented but rather Market-oriented and it will be placed at one of the main issue in Office of Industry Liason (OIL) of TokyoTech.

Masako Ikegami, Prof.
Tokyo Institute of Technology

Prof. Ikegami's interdisciplinary research focuses on science, technology and international security, ranging from decision-making analysis in the nuclear age, nuclear deterrence & strategy, nuclear security & non-proliferation, political economy & policy analysis of defence industry/technology R&D and global transfer of advanced technology, regional security & confidence building measures for conflict prevention, and crisis management & human security. Her major publication includes The Military-Industrial Complex: The Cases of Sweden and Japan (Dartmouth 1993), "Japan" in R. Pal Singh (ed.) Arms Procurement Decision Making, Volume I (SIPRI: Oxford University Press, 1998), "Japan: a latent supplier of dual-use technology" in H. Wulf (ed.) Arms Industry Limited (SIPRI: Oxford University Press, 1993); Her latest publication "Seeking a path toward missile nonproliferation: A Japanese response" appears in Global Forum, Bulletin of the Atomic Scientists (forthcoming 2016). Formerly she was Director (2001-08) of and a professor at the Center for Pacific Asia Studies, Stockholm University. She has been an active member of the Pugwash Conferences on Science and World Affairs (Nobel Peace Prize 1995) as well as Abe Fellow (2010) at the East-West Center in Washington, D.C. and Honolulu. She holds Doctor of Sociology (University of Tokyo, 1996) and Ph.D. in peace and conflict research (Uppsala University, 1998).

Gunnar Ingelman, Prof.
Uppsala University

Theoretical particle physics related to experiments: strong interaction theory, quantum chromodynamics (QCD), physics beyond the Standard Model and astroparticle physics. Methods include computer simulations with Monte Carlo techniques.

Fumiharu Kato, Prof.
Tokyo Institute of Technology

While at the basis of ordinary mathematics lie the real and complex numbers, mathematics based on the p-adic numbers has recently attracted more and more attention. One of the most prominent features of p-adic mathematics, so to speak, is its strong affinity to number theory, which provides "analytic" approach to number theory and arithmetic geometry. Through the so-called non-archimedean uniformization, which is perhaps one of the most important techniques in non-archimedean mathematics, we conduct researches on e.g. p-adic triangle groups and p-adic differential equations. Another challenge is to give sound foundations of rigid geometry, which is one of the ultimate generalities of non-archimedean geometries.

Yuriko Kawakubo, Deputy Director
JSPS Stockholm

The Japan Society for the Promotion of Science (JSPS) is an independent administrative institution, established for the purpose of contributing to the advancement of science. We are concerned not only with the natural and applied sciences but also humanities and social sciences. JSPS operates under the auspices of the Japanese Ministry of Education, Culture, Sport, Science and Technology (MEXT).
JSPS plays a key role in the administration of various scientific and academic programs. While working within the broad framework of government policies established to promote scientific advancement, we try to carry out our programs in a manner flexible to the needs of the participating scientists.

Itsuo Kumazawa, Prof.
Tokyo Institute of Technology

In this session, technologies for human interface are presented with some demonstrations. These technologies are applied to gaming including serious games, virtual reality and any situation where human and machine interaction is needed. Talks and demonstration with collaborating students on the following topics are given.
(1) Ultrafast image sensing to minimize latency in generating feedback for virtual reality system.
We present the original method and the innovative device for image sensing that combines the ultrafast optical image sensor that is used in the computer mouse and the Leap Motion to detect the very quick motion of the human hand and the fingers. This technique is essential to improve the reality and usability of virtual reality applications. The demonstration of the technique is given with a poster presentation.
(2) Brain Machine interface.
Human interface is a device which is used by users to interact with application or machine. Computer mouse is one of the popular human interface device, but recently our hand is also used as human interface for mobile device, such as tablet, smart phone. Brain Machine interface is proposed recently and we can control machine by brain activities. In this talk, BMI is introduced by video.
(3) Haptic technologies.
The use of haptic sensing and feedback devices is getting more popular to provide realistic information. Several demos are provided to facilitate fruitful discussions on multimodal human-computer interfaces in gaming context.

Marcus Lindahl, Prof.
Uppsala University

Professor Marcus Lindahl is Chair of Industrial Engineering & Management, Dept of Engineering Sciences. Lindahl´s research is generally focused on innovation, organizing of product development & project management within technology intensive environments. Lindahl is currently heading two major research efforts, ”Hidden innovation” and “Sustainable visits”. The project “Hidden innovation” address issues of how innovation may be enabled and stimulated in highly conservative markets. The energy and medical device business define two empirical research areas. One key research question is how we may understand new strategies of innovation and product introduction where market actors for instance have lost part of their innovation assessment capacity do to de-investment in for instance system development & operations.

The program “Sustainable visits” is a broad initiative to develop new knowledge and management methods that secure economic, social and ecological sustainability within a highly expansive tourism industry. The program´s main research focus is on maritime cruise tourism in the Baltic Sea. Several cross-disciplinary research efforts are pursued, spanning innovation& entrepreneurship, the utilization of ecological and social resources to historical perspectives on tourism industry development. Here Lindahl is also active to incorporate innovation & entrepreneurship education programs into an integrated research & education initiative in the Uppsala University Campus Gotland.

Hans Nylén,
Manager of operations,
STUNS Energi

Uppsala Energy Stories is a concept developed by STUNS (The Foundation for collaboration between the Universities in Uppsala, the business community and the public sector) in which students writing their candidate theses are matched with real case challenges gathered from small and medium enterprises (SMEs) in the Uppsala region. The aim is to provide relevant and authentic tasks for the students while help solving challenges for the SMEs, often related to business development within clean tech. The concept involves progressive introduction to entrepreneurial mindsets and tools, such as Lean Startup, pitchtraining and early stages of Customer Development, thus making students better prepared for the future labor market and hopefully a bit more prone to entrepreneurship and/or intrapreneurship.

Kei Sakaguchi, Assoc. Prof.
Tokyo Institute of Technology

Prof. Sakaguchi has been working on wireless systems more than 15 years such as IEEE802.11n/ad/ay WLAN and 3GPP LTE/LTE-A/LTE-A Pro/5G cellular networks. His academic skills are in system design using multiple antennas and higher frequency. Recently, he has expanded his scope to non-communication applications such as wireless energy transmission, building automation using wireless networks, and infrastructure assisted autonomous driving. In 2015, he received another position in Fraunhofer HHI in Germany to promote mmWave based 5G systems by harmonization between Europe and Japan.

Lars Stolt, Adjun. Prof.
Uppsala University

Dr. Lars Stolt has worked with solar cell R&D since 1982, after his graduation in electronics from Uppsala University in 1982. In September 2003, Stolt left the university and became the managing director of a spin-off company, Solibro AB, developing production technology for CIGS thin film solar cells. He is one of the co-founders of Solibro AB, and since the start of the activities, Stolt has remained the CTO. During 2007-2014, Stolt served as a Member of Scientific Advisory Council at Helmholtz Centre for Materials and Energy, Berlin. Now, since January 2014, he holds a position of Adjunct Professor at Department of Engineering Sciences, Uppsala University, in addition to his CTO role at Solibro.

Misako Takayasu, Assoc. Prof.
Tokyo Institute of Technology

The accelerated increase in the level of information this century has seen the generation of a greater amount of big data on human behavior than ever before. The Advanced Data Analysis and Modeling Unit (in short ADAM) in Tokyo Tech utilizes big data owned by public and private entities in an integrated manner to clarify phenomena in human society from a scientific viewpoint. The unit attempts to express changes in society through equations applying both mathematics and physics. Expansion in this field of research will make possible the prediction of future conditions in economic and social systems in much the same way we now forecast weather utilizing airflow equations. Examples of the systems developed by this research unit are PUCK-tools, financial market data risk analysis tools included in standard applications used in the financial industry, and the estimation algorithms and transactions among Japanese companies are used by RESAS, a regional economy analysis system provided by the Cabinet Office. The unit conducts joint research with private companies, governmental institutions, and universities in several countries.

Kenji Takeshita, Prof.
Tokyo Institute of Technology

The Advanced Nuclear Fuel Cycle Unit that I represent is a research group developing technology for the processing of high-level radioactive liquid waste (HLLW) produced in the nuclear fuel cycle. The goal of the unit is to establish a safe, environmental preservation-type low-emission nuclear fuel cycle that significantly reduces environmental load and radiation risk. Main research subjects of the unit are as follows.

(1) The vitrification process in a spent nuclear fuel reprocessing plant is very important for the safe disposal of HLLW. We are developing technologies to vitrify HLLW for high volume reduction and to recover and separate platinum-group metals and molybdenum from HLLW. They are useful for the stable operation of vitrification process and the downsizing of disposal facility.

(2) The partitioning and transmutation (P&T) of minor actinides (MA) contained in HLLW are valid for reducing the radiotoxicity of HLLW drastically. We are developing a soft-donor extractant for the separation of MA and established a practical MA separation process. This will make it possible in the near future to reduce the radiotoxicity of HLLW to the natural uranium level within 300 yr and become a solution to the root of the nuclear waste problem.

(3) We are also developing technology to remove radioactive materials that are released to the natural environment by nuclear accidents. A washing process using subcritical water was developed for the recovery of radioactive cesium from contaminated soil generated by the Fukushima Daiichi NPP accident. Furthermore we started the sociological approach to solve the environmental radioactivity problem, such as the exchange of opinions with local residents and the creation of scenarios to form agreements that lead to problem solving.

Thiemo Voigt, Prof.
Uppsala University

Prof. Thiemo Voigt leads the Uppsala Networked Objects (UNO) group. UNO networks all kind of objects from the tiniest sensors and actuators to more full-blown objects such as quadrocopters in a reliable, secure and efficient way. Our current research foci are battery-free Internet of Things and visible light communication.