Conferences and Workshops

Spectroscopies in Novel Superconductors (SNS2019)

June 16-21, 2019
K. Okazaki and H. Wadati

SNS 2019 follows a successful series of international conferences in Argonne (1991), Sendai (1992), Santa Fe (1993); Stanford (1995), Cape Cod (1997), Chicago (2001), Sitges (2004), Sendai (2007), Shanghai (2010), Berkeley (2013), and Stuttgart (2016). Leading experts in spectroscopy, transport, materials, and theory meet to address current issues in the frontier of superconductivity research. Highlights to be discussed include the pairing mechanisms of cuprates, ruthenates, iridates, iron compounds, heavy-fermion systems, organic compounds, and low-dimensional materials; interplay between superconductivity and competing orders; topological superconductivity; superconductivity in 2D materials, at surfaces, and interfaces; non-equilibrium superconductivity and its dynamical control; experiments under extreme conditions; new experimental methods; and the design and discovery of novel superconductors with higher transition temperatures. This conference was held at Ito international research center, the University of Tokyo, and organized by the international steering committee, of which chair is Professor Arun Bansil (Northeastern University, USA), the program committee, of which chair is Professor Takami Tohyama, and the organizing committee, of which chairs are Professor Atsushi Fujimori and Professor Shik Shin, and advised from the international advisory committee. There are 208 participants from 21 countries mainly from Japan, China, and USA. As main topics, the recent progress in charge ordering and physical properties under uniaxial pressure of cuprate high-Tc superconductors, nematic electronic states of cuprates and iron-based superconductors, non-equilibrium superconductivity, superconductivity in magic-angle bilayer graphene, topological superconductivity, and Higgs mode in superconductors were presented. The programs proceeded in a single track without parallel sessions, and there were 193 presentations including 75 oral presentations (47 invited presentations) and 118 poster presentations. During the conference, discussions were actively conducted every day. In the closing session, it was announced that the next conference will be held at Bangalore in India, and 6 young researchers were awarded the young researcher's prize.

Computational Approaches to Quantum Many-body Problems (CAQMP2019)

July 16 - Aug. 8, 2019

K. Harada, K. Ido, R. Kaneko, N. Kawashima, Y. Kuramashi, T. Misawa, S. Morita, Y. Motoyama, T. Nishino, T. Okubo, T. Sakurai, T. Suzuki, K. Tamai, S. Todo, and K. Yoshimi

This event is one of the series of long-term annual international workshops started in 2006, in which a theoretical staff member serves as the principal organizer. A relatively small number of researchers stay in one place for a longer period than ordinary meetings, focusing on the subjects of remarkable recent progress. The 2019 workshop (CAQMP2019) was the 13th in the series. The theme of CAQMP2019 was the tensor network and its application. The 2016 workshop (TNQMP2016) was also dedicated to this subject. Between two workshops, there have been many advances in the methodology and application. Also, researchers recently became aware of connection between the tensor network and information science. Reflecting them, in the first week of the workshop, we discussed new numerical calculation methods, in the second week, the tensor network method, and in the third week, we focused on the connection with information science. The 4th week was dedicated to the comparison between calculations and experiments. We used the same format as in TNQMP2016, *i.e.*, on Mondays, we have symposia, each consisting of 30-minute talks, and from Tuesday to Friday, there was a lecture in the morning and a seminar in the afternoon. The list of the participants included: Anders Sandvik (Boston), Tao Xiang (CAS, Beijing), Laurence Vanderstraeten (Ghent), Yoshinobu Kuramasu (Univ. Of Tsukuba), Guangming Zhang (Tsinghua), Qibin Zhao (RIKEN), Hyun-Yong Lee (ISSP), Lei Wang (CAS, Beijing) and Cristian Batista (Tennessee). The total number of participants, including lectures and symposia, was 538 (of which 380 were lectures and 158 were symposia). Many lectures held this time were all recorded and uploaded to YouTube.

New Perspective in Spin Conversion Science (NPSCS2020)

February 3-4, 2020
Y. Otani, E. Saitoh, M. Shiraishi, S. Murakami, and A. Oiwa

Spin conversion is a generic term for the phenomena associated with the interconversion between different physical entities such as electricity, light, sound, vibration, and heat that are mediated by spins. Most spin-conversion phenomena take place at the nanoscale in the regions near the interface of two diverse varieties of materials, such as magnets, non-magnets, semiconductors, and insulators. The fundamental understanding of the spin conversion phenomena will thus allow us to develop novel functionalities applicable to practical energy-efficient spintronics as well as thermoelectric devices.

Therefore, we set the purpose of this workshop is for the international spintronics research community, especially for the world-leading foreign and domestic researchers working on the spin conversion phenomena, to exchange the most recent experimental and theoretical achievements on the spin conversion science. This workshop was also held as a concluding meeting of the Grant in Aid for Scientific Research in Innovative Areas, "Nano-Spin Conversion Science" conducted from 2014 to 2020.

The workshop was a great success. The 21 invited talks covered a variety of research topics such as spin-charge interconversion at the topological surface and Rashba interface states, the magnon-phonon coupling, antiferromagnet spintronics, superconducting spintronics, and also neuromorphic computing using spin conversion phenomena. Young researchers and graduate course students gave 53 poster presentations and participated in animated discussions at the workshop. The total number of participants was 183. Lastly, we much appreciate everyone's generous support, including the organizers, judges, directors, secretaries, and student part-timers. Without any help from the members, this could not have been accomplished.

Computational Materials Science —New Perspectives—

April 2-3, 2019

T. Ozaki, N. Kawashima, O. Sugino, H. Noguchi, Y. Higuchi, S. Morita, H. Watanabe, H. Kawamura, J. Haruyama, T. Hoshi, T. Tohyama, and H. Okuyama

This workshop was organized for the computational condensed matter research community, especially for the users of the ISSP supercomputers, to exchange the most recent research progress and related information on the computational condensed matter research and on the high-performance computation of related research areas. This was held as a series of annual workshop of ISSP supercomputer that has been held every year. The selected topics include the target of the post-K supercomputer project, the progress made in the elements strategy projects, the emergent data-driven material research, and "the Project for advancement of software usability in materials science" that in 2019 developed abICS, which is a software framework for performing configurational sampling in disordered systems, with a specific emphasis on multi-component solid state systems such as metal and oxide alloys, and TeNes, which is a solver for 2D quantum lattice system based on a PEPS wave function and the CTM method. In addition to 16 invited talks and 30 poster presentations, two special lectures were given by Prof. Miyashita and Prof. Fujii for quantum states of photons and quantum computing, respectively.

Joint Workshop of Novel Material Development and Measuring Technique by Using High-Pressure

July 5-6, 2019

F. Iga, Y. Uwatoko, and C. Sekine

Much novel and interesting physical properties such as superconductivity, metal-insulator transition and multipole transition induced under high-pressure condition have been found in recent years. Furthermore, much novel interesting materials by using high pressure synthesis have been also developed recently. High-pressure technology in Japan is historically on the top class in the world, but it becomes severe in international competition in recent years. Researchers of condensed matter physics and geophysics fields have carried development of high-pressure synthetic technology together, while sometimes influencing some degree independence each other, up to date. This joint workshop at ISSP has been organized for the high-pressure community to discuss the recent interesting physics and exchange the most recent information on each measurement technique.

In the workshop, 19 of oral and 25 poster presentations in total have been held for 2 days, and the participants had fruitful discussion, especially including a topic of room temperature superconductivity. The 1st day participants were 75 people (47 people from outside ISSP and 28 from the campus) and the number of the participants of the 2nd day were 49 (36 from outside and 28 from the ISSP). It can be said that this workshop has succeeded in accomplishing purposes as expected.

Physics and Chemistry of Light-induced Functions of Retinylidene Proteins

September 5-6, 2019
K. Inoue

Retinal proteins (rhodopsins) are photoreceptive membrane proteins that exist in an extremely wide range of biological species, from bacteria to animal, and giant viruses. When the retinal protein absorbs light, the retinal chromophore is isomerized and various physiological functions such as ion transport, enzymatic reaction and intracellular signal transduction are expressed. To achieve common understanding of the current situation of the study on retinal proteins, we held an ISSP workshop presenting cutting-edge researches by representative retinal protein researchers in Japan. This workshop was also positioned as a satellite symposium of the International Conference on Retinal Proteins, which is held in Ise-Shima in 2020. Totally, 111 people participated, and one keynote speech, 22 invited speeches, and 24 poster presentations from the general public were given. They presented recent studies on non-equilibrium processes in expression of the biological functions using advanced laser spectroscopy, structural studies by synchrotron x-ray radiation and free electron laser, and NMR, large-scale computational study, and so on. Throughout the workshop, many opinions on the current situation in the discipline and new problems to be solved were actively exchanged.

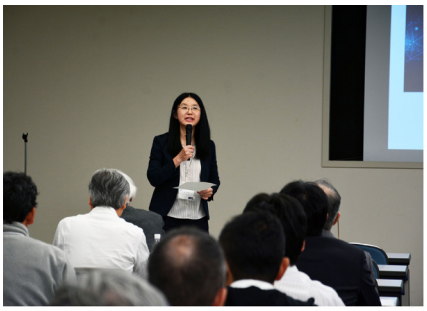
Helium Crisis: Present and Future

November 6, 2019
S. Ohara, H. Kawamura, H. Mori, S. Katsumoto, K. Kindo, T. Kondo, H. Tsuchiya, R. Sagiyama, and M. Yamashita

Shortage of helium supply directly hits researchers and is threatening sustainability of current academic studies all over the world. Helium is indispensable not only for condensed-matter scientists, but also for those in various research fields including elementary-particle physics, astronomy, and chemistry. Moreover, helium is unsubstitutable gas for many industrial uses, such as medical MRI examinations, productions of semiconductors and optical fibers, etc. Helium supply in Japan totally depends on imports from unstable suppliers in limited production areas, resulting “Helium Crisis” frequently. The present Helium Crisis is more serious than ever before because the demands from developing countries increase rapidly despite the decrease of supplies from United States.

In this workshop, we assembled academic scientists from different research area and participants from relevant companies to discuss the present status and possible future perspectives. We first discussed the current situations happening in research institutions. A review regarding the situation of gas supplying companies was also given by Y. Koizumi, president of Gas Review. Discussions about the restrictions applied to liquid helium and subjects to form the urgent proposals were also given.

One of the focus topics of this workshop was a helium-recycle framework by utilizing helium liquefying facilities of academic places. Recycling helium from vaporized helium gas is limited in research institutions equipped with expensive helium-liquefaction facility. Therefore, sharing a liquefaction facility with neighboring sites can considerably save the cost for recycling helium. Successful cases were reported from the collaborations between OIST and University of the Ryukyus and those between JAXA and Osaka University. It was also pointed out as an important future issue to build stockpiles of helium gas for preparing shortage. We hope that this workshop will be taken as an opportunity to enhance helium recycle in Japan.



New Development of High Magnetic Field Science by HMF Collaboratory —Associated with Optical Science—

December 3-5, 2019

M. Hagiwara, K. Kindo, M. Tokunaga, Y. H. Matsuda, H. Nojiri, T. Sasaki, S. Tajima, N. Hanasaki, and Y. Narumi

This workshop was organized by high magnetic field (HMF) forum, the members of which are HMF users and providers, to exchange the most recent information on the development of measurement techniques and scientific research in high magnetic fields, and to aim at the association with optical science. This was held for the first time outside ISSP, namely Osaka University where the Joint-usage program of HMF research is conducted by the Center for Advanced High Magnetic Field Science with International MegaGauss Science Laboratory at ISSP as a new network-type Joint Usage/Research Center. A variety of scientific topics including optical science (magnetic alloy, multiferroics, heavy fermions, frustrated magnets, quantum magnets, topological materials, magnetic semiconductors, measurement techniques, theory and so on.) were presented at this workshop. In addition to 20 talks and 57 poster presentations, 6 invited talks by optical scientists were given. The number of registered participants was 112. During the workshop, present status and future plan of HMF facilities in Japan and a western Japan HMF network named KOFUC network were also provided.

Innovations to the Next-Generation Synchrotron Radiation

February 14, 2020

I. Matsuda, T. Arima, F. Komori, Y. Harada, H. Mimura, and T. Kondo

A plan for the next-generation synchrotron radiation facility was launched in Japan and the user-experiments are expected from 2023. Ten beamlines are planned by the Photon Science Innovation Center (PhoSIC) and the National Institutes for Quantum and Radiological Science and Technology (QST). There have been vigorous discussions on experimental methods for the individual beamlines that are expected to innovate our science and technology, including novel X-ray optics, advanced measurements, informatics analyses and automatic controls by AI robots.

To promote our project toward the new synchrotron radiation facility, we organized this workshop at the ISSP lecture room with broadcast live at SPring-8. It has successfully brought together 91 participants with fruitful discussion on these new technologies and foresights of the coming science. The program started with invite talks by Dr. Tetsuya Nakamura (PhoSIC) and Dr. Masamitsu Takahashi (QST), introducing their beamlines. In the following, there were invited talks by leading young researchers who made presentations on technical innovations for synchrotron radiation. We had a poster session by graduate students and postdocs who shared their new results and actively discussed with each other. Participants were confident to find that our next-generation synchrotron radiation facility would be developed by our next generations.