OIST News No.8 Okinawa Institute of Science and Technology

OIST News

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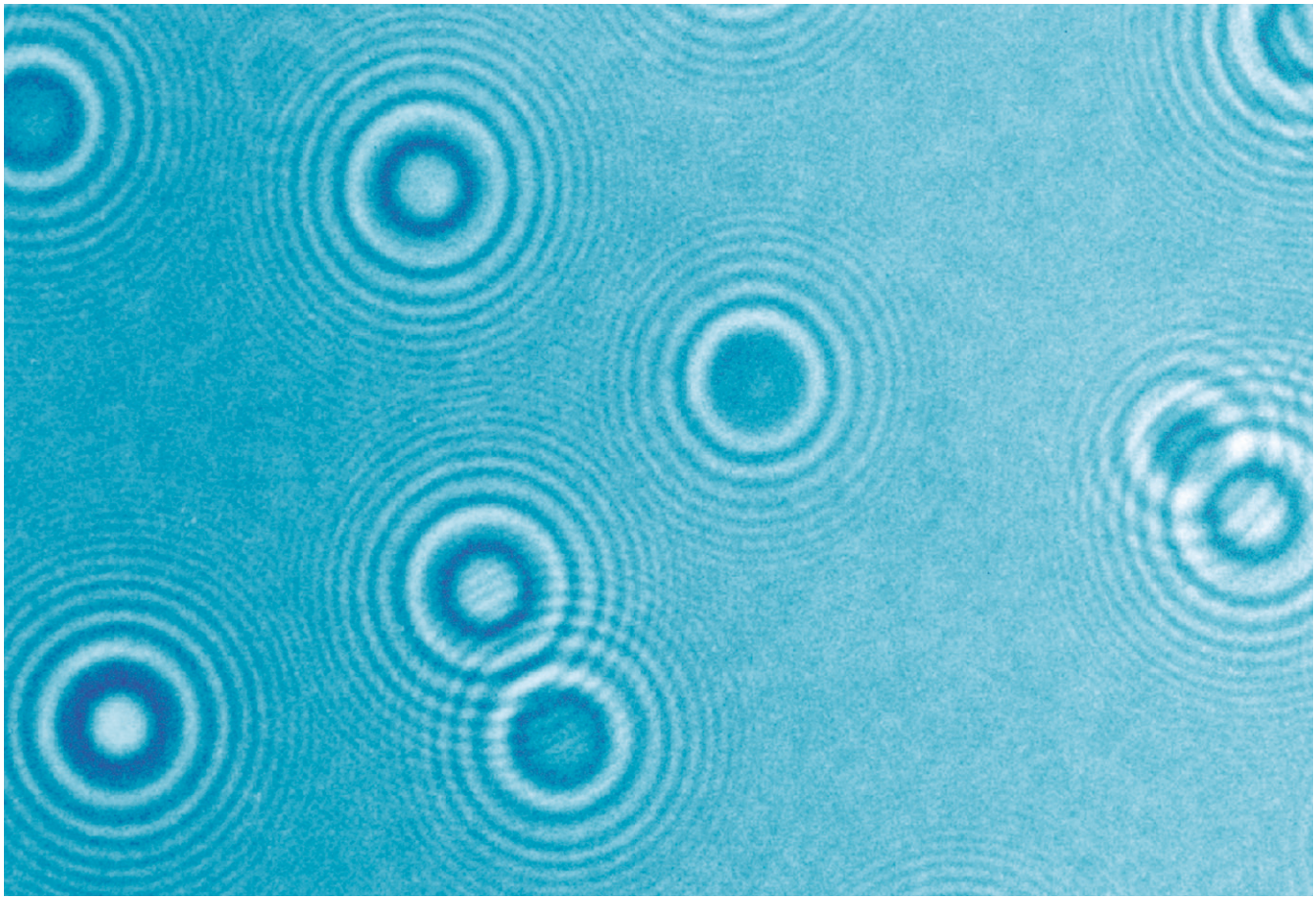
The Okinawa Institute of Science and Technology Promotion Corporation is an independent administrative institution launched in September 2005 to conduct outstanding research and to prepare for the establishment of a graduate university of science and technology in Okinawa. OIST News is a print publication intended to highlight current activities at OIST.



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Members of the Electron Holography Unit
Principal Investigator: Dr. Akira Tonomura (center)

The Electron Holography Unit, led by Dr. Akira Tonomura, was launched in March 2005 in Uruma City. A native of Tokyo, Dr. Tonomura graduated from the University of Tokyo and joined Hitachi's Central Research Laboratory in 1965. In 1968, he began research on electron holography, spending the next 10 years developing a technique to produce highly coherent electron beams, which are indispensable for putting electron holography at a practical level. In 1986, Dr. Tonomura used electron holography to verify the Aharonov-Bohm effect[1], ending a quarter-century dispute. Using electron-holographic interference microscopy, he visualized magnetic lines in ferromagnetic materials[2] in 1980 and magnetic vortices[3] inside superconductors in 1989. The double-slit experiment[4] he conducted in 1989 was chosen as the most beautiful experiment in the history of physics by *Physics World* readers in 2002. The unit aims to solve various problems in nanoscience by using electron holography and electron microscopy. Dr. Tonomura talked about his ongoing research project and future aspirations with *OIST News*.
Cover page: Electron ripples produced at small holes in collodion film (Photo taken by Dr. Tonomura in 1972)

Pursuing his childhood interest

In my childhood, I was very weak and often became absent from school. Since there was no television or video games at the time, I used to lie down on my bed and observe the wood grain of the ceiling, or look out the window to watch raindrops making ripples in rain puddles. I was always impressed with the beautiful patterns. In junior high school, I joined the physic club. The former Soviet Union had just launched the world's first artificial satellite, *Sputnik*, and I used to explain to my classmates how the satellite revolved around the Earth. I must have enjoyed physics ever since.

A picture is worth a thousand words

In physics, we can accurately predict various phenomena that occur in nature, such as the movements of the sun and the moon, and the trajectory of an artillery shell. What is particularly interesting is that just one law of physics can explain all these phenomena.

Dr. Akira Tonomura

Quantum physics, which I first studied in university, is fascinating. In the microscopic world, there are many phenomena that exist beyond common sense notions. When I learned that electrons have both wave and particle natures, I wanted to see one firsthand.
At Hitachi's Central Research Laboratory, which I joined after my undergraduate study, there was Dr. Hiroshi Watanabe, who verified the existence of Bohm-Pines' plasma oscillation theory[5] with a single picture. During a yearlong fellowship at the University of Tübingen in what was then West Germany in 1973, I worked with Professor Gottfried Möllenstedt, who was the first in the world to observe "electron" interference patterns. My encounters with these scientists laid the foundation for my research style – clearly explaining physical phenomena by using one picture taken with an original apparatus.

Electron holography

In our unit, we are delving into the microscopic world with the use of electron holography. Electron holography is a technique for observing electric and magnetic fields, which are on a nano-scale and therefore invisible under an optical microscope. In this technique, a picture of striped patterns produced by interference of electron waves is first photographed on film as a "hologram." Then, by illuminating this hologram with a laser light, we can produce an actual image of the electric and magnetic fields. While an optical microscope can distinguish two small objects 200 nm apart, an electron microscope has a much higher resolution because the wavelength of electrons is only 0.002 nm. This shorter wavelength enables us to see objects 10,000 times smaller, including cells, viruses, and DNA, as well as atoms and molecules, which make up all matter in the universe.
In our research, we use a pointed needle to produce electron waves. The emitted electrons are accelerated to 80% of the speed of light and passed through a sample to obtain the magnetic and electric

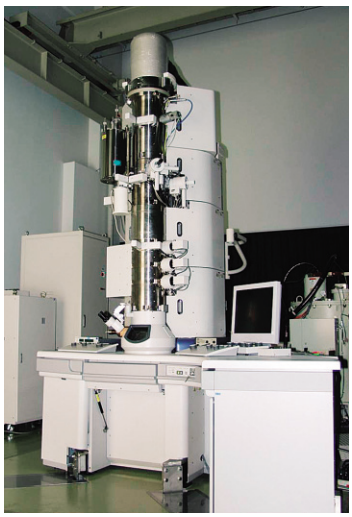
fields of the sample. The information obtained by the observation is particularly valuable in the development of new electric and magnetic materials and devices, such as magnetic hard-disk drives and magnetic recording tapes. The rapid increase in data storage density of various media, including a personal computer for example, is attributed to this technological advancement brought about by electron holography. Continuing effort to develop techniques for observation of even weaker fields in smaller spaces with higher accuracy is sought for.

Achieving first in the world

When I began my research, I realized that inventing a coherent electron beam, like a laser in optics, was indispensable for practical application of the wave nature of electrons. In 1968, I embarked on the development of a holography electron microscope equipped with field-emission electrons, instead of the conventional thermal electrons. By 1978, I had succeeded in producing brighter electron beams by two orders of magnitude. This enabled direct observation of interference fringes, bringing holography electron microscopy into the practical realm.

The technique made experimental verification of theoretical quantum effects possible. In 1986, we verified the Aharonov-Bohm effect[1], and, in 1989, conducted the double-slit experiment[4]. The coherence of the electron beam was further improved, allowing us to directly observe magnetic vortices[3] inside superconductors in 1989. And in 2000, 17 years after the launch of the electron holography project, I created a 1-million-volt microscope, with which we can distinguish objects as small as 0.05 nm and produce highly coherent electron beams four digits brighter than those available in 1968, both world records.

In the OIST project, we spent the first three years designing and developing a world-class 300-kilo-volt electron microscope for observation of nano-scale magnets. In May 2007, we decided to combine our two laboratories in Okinawa and Saitama to Hitachi's Advanced Research Laboratory in Saitama, because the site, with firmer ground and free of alternating-current magnetic fields caused by high-voltage lines or trains, was suited for our microscope. We have since focused on conducting interesting experiments through observation of ferromagnetic and superconducting thin films.



The 300-kilo-volt electron microscope developed by the unit for the OIST project

The microscope is the embodiment of my accumulated experience and expertise. It can readily customize conditions for observation. However, the development of an electron microscope still has leeway for improvement. In theory, we should be able to see objects as small as one-hundredth of an atom with the 1-million-volt microscope. But in reality, we barely manage to observe atoms because we have not fully capitalized on the information carried by electrons from inside a specimen. We must work harder to create, for instance, a composite lens with concave and convex lenses combined.

Our research does not directly result in the development of new devices, but what we verify in basic science can be applied to create new technologies. For example, we have seen in the double-slit experiment that a single electron goes through both slits. By creating a number of such states which a single quantum can have, we can develop a quantum computer that performs parallel computation at an ultra-high speed. We hope to contribute to the advancement of nanotechnology and biotechnology since research in these fields is increasingly looking into the molecular and atomic level.

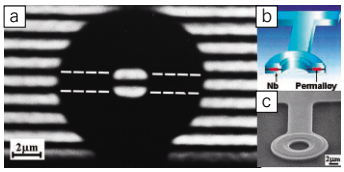
"Team Japan" effort

When I pursued research in West Germany in the 1970s, most Japanese researchers opted for study in the U.S. since the country was at the peak of its industrial prosperity. The U.S. has led the world in physics since the end of World War II, producing a number of Nobel Laureates in physics. History tells us that the center of scientific research had shifted from Europe, where quantum mechanics and electron microscopy were born, to the U.S., where these studies and technologies have advanced. As the prosperity of one nation does not last forever, I am hoping that it is Asia's turn next, with Japan at the center.

The national budget for promoting science and technology in Japan has significantly increased in recent years. But a S&T policy looking 50-100 years ahead is also crucial for Japan to be acknowledged as a leading nation in the creation of advanced knowledge and technological innovations. I hope OIST can build momentum towards reaching this goal. I also hope that our team will contribute to this purpose.

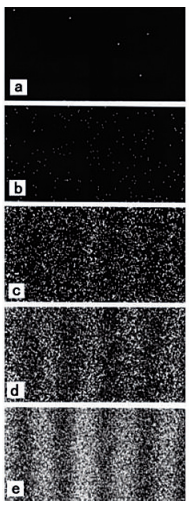
When I first began experiments with electrons more than 40 years ago, I never dreamed of creating a large device like the 1-million-

1.



Verification of Aharonov-Bohm (AB) effect: In 1959, Y. Aharonov and D. Bohm proposed that electrons are affected by the hidden electromagnetic field without actually touching the field. In Dr. Tonomura's experiment, a leakage-free, toroidal micromagnet with a completed ring was used. An observation with electron holography recorded a difference between two electron beams passing inside the hole and outside the ring, demonstrating the existence of the AB effect.
a) Two parallel fringes of electrons show a phase difference between two beams inside and outside of the ring in their interference pattern of the sample.
b) Schematic diagram
c) Scanning electron micrograph

4.



The double-slit experiment: Electrons are shot individually at certain intervals through a device called an "electron biprism" before reaching a detector. While electrons emitted are recorded as individual particles, they begin to form interference fringes as the number of electrons increases, displaying the wave-particle duality of electrons.
a)Number of electrons: 5
b)Number of electrons: 200
c)Number of electrons: 6,000
d)Number of electrons: 40,000
e) Number of electrons: 140,000

volt electron holography microscope. Thanks to the support I have received from various entities over the past 40 years, my research has led to the development of electron beams 20,000 times brighter than those in 1968. In return for this support, now I would like to assist young researchers in Japan. While research requires long-term effort, time, and funds, researchers these days are under continuous pressure to produce immediate results, making it difficult to work on one theme for a long period of time. What we need is an ambition of "Team Japan" effort to produce outstanding and original research results, even if it may take several decades to achieve them. I would like to help promote this effort.

2. Ferromagnetic materials: A ferromagnetic substance, made up of iron, cobalt and nickel, is strongly attracted by a magnet. In some ferromagnetic substances, the magnetism persists even when the external magnetic field is removed.
3. Magnetic vortices: When a superconductor is placed in a magnetic field, magnetic lines penetrate the superconducting material. The penetrating lines are called magnetic vortices.
5. Bohm-Pines' theory: In 1955, Dr. Hiroshi Watanabe of Hitachi's Central Research Laboratory produced experimental evidence of the Bohm-Pines' plasma oscillation theory with a single picture showing plasma excitation in metal electrons.

Promising Stars

Mr. Hiroto Kasai Dr. Yasukazu Murakami

Japan has long been widely known for the development of electron microscopes by the industrial sector and academia. Hitachi's Central Research Laboratory, and its Advanced Research Laboratory established in 1985, have played a leading role in this field. Mr. Hiroto Kasai, a researcher at the Laboratory's electron microscope group that has historically handed down technology and expertise from one generation to the next, is one of Dr. Tonomura's staff who joined the Electron Holography Unit in November 2008. He strives every day to obtain the very image Dr. Tonomura needs for his research. Dr. Yasukazu Murakami, an associate professor of Tohoku University, also joined the unit in November 2008. A key player in the industry-academia research collaboration, Dr. Murakami is referred to by Dr. Tonomura as a scientist not only capable of dexterously operating a microscope, but also conducting very interesting research. With *OIST News*, Mr. Kasai and Dr. Murakami each talked about their roles in the unit and future aspirations.

Mr. Hiroto Kasai (left)

When I was a child, I used to dissemble toys with a screwdriver, but often ended up crying because I could not put the toy parts back together. In my fifth grade, this curious and naughty boy bought an optical microscope with a small sum of money given by my parents and relatives as a new year's present, and became fascinated with it. Back then, I never dreamed of pursuing a job that deals with microscopes.

I have been participating in the OIST research project as a secondee from the Hitachi Advanced Research Laboratory. My primary mission is to take beautiful pictures using an electron microscope. An electron microscope uses a convergent electron beam to illuminate a specimen and create a highly-magnified image. However, when placed in an electric or a magnetic field, the electron beam shakes before reaching a specimen, preventing the electron microscope from performing to its full potential. However, the 300-kilo-volt electron microscope operated in our unit is capable of holding down the divergence angle of the beam to an unprecedentedly small degree. At the time of its development, I was one of the technical support staff on the Hitachi side, trying to capture an image that quantitatively showed the ability of this electron microscope. With all my knowledge and skills devoted, I was able to successfully obtain the image just before its due date. Since I later joined the unit, my experiences with this microscope have been extremely useful in my daily research. With this excellent device, I would like to obtain and show to the world an electron microscopic image that even makes me shiver with awe.

Last year, my son worked on burning a paper with magnifying glass and the sun for his summer holiday homework. It was very heartwarming to see him experience science. Some say children these days do not enjoy studying science, but I would like to achieve research results that raise the interest of younger generation in science, while also pursuing advanced science and research as an OIST researcher.

Dr. Yasukazu Murakami (right)

In my graduate study, I studied material science and engineering with an emphasis on the shape memory effect of alloys. While there are several basic crystal structures in shape memory alloys, I was able to obtain a very unique research result on a structural phase transition that was newly discovered back then. At one international conference where I made an oral presentation on this result, I made connections with many researchers, a fortunate experience that further deepened my interest in research. Because of this experience, I decided to pursue a Ph. D. program and became a scientist.

In 1996, I became an assistant professor at Tohoku University and began research using an electron microscope. One of the targets of my research was manganese oxide, a chemical compound that has long been the subject of study in many fields, including physics and electronics. Interested in its ability to easily pass electricity when placed in a magnetic field, I investigated the microscopic mechanisms of manganese oxide. Unlike an optical microscope that uses glass lenses, an electronic microscope uses a magnetic field to enlarge an image. However, the magnetic field itself modifies the magnetic domain structure of the specimen that we are interested in. With the 300-kilo-volt electron microscope, developed by the unit for the OIST project, one can control the magnetic field at the specimen position. In addition, the new device allows precise control of the temperature of the specimen to an extremely low temperature. These functions are highly useful when studying material science, especially the relationship between nanostructure and magnetic properties. In this regard, it is possible to say that this OIST electron microscope is one of the "best in the world." My role in the unit is to use this device to unveil the reasons behind the behaviors and specific functions of a specimen, which appear when it is placed in a particular environment, such as a magnetic field and an extremely low temperature.

Dr. Tonomura is a pioneer of electron holography, who has achieved outstanding research results. I feel very fortunate to have the opportunity to learn firsthand various aspiring experiment approaches from him.

Okinawa Institute of Science and Technology School Corporation Act

The Okinawa Institute of Science and Technology School Corporation Act was enacted on July 10, 2009, clearing the way for the OIST Graduate University to apply for accreditation to open in 2012. From the perspective of respecting the autonomy and the management flexibility of the school, the Act stipulates the establishment of the Graduate University as an independent special school corporation.

The Act was based on the Blueprint, a set of recommendations finalized by the Board of Governors for the establishment and submitted to then Minister for Okinawa Affairs Fumio Kishida at the end of the 6th BOG meeting on July 28-30, 2008 in Okinawa and Tokyo. During the 7th BOG meeting on February 17, 2009 in Tokyo, the Cabinet Office presented a summary of the Act to the BOG members. The bill was submitted to the Diet, following its approval by the cabinet of Prime Minister Taro Aso on March 3, 2009.

On May 8, an urgent general meeting of the Okinawa People's Council for the Promotion of OIST, chaired by Okinawa Governor Hirokazu Nakaima, took place to call for early enactment of the bill. In the meeting, OIST Executive Director Dr. Robert Baughman made presentation on the progress of the project, while BOG member Dr. Hiroko Sho read out an Urgent Appeal for Support of the Opening of the OIST, signed by Nobel Laureates and other renowned scientists around the world. At the end of the meeting, the members unanimously adopted a resolution.

Urgent general meeting of the Okinawa People's Council

Governor Nakaima

Dr. Baughman

Dr. Hiroko Sho

Urgent town hall meeting in Onna Village

Onna Village also held an urgent town hall meeting on May 15 to promote early opening of the Graduate University. Representing the OIST community, Dr. Kenji Doya of the Neural Computation Unit delivered a speech, seeking continued support by the local residents toward the opening of the Graduate University.

Dr. Kenji Doya

On May 27, the members of the House of Representatives Special Committee on Okinawa and Northern Territories Affairs visited OIST to see firsthand the ongoing preparation for the establishment of the Graduate University, including the construction of the campus in Onna Village and research activities in Uruma City. At the outset of the visit, OIST President Dr. Sydney Brenner welcomed the lawmakers in a meeting, which was also attended by many other guests, including Dr. Sho and Onna Mayor Fumiyasu Shikiya. The lawmakers then moved to the campus site and to the OIST Research Laboratory in Uruma City, where Dr. Noriyuki Satoh of the Marine Genomics Unit and Dr. Jeff Wickens of the Neurobiology Research Unit each made a presentation on their research.

Dr. Brenner welcomes the lawmakers

Dr. Satoh

Dr. Baughman explains about construction plan

Dr. Wickens

The bill was passed unanimously in the House of Representatives on June 11 and the House of Councilors on July 3. As part of the legislative deliberations, Dr. Brenner appeared as a guest speaker in the House of Councilors Special Committee on Okinawa and Northern Territories Affairs on June 19. He answered questions including those on the progress and future prospects, including the formation of an intellectual cluster with the Graduate University at the center.

Dr. Brenner

The full text of the Act is available on our Website :
http://www.oist.jp/doc/OISTSC_Act_20090713.pdf

Following the enactment of the Act, OIST has begun an international search for the president of the OIST Graduate University. The details of the announcement for the search can be seen on our Website.
http://www.oist.jp/doc/career/200908_OIST_President_Ad_En.pdf

Message from
OIST Executive Director Dr. Robert Baughman

We, the members of OIST P.C., deeply appreciate the enactment of the Okinawa Institute of Science and Technology School Corporation Act. We wish to thank the citizens of Okinawa and all other parties concerned for their understanding and support, which was important to achieve this. We take the expectations of the public in Okinawa and Japan very seriously, and we will continue to make our best efforts toward the successful opening of the Graduate University.

International Workshop on "Fundamentals of Quantum Mechanics and Its Applications"

Participants of the International Workshop

The International Workshop on "Fundamentals of Quantum Mechanics and Its Applications" took place on May 13-15, 2009, at the OIST Seaside House. The workshop brought together leading scientists and engineers from all over the world to explore future possibilities in fundamental issues of quantum mechanics unveiled by new advanced technologies. For young students and researchers, it was an opportunity to engage in discussion with world-leading scientists including three Nobel Laureates, and to present their research in a poster session. The workshop was organized by four renowned scientists including Dr. Akira Tonomura of OIST. With *OIST News*, the Nobel Laureates shared part of their career and advice for OIST.

International Workshops and Seminars

OIST has been hosting international workshops and seminars to enhance cooperation with research institutions at home and abroad. These workshops and seminars also help introduce the vision of establishing a graduate university in Okinawa to the worldwide scientific community. Below is a list of workshops, seminars and lectures that took place between February and June 2009.

February 2 Seminar at the Bio Center
"Larval dispersal in the turbulent coastal ocean: Dynamics and Impacts"
Speaker: Dr. Satoshi Mitarai, UC Santa Barbara

February 3 Seminar at the Bio Center
"Neural mechanisms of decisions based on preference"
Speaker: Dr. Michael Campos, California Institute of Technology

February 4 Seminar at the Bio Center
"Neural network dynamics of perceptual decision-making"
Speaker: Dr. Kong Fatt Wong-Lin, Princeton University

February 4 Seminar at the Research Laboratory
"Circuits, differentiation and homeostasis in genetic regulatory networks"
Speaker: Dr. Paul Ruet, CNRS
Organizer: Dr. Robert Sinclair, OIST

February 5 Seminar at the Bio Center
"A synaptic memory trace for cortical receptive field plasticity"
Speaker: Dr. Robert Froemke, University of California, San Francisco

February 5 Seminar at the OITC
"The novel neuronal growth-associated proteins revealed by the proteomic analysis of the growth cone"
Speaker: Dr. Michihiro Igarashi, Niigata University
Organizer: Dr. Ichiro Maruyama, OIST

February 5-6 Lecture at Kubura Junior High School & Yonaguni Junior High School
"Let's Learn from DNA"
Lecturer: Dr. Mary Ann Price, OIST

February 9 Seminar at the Seaside House
"From Micro Scale to Macro Data in Physics and Engineering"
Speaker: Dr. Alexander Palov, Lomonosov Moscow State University
Organizer: Dr. Jonathan Miller, OIST

February 12 Seminar at the Bio Center
"Understanding the chemical language of insects using mass spectrometry"
Speaker: Dr. Joanne Yew, Harvard Medical School

February 12 Seminar at the Research Laboratory
"Behavioral state-dependent change of granule-to-mitral inhibition in the rat olfactory bulb"
Speaker: Mr. Yusuke Tsuno, Graduate Student, University of Tokyo
Organizer: Dr. Kenji Doya, OIST

February 13 OIST-IRP Internal Seminars at the Research Laboratory
"Dopaminergic modulation of striatal spike-timing-dependent plasticity in adult mice"
Speaker: Dr. Tomomi Shindou, OIST
"Striatal interneurons in dissociated culture"
Speaker: Dr. S. Schock and Dr. K. Jolin-Dahel, University of Ottawa

February 15 Talk at Science Film Show 2009
Speaker: Dr. Kenji Doya, OIST

February 17 Seminar at the Seaside House
"Methods of theory of dynamical systems and partial differential equations in the problem of compression of discrete signals"
Speaker: Dr. Maxim Koroteev, Samsung Electronics Ltd. Korea
Organizer: Dr. Jonathan Miller, OIST

February 18 Lecture at Nakadomari Junior High School
"Introduction of the research in the Stiefel Unit"
Lecturer: Dr. Klaus Stiefel, OIST

February 19 Seminar at the Research Laboratory
"Functional States in the Dynamics of Striatal Cell Assemblies"
Speaker: Dr. Luis Alberto Carrillo Reid, National University of Mexico
Organizer: Dr. Gordon Arbuthnott, OIST

February 20 Seminar at the Research Laboratory
"Capacity of a single spiking neuron for temporal and rate coding"
Speaker: Dr. Shiro Ikeda, the Institute of Statistical Mathematics
Organizer: Dr. Kenji Doya, OIST

February 23 Seminar at the Research Laboratory
"The Road to the Synapse: Kinesin–based transport of neuronal receptors"
Speaker: Dr. Guillaud Laurent, the University of Tokyo
Organizer: Dr. Tomoyuki Takahashi, OIST

February 25 Seminar at the Research Laboratory
"Diffusional barriers in neurons: From synapses to dendrites"
Speaker: Dr. Fidel Santamaria, the University of Texas at San Antonio
Organizer: Dr. Erik De Schutter, OIST

February 26 Seminar at the Research Laboratory
"Multielectrode arrays and the study of neuronal firing patterns *in vitro*"
Speaker: Dr. Stephan Theiss, University of Dusseldorf, Germany
Organizer: Dr. Gordon Arbuthnott, OIST

March 2 Seminar at the OITC
"Regulation of gonad formation by chondroitin sulfate proteoglycan, and characterization of molecule involved in neural gene expression in *C.elegans*"
Speaker: Dr. Toshihiro Sassa of RIKEN Kobe Institute
Organizer: Dr. Ichiro Maruyama, OIST

March 6 Seminar at the Research Laboratory
"On the nature of neuronal branching"
Speaker: Dr. Hermann Cuntz, University College London
Organizer: Dr. Erik De Schutter, OIST

March 9 Seminar at the Seaside House
"Improving Constraint-Based Solvers"
Speaker: Dr. Horst Samulowitz, Microsoft Research, UK
Organizer: Dr. Jonathan Miller, OIST

March 13 OIST-IRP Internal Seminars at the Research Laboratory
"Using Neurofitter to fit a Purkinje cell model to experimental data"
Speaker: Mr. Werner Van Geit, OIST

Dr. Chen Ning Yang
Tsighua University

1957 Nobel Prize in physics
for his work on parity nonconservation of weak interaction

My interest in physics grew in 1938, when I was studying the subject for an entrance exam for university admission in my home country of China. In my long career as a physicist, I have come to know a number of young researchers, who are very serious about their work, including Dr. Tonomura whom I first met in 1981. I am glad that OIST is nurturing the enthusiasm of such researchers. I am confident that OIST, surrounded by Okinawa's beautiful nature, will grow into a great institute in a few years.

Dr. Klaus von Klitzing
Max-Planck Institute

1985 Nobel Prize in physics
for his discovery of the integer quantum hall effect

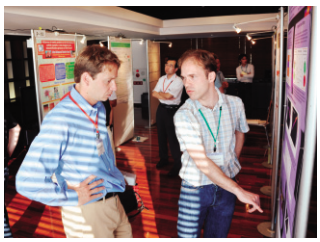
As a small boy, I helped my father with calculation and received little money for the work. I was always interested in mathematics, and decided to apply it to physics in my undergraduate study. When I went abroad for research, I always looked for unique universities or special institutions. In order for OIST to attract top professors and good students, it needs excellent equipment and infrastructure, as well as excellent people to interact with, because this is a main drive for scientists.

Dr. Peter Grünberg
Forschungszentrum Jülich GmbH

2007 Nobel Prize in physics
for his discovery of giant magnetoresistance

I was first interested in astronomy. But when my physics teacher taught me that the Sun's gravity keeps planets in their orbits, I turned to physics because I wanted to know answers for many phenomena in nature. In addition to attending international conferences in Japan since 1987, I have stayed in Sendai, Miyagi Prefecture and Tsukuba, Ibaraki Prefecture for seven months as a visiting professor. It is important for a society, including the academic society, to try new things and go new ways on a long term. And that is what I see here at OIST.

Lecture in the Seminar Room



Poster session in the Chura Hall

"Crystallization of membrane proteins"
Speaker: Dr. Vladimir Meshcheryakov, OIST

March 16-17 Seminar at the Research Laboratory
"Activity-dependent plasticity of hippocampal interneurons" (March 16)
"Large-scale computational modeling of the normal and epileptic dentate gyrus" (March 17)
Speaker: Dr. Ivan Soltesz, University of California, Irvine
Organizer: Dr. Klaus Stiefel, OIST

March 18 Lecture at the English Education Forum
"The Importance of English in a Global Society"
Lecturer: Dr. Gail Tripp, OIST

March 19 Seminar at the OITC
"The Broadest Panel of Kinase Solutions for Characterization, Profiling & Screening"
Speaker: Dr. Taffeta Chen, DiscoveRx Corporation
Organizer: Dr. Ichiro Maruyama, OIST

March 26 Seminar at the Research Laboratory
"Ten-m proteins are essential for the generation of visual circuitry"
Speaker: Dr. Catherine A. Leamey, University of Sydney
Organizer: Dr. Klaus Stiefel, OIST

March 27 Seminar at the Research Laboratory
"The role of experience on the development of a motor control area"
Speaker: Dr. Atomu Sawatari, University of Sydney
Organizer: Dr. Klaus Stiefel, OIST

April 7 Seminar at the Research Laboratory
"Migration of Epithelia: The Mechanobiology of Cells and Tissues"
Speaker: Professor Paul Matsudaira, National University of Singapore
Organizer: Dr. Ichiro Maruyama, OIST

April 10 OIST-IRP Internal Seminars at the Research Laboratory
"Pi-calculus and RNA interference"
Speaker: Dr. Masahiro Hamano, OIST

"Non-saturation of postsynaptic glutamate receptors by a single vesicular transmitter content"
Speaker: Kohgaku Eguchi, OIST

April 21 Seminar at the Research Laboratory
"Expression and structure analysis of malaria circumsporozoite protein using *E.coli* for drug and vaccine development"
Speaker: Dr. Young-Ho Yoon of Yokohama City University
Organizer: Dr. Fadel Samatey, OIST

April 23 Seminar at the Research Laboratory
"Sexually distinct vocal pattern generation in African clawed frog"
Speaker: Dr. Ayako Yamaguchi, Boston University
Organizer: Dr. Mary Ann Price, OIST

April 24 Seminar at the Research Laboratory
"Seeing what the nose tells the brain - Active sensing and odor coding imaged in the awake rat and mouse"
Speaker: Dr. Matthew Wachowiak, Boston University
Organizer: Dr. Mary Ann Price, OIST

May 11 Seminar at the Research Laboratory
"The physics of whole genome sequences and its implications for genome growth and evolution"
Speaker: Professor H.C. Paul Lee, National Central University, Taiwan
Organizer: Dr. Jonathan Miller, OIST

May 15 OIST-IRP Internal Seminars at the Research Laboratory
"Emergence of heterogeneous mating strategies in embodied evolution"
Speaker: Dr. Stefan Elfwing, OIST

"The mechanism of partial proteolysis of the Hedgehog signalling effector Ci and its evolutionary conservation"
Speaker: Dr. Mary Ann Price, OIST

May 19 Seminar at the Research Laboratory
"Systems biology: current status and future perspectives"
Speaker: Dr. Igor Goryanin, The University of Edinburgh

May 25-26 Joint workshop on neuro-computing and bioinformatics at the Seaside House
"Colossal ultraconservation and super-colossal ultraconservation"
Invited Speaker: Dr. Jonathan Miller, OIST

May 28 Seminar at the Research Laboratory
"Coupled Exclusion Processes for the Modeling of Intracellular Particle Transport"
Speaker: Dr. Konstantinos Tsekouras, Rice University, USA
Organizer: Dr. Jonathan Miller, OIST

June 6 Seeds and Needs for Large-Scale Computing Workshop at the Seaside House
"Large-scale modeling in neuroscience: from signaling networks to neural networks"
Speaker: Dr. Erik De Schutter
"Bayesian sampling methods in neuroscience: from synapses to behaviors"
Speaker: Dr. Kenji Doya, OIST

June 10 Seminar at the Research Laboratory
"Full Azimuth Direction-of-Arrival Estimation with Successive-Selection Technique"
Speaker: Dr. Eddy Taillefer, Fujitsu, Osaka, Japan
Organizer: Dr. Jonathan Miller, OIST

June15-July 2 Okinawa Computational Neuroscience Course (OCNC) 2009 at the Seaside House
Organizers: Drs. Erik De Schutter, Kenji Doya, Klaus Stiefel, Jeff Wickens, OIST
URL: http://www.irp.oist.jp/ocnc/2009/index.html

June 21-25 The 5th International Tunicate Meeting at the Okinawa Industry Support Center
Organizers: Dr. Noriyuki Satoh, OIST et al.
URL: http://www.irp.oist.jp/tunicatemeeting/index.php

June 26 Seminar at the Research Laboratory
"Deep-sea chemoautotrophic endosymbioses: emerging models for symbiogenesis"
Speaker: Dr. François H. Lallie, PMC Univ. Paris 6 & CNRS UMR
Organizer: Dr. Noriyuki Satoh, OIST

OIST Volunteer Activity

As part of community involvement, OIST researchers have begun to volunteer at Miyazato Elementary School in Okinawa City in the English conversation club and in classrooms. On June 10, Japanese researchers and staff from the Human Developmental Neurobiology Unit and the Developmental Signalling Unit each helped a teacher mark math and *kanji* drills. On July 1, Dr. Jeff Wickens, Principal Investigator of the Neurobiology Research Unit, and Dr. Mary Ann Price, Principal Investigator of the Developmental Signalling Unit, as well as Dr. Zacharie Taoufiq of the Information Processing Unit took part in the English club together with volunteers from the U.S.military.

Dr. Wickens (left) and Dr. Price play volleyball in a gesture game

Dr. Taoufiq introduces himself to students

Marking math and *kanji* drills

Visit by Participants of Japan-China S&T Policy Seminar

On April 15, participants of the 6th Japan-China Science and Technology (S&T) Seminar visited OIST. The annual seminar, which took place April 13-17 in Okinawa, brought together S&T policy makers from Japan and China for policy planning, promotion of S&T foundation building, and enhancement of a bilateral network through an opinion exchange. Among the Japanese delegates who visited the campus construction site etc. was Dr. Akito Arima, the co-chair of the OIST Board of Governors.

BOG co-chair Dr. Akito Arima (center)

Campus Update

Construction of Laboratory 1 and the Center Building is almost complete, with the interior fit-out work being carried out. The initial use of the facilities is expected for early next year.

The Center Building (left) and Laboratory 1

Laboratory 1

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