OIST

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY

CHANGE!

Gender Equality Task Force

OIST 2014 Achievement

Achievement 2014

OIST

OKINAWA INSTITUTE OF SCIENCE AND TECHNOLOGY GRADUATE UNIVERSITY
沖縄科学技術大学院大学

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Introduction

Okinawa Institute of Science and Technology Graduate University (OIST) is an extraordinarily bold vision by the Japanese Government to establish a world-leading science and technology graduate university in Okinawa. Conceived in the early 2000s and conceptualized through the mid 2000s, the vision became a reality with the passing of the OIST School Act in July 2009. Accreditation by MEXT followed in October 2011 and the University began operation in late November 2011. By September 2012, the first class of graduate students, 34 in total, began their PhD studies. By any standard, the realization of the Government's vision has been achieved at blistering speed.

This document "Achievement 2014" takes stock of OIST in 2014 and attempts to seize the essential ingredients of vigor, enthusiasm, and competence that characterize the new Graduate University.

The Vision

“OIST Graduate University is at the forefront of creating change in how research and education are practiced. We hire world-leading faculty and we give them substantial support and considerable freedom to pursue basic research. By avoiding traditional administrative and physical boundaries, and by creating easy access for people to each other and to research equipment, we have established a very open and intimate environment, which naturally promotes cross-disciplinary education and research.

We are training a new breed of students and young researchers to become future leaders in the global world of academia and/or industry—young talent that is receiving strong disciplinary training while additionally being exposed to a truly multidisciplinary experience that challenges them to bridge the boundaries between the physical and life sciences.”

Jonathan Dorfan
President, OIST

I recently had the chance to visit OIST. It struck me that the essential features that made AT&T Bell Labs so successful, such as very high expectations of researchers, the critical mass of gifted talent from a great diversity of backgrounds, and extreme level of autonomy given to scientists working at OIST, were converging to produce a new kind of Bell Labs. It really gives me hope that Japan can lead the world and build not just another research park, but a "creativity park” of the future.

Susan Hackwood
Executive Director of the California Council on Science and Technology (CCST)

Selecting with care outstanding young scientists, trusting them and giving them the means and the time to achieve the ambitious projects they have freely outlined for themselves is the best way for a research institution to attract bright students and to thrive. OIST applies this recipe with great determination. It is a remarkable place, located in an inspiring setting, where multidisciplinary research is carried on in an atmosphere of freedom by young scientists coming from all over the world.
I am looking forward to witnessing its scientific achievements in the years to come".

Serge Haroche
Nobel Prize for Physics 2012

"OIST is a truly international institution with a very diverse cross section of faculty from around the world, providing an invaluable asset to Japan. Located strategically within Asia, the research climate is second to none in creating an environment where creativity and innovation flourish.”

William Saito
Special Advisor - Cabinet Office
Government of Japan

History

June 2001 A plan was announced to establish a new graduate university in Okinawa.

April 2003 A site in Onna Village was selected as the venue for the campus.

February 2004 The recruitment of PIs started in summer 2003, and the first four were appointed out of 137 applicants in February 2004. Research commenced in April 2004 in a newly built Initial Research Project building in Uruma.

December 2004 The Japanese Government decided to establish a new research institute by September 2005.

March 2005 The bill to establish Okinawa Institute of Science and Technology Promotion Corporation as the organization to prepare the graduate university was approved by the Diet.

September 2005 The Okinawa Institute of Science and Technology Promotion Corporation received legal status as an Independent Administrative Institution.

April 2006 The renovation of the former Hakuun-so was completed and the facility was renamed "Seaside House."

March 2007 The first phase of site preparation for the current campus commenced.

March 2009 The Okinawa Institute of Science and Technology School Corporation Bill was submitted to the Diet.

July 2009 The House of Representatives and Councilors unanimously passed the Okinawa Institute of Science and Technology School Corporation Bill.

The Okinawa Institute of Science and Technology School Corporation Act was enacted.

March 2010 Use of the new campus buildings, Central Building & Lab 1, commenced.

March 2011 Documents for graduate school accreditation were submitted to the Japanese Government.

November 2011 OIST's status changed to Okinawa Institute of Science and Technology School Corporation. The Graduate University was inaugurated.

July 2012 Lab 2 opened.

September 2012 The new Science and Technology Graduate School opened and admitted its first class of PhD students.

August 2013 Lab 3 construction commenced.

October 2013 The OIST Board of Governors proposed the expansion of the university from 50 to 100 faculty members.

The OIST Board of Governors Meeting July 8-10, 2007

Front row from left :
Dr. Ichiro Kanazawa, Dr. Hiroko Sho, Dr. Jerome Friedman, Dr. Torsten Wiesel (co-chair), Dr. Akito Arima (co-chair), Dr. Susumu Tonegawa, Dr. Yuan Tseh Lee

Back row from left :
Dr. Chris Tan, Dr. Mamoru Tamura, Dr. Robert Baughman, Dr. Sydney Brenner, Dr. Hiroaki Kitano, Mr. Osamu Shimizu

Concentrating on Research

Enabling basic research that contributes to world knowledge, but that is also directly beneficial to Okinawa is a fundamental goal for OIST. Professor Noriyuki Satoh, who heads the Marine Genomics Unit has shown that concentrating on research has important consequences.

“When I launched my lab at OIST in 2008, after 35 years at Kyoto University, I told my colleagues to ‘think big’ and conduct research that no other university has ever done; here we concentrate on research.”

Since his arrival at OIST, he has assembled a strong team that has produced world-class results. His team was the first in the world to sequence the genome of the stony coral, Acropora digitifera, work that was published in the journal Nature.

“This publication had a big impact on the genomics research community. Other genomics researchers were amazed that there were only 13 authors on the paper. A sequencing paper normally has 60-70 authors. At OIST we have the equipment, the talent, and the time, and we capitalize on this to produce important results.”

Satoh’s group has since gone on to make further contributions to marine science by decoding the pearl oyster genome, the coral symbiont *Symbiodinium minutum*, genome, and simultaneous genetic sequencing of host coral and symbiont dinoflagellate.

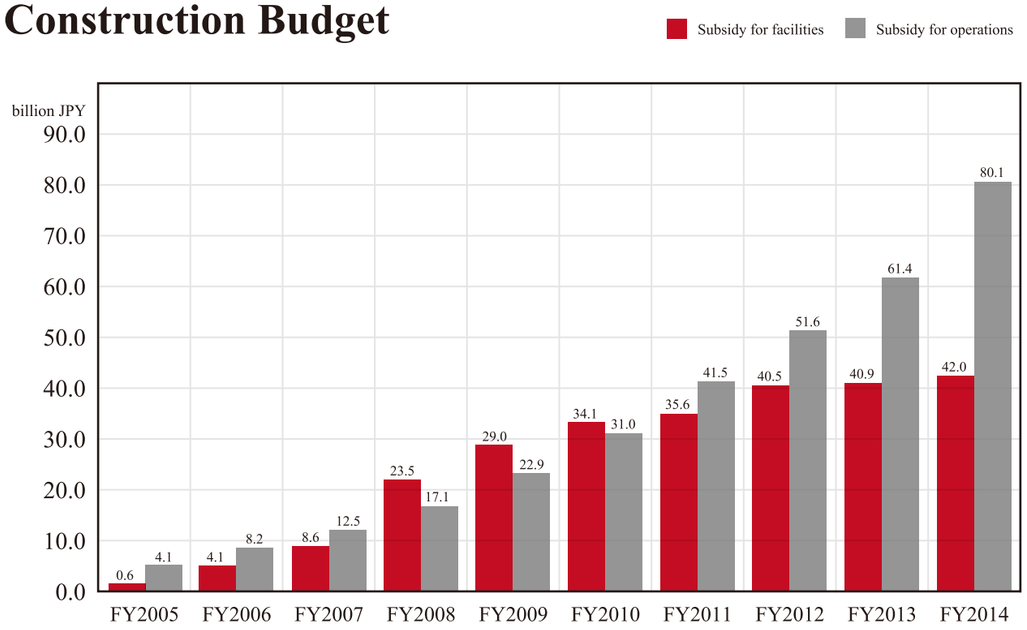
Maintaining a healthy coral population around Okinawa is necessary for the Island’s environment and economy. The new understanding of coral population genetics derived from Satoh’s research helps to establish diversity in coral beds, which in turn results in stronger healthier growth. “ I am also able to collaborate easily with other units at OIST to integrate current flow, and other oceanographic research into our work.”

Satoh and his group are now helping the Okinawan Prefectural Government on projects to relocate coral to create healthier beds around the island. This was not planned, nor was it the goal of Satoh’s genetic studies, but it is a demonstration of how fostering basic research leads to directly useful applications.

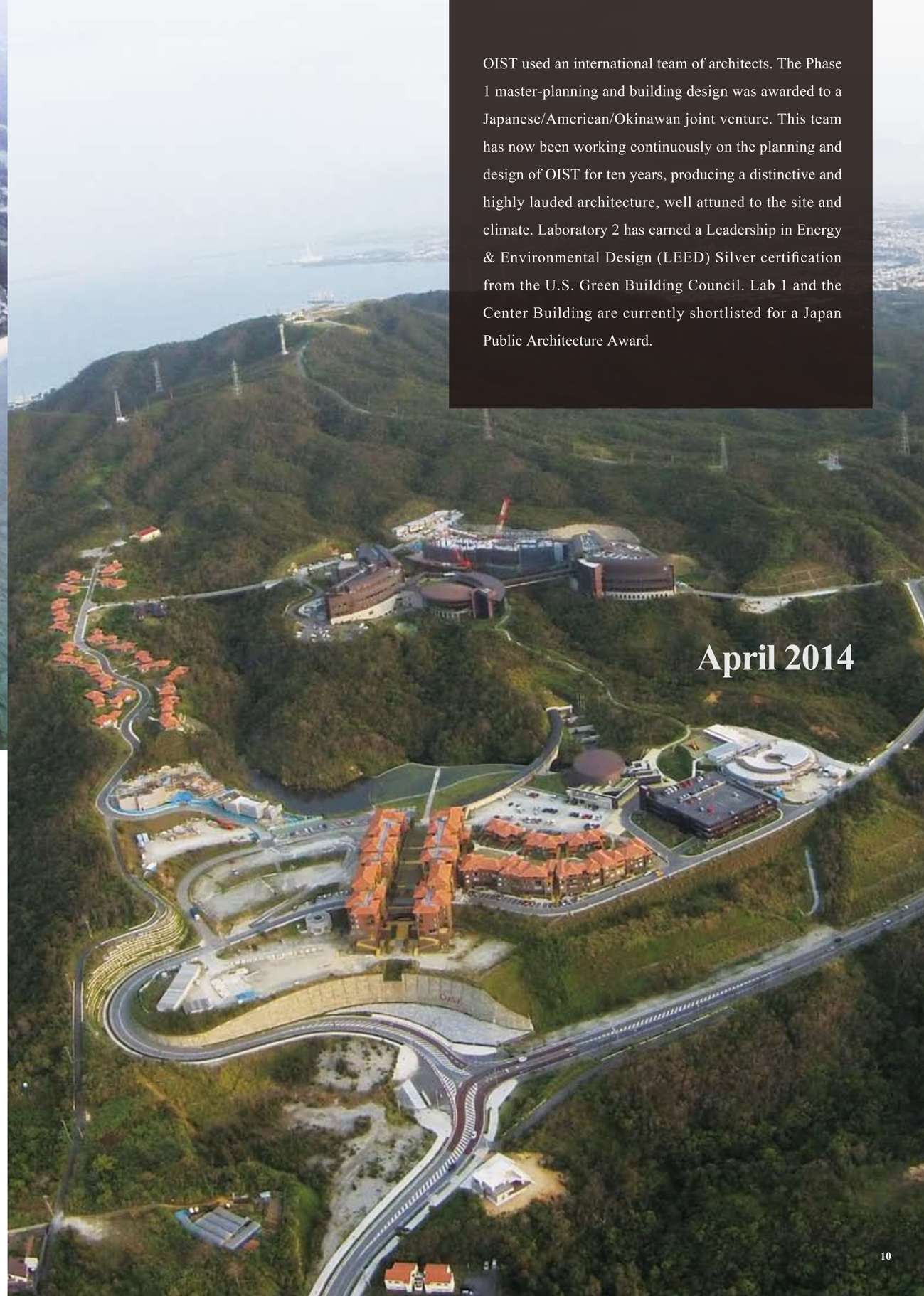
Buildings

The original Framework Document of the University document prepared in 2003 to guide the development of OIST called for a campus “built to make use of the rich natural environment as far as possible”. It further stated: “A major challenge for the architect is to design the campus and facilities in such a way that interactions among researchers are encouraged to the maximum extent while the surrounding nature of the campus site is preserved as far as possible.” OIST has taken these objectives into account throughout the design and construction of the campus.

Construction Budget



OIST used an international team of architects. The Phase 1 master-planning and building design was awarded to a Japanese/American/Okinawan joint venture. This team has now been working continuously on the planning and design of OIST for ten years, producing a distinctive and highly lauded architecture, well attuned to the site and climate. Laboratory 2 has earned a Leadership in Energy & Environmental Design (LEED) Silver certification from the U.S. Green Building Council. Lab 1 and the Center Building are currently shortlisted for a Japan Public Architecture Award.



Design Concepts

A key planning and design objective was to create a campus that would both fit into and showcase the natural environment of the site. Honoring local, traditional architecture, OIST is built like a modern version of Okinawa's fortresses—stone walls rise from the hillside to a central plaza surrounded by the main buildings. Exterior walls are covered with the same local, quarried stone that was used in regional castles centuries ago, letting OIST blend into the landscape. All buildings and structures on campus are painted in natural tones of brown and green to reduce their visual impact, or clad with earth-toned shingles, tiles and bricks, or locally quarried stone.

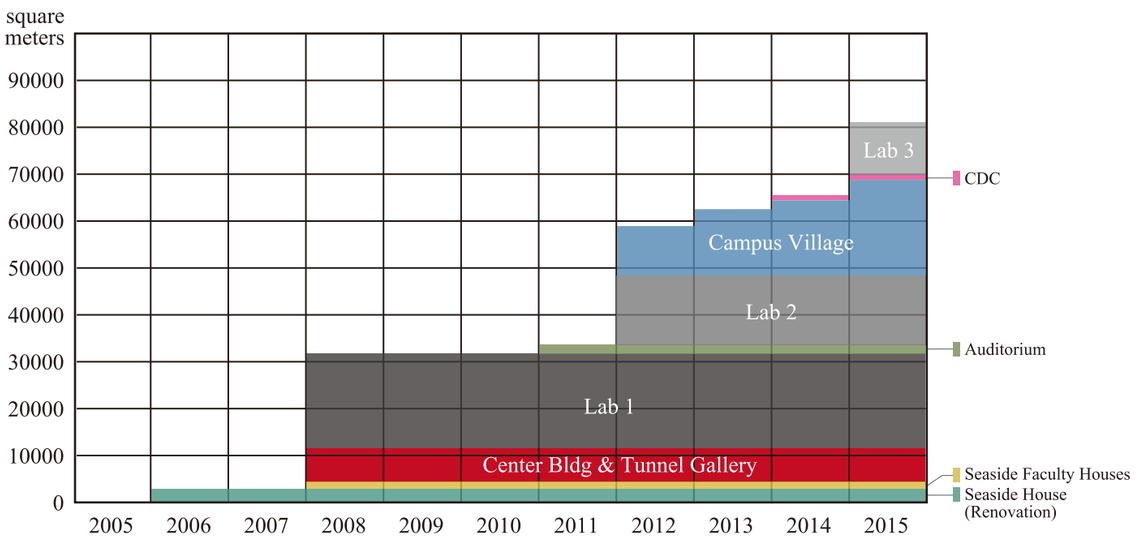
Architecture that Encourages Collaboration

The architecture at OIST encourages interactions among researchers to the greatest extent possible. Several aspects of the building design contribute to achieving this goal: the main access to the labs is via the tunnel gallery, while the only connections between labs are via the skywalks. People routinely encounter each other as they move around the campus during the course of the day. Break areas shared by researchers of several units are located at the ends of each building, encouraging mingling among research groups. Faculty offices are clustered together at the center of each floor, making it easy for professors to meet and talk with each other. And the cafeteria and outdoor courtyard are located at the hub of the campus, further encouraging interactions among researchers.

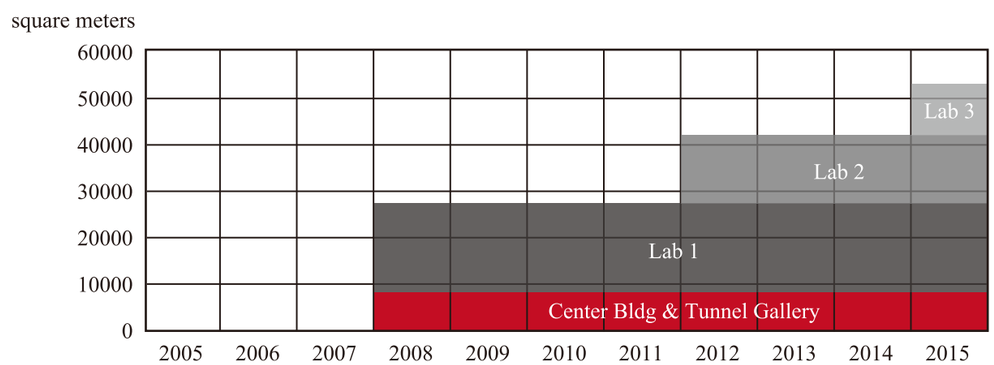
The lab buildings all have the same basic floor plan, providing maximum flexibility of function to accommodate changes in research requirements over time. Any lab area can be used as wet or dry lab space with minimal modification. The floor plan arranges research units around the perimeter, while service rooms for common equipment such as freezers, centrifuges, and incubators are placed along the central spine. This arrangement encourages the shared use of such equipment by multiple research units, increasing efficiency and avoiding duplication of resources.

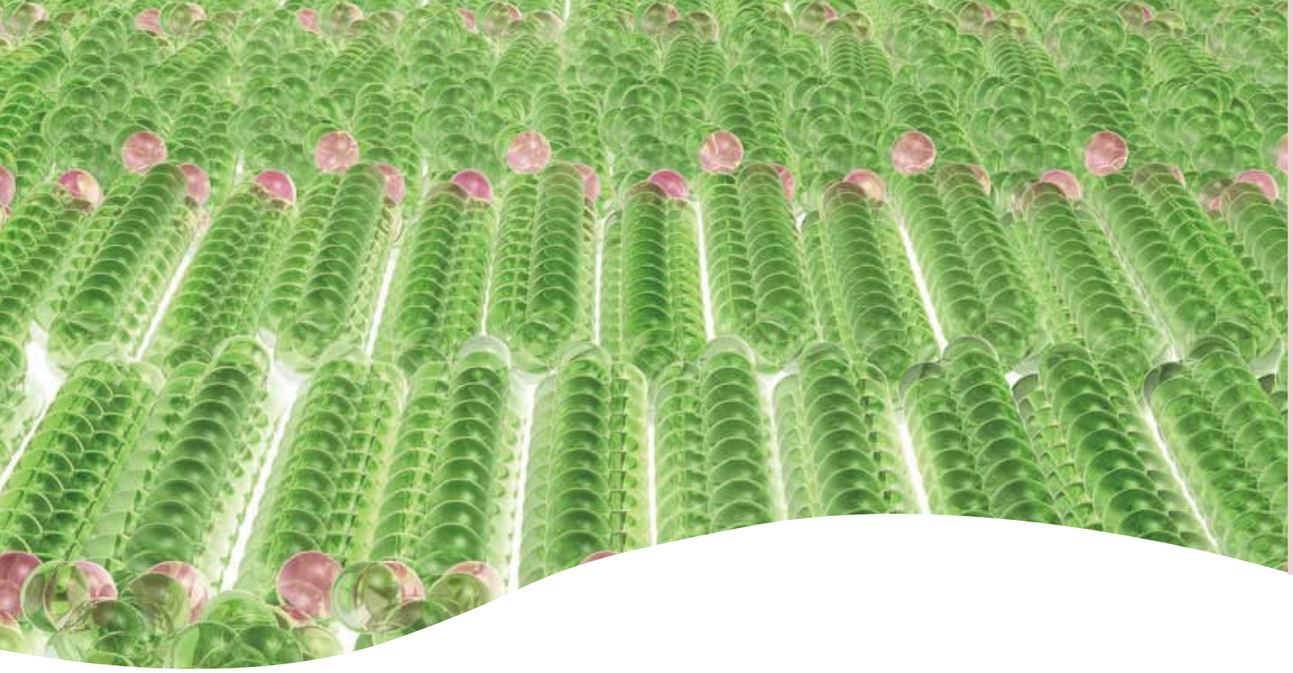
Ancillary facilities including an auditorium seating 500, a multi-story parking building for 320 vehicles, and a child development center for 100 children have been designed and constructed in the past three years. A campus village, comprising housing of several types from 1-bedroom apartments to 3-bedroom faculty houses, has been developed under a public-private partnership, with the first 100 units completed in 2012 ahead of the initial intake of students that September. Construction is continuing in stages, with full completion scheduled for 2015, by which time there will be just over 200 units of housing in total, sufficient to accommodate approximately half of the Phase 1 University's academic population.

OIST Built Area



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Seaside House (Renovation)		3000	3000	3000	3000	3000	3000	3000	3000	3000	3000
Seaside Faculty Houses				1400	1400	1400	1400	1400	1400	1400	1400
Center Bldg & Tunnel Gallery				8800	8800	8800	8800	8800	8800	8800	8800
Lab 1				18000	18000	18000	18000	18000	18000	18000	18000
Auditorium							2500	2500	2500	2500	2500
Lab 2								14300	14300	14300	14300
Campus Village								11100	15000	16400	21500
CDC										900	900
Lab 3											10900





Research

OIST has established an extraordinary research facility in a remarkably short time. There are 47 active research units, each directed by a faculty member, and more than 360 researchers, including students, postdocs, and technicians. A broad range of research areas is represented, including cell biology, neurobiology, developmental biology, evolutional biology, genomics, structural biology, and systems biology in the life sciences; and in the physical sciences, nanotechnology, novel 2D materials and heterostructures, organic and inorganic functional materials, interface science, photocatalytic and energy materials, quantum optics, quantum materials, and surface science. Two world-class research laboratories have been completed and equipped with excellent instrumentation. Faculty members and researchers have been recruited from leading laboratories around the world.

It’s a Small World for Titans

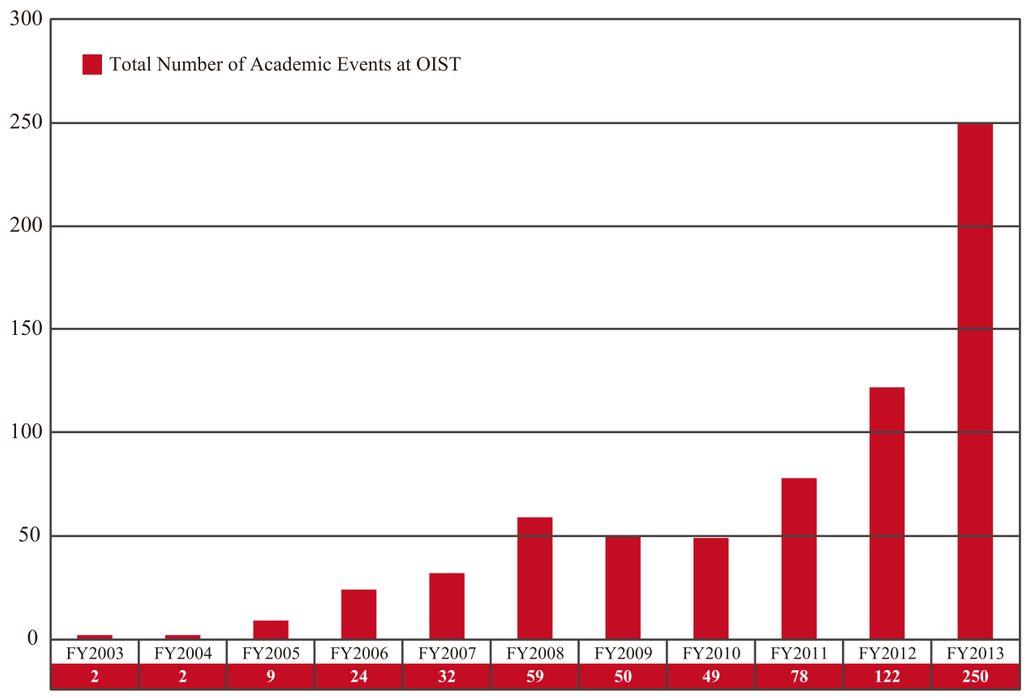
“It is estimated that only 20% of the proteins that make up our body can be crystallized. Therefore, the structure of all other human proteins remains undetermined with existing techniques. I want to break this limit,” said OIST Professor Ulf Skoglund, who heads the Structural Cellular Biology Unit.

For decades, pharmaceutical companies have studied the structure of proteins on the surface of human cells to develop drugs that latch onto the proteins and block the entry of viruses or bacteria. Conventionally, scientists have resorted to crystallography to determine the three-dimensional (3D) structure of proteins. However, Skoglund and his team use a powerful Titan Krios electron microscope to take pictures of a frozen biological specimen at hundreds of angles to generate 3D images. Without crystallization, they can obtain images of biological molecules in their natural state. The technique, called Molecular Electron Tomography (MET), coupled with software developed by the unit, has allowed Skoglund’s group to create 3D images of the smallest protein ever captured.

“When researchers finally get to see in 3D the proteins they’ve been studying for years in 3D, the first thing they say is, ‘What?!’” said Skoglund. The potential of Skoglund’s work in molecular imaging technology is huge. With a grant from the Japanese government, he is establishing a spin-off company in Okinawa to use these protein-viewing techniques to help create business opportunities in biomedicine and drug discovery.

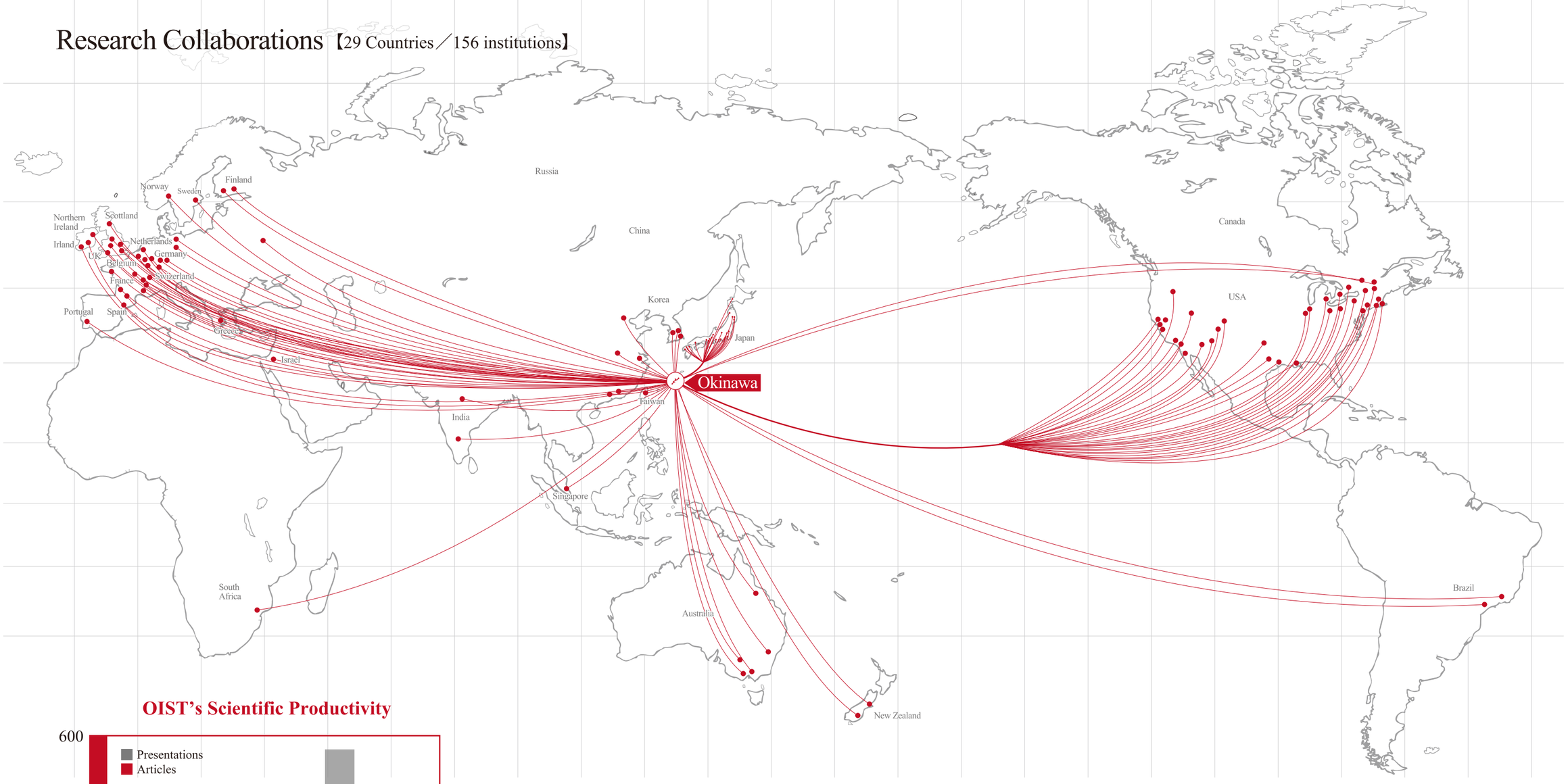
“OIST gave me the chance to turn my vision into reality,” said Skoglund. Like most other OIST faculty members, Skoglund was involved in the design and installation of his own lab, which has sound-absorbing walls and the mounting for the microscope imbedded directly into the solid rock foundation of the site to prevent any vibrations from the building affecting its performance. OIST’s Titan Krios, one of only three in Japan, has performed the best among 40 currently in operation around the world because of the lab’s set-up. “This can happen only at OIST,” said Skoglund.

Total Number of Academic Events at OIST

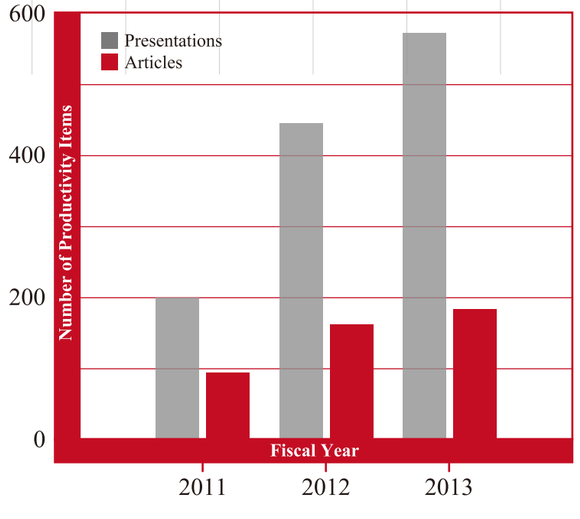


*The “Total Number of Academic Events at OIST 2003 – 2013” includes:
OIST Workshops, Seminars and Lectures, Training Symposia, Colloquia, Public Lectures, Joint Symposia, External Academic Events, etc.

Research Collaborations【29 Countries／156 institutions】



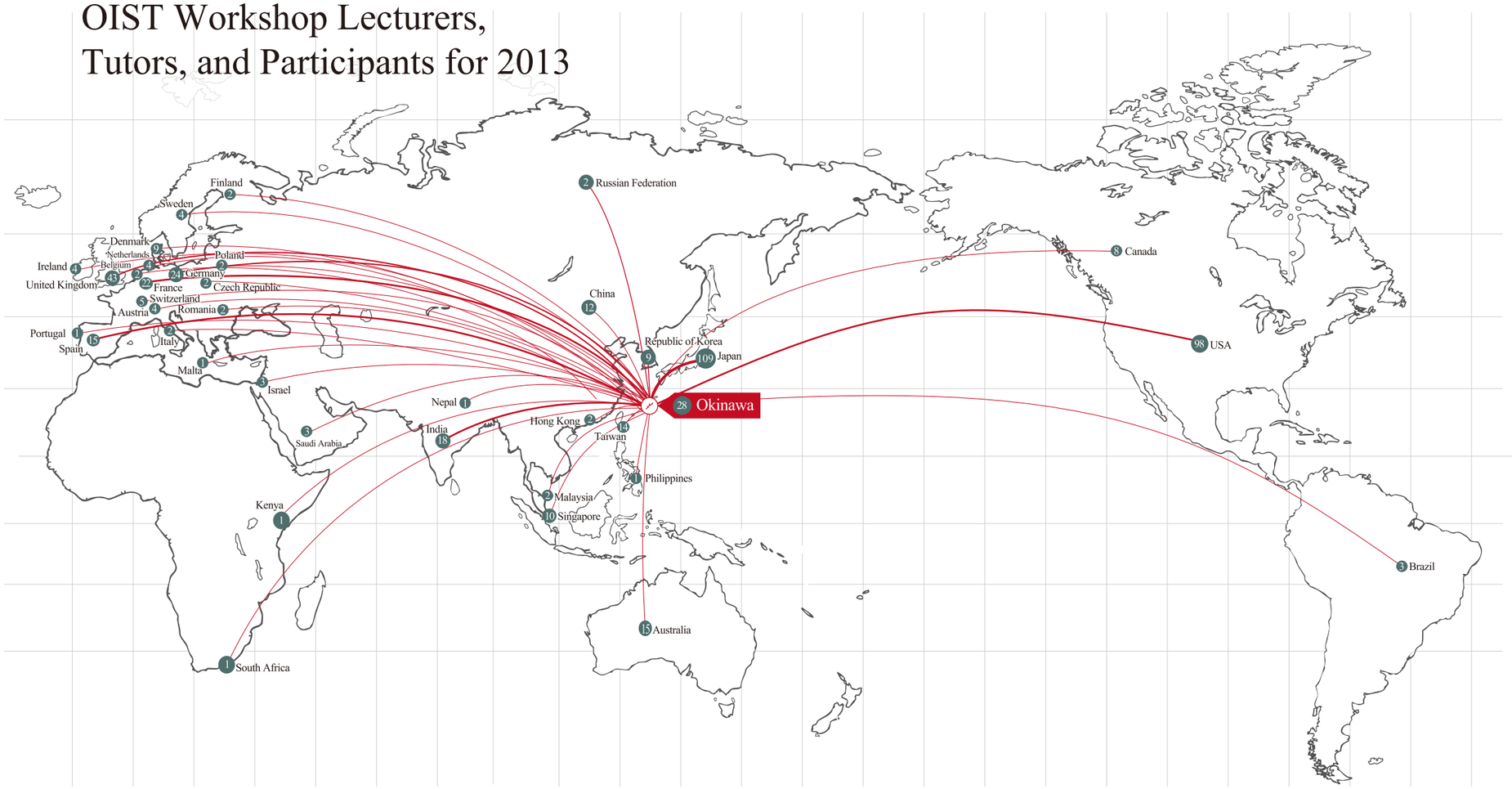
OIST's Scientific Productivity



Historical progress of scientific productivity at OIST

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	**Total**
Conference Presentations	61	45	41	98	109	171	223	260	455	548	**2,011**
Dissertations	0	0	2	3	4	0	1	1	2	3	**16**
Software	0	0	0	0	0	0	0	0	7	9	**16**
Journal Articles, Book Chapters	11	15	20	44	39	52	65	107	146	174	**673**
Books	0	3	0	2	1	1	0	1	1	2	**11**
Patents (Pending)	0	0	0	0	0	0	0	1	9	14	**24**
Patents (Granted)	0	1	0	3	2	0	5	0	0	0	**11**
Total	**72**	**64**	**63**	**150**	**155**	**224**	**294**	**370**	**620**	**750**	**2,762**

OIST Workshop Lecturers, Tutors, and Participants for 2013



The OIST Funded Workshops (OIST Workshops) are used as a vehicle to provide training in advanced scientific techniques and to share new discoveries at the cutting edge of science. One of the main goals is to expose participants to a wide range of scientific approaches and a broad overview of the field of research. By inviting some of the most prominent researchers from around the world, and offering eager workshop participants the opportunity to learn about the latest advances in science, OIST Workshops are becoming a hub for scientific exchange between Asia and the rest of the world. Between FY2003 - FY2013 more than 4000 participants and lecturers from more than 50 countries/ regions around the world participated in OIST Workshops.

The number of applications for participation in OIST Workshops demonstrates their rising popularity and the increasing recognition of OIST as a world-class university. An example is the Okinawa Computational Neuroscience Course, which celebrates its 10th anniversary in 2014. This workshop received 224 applications from around the world for 29 available slots.

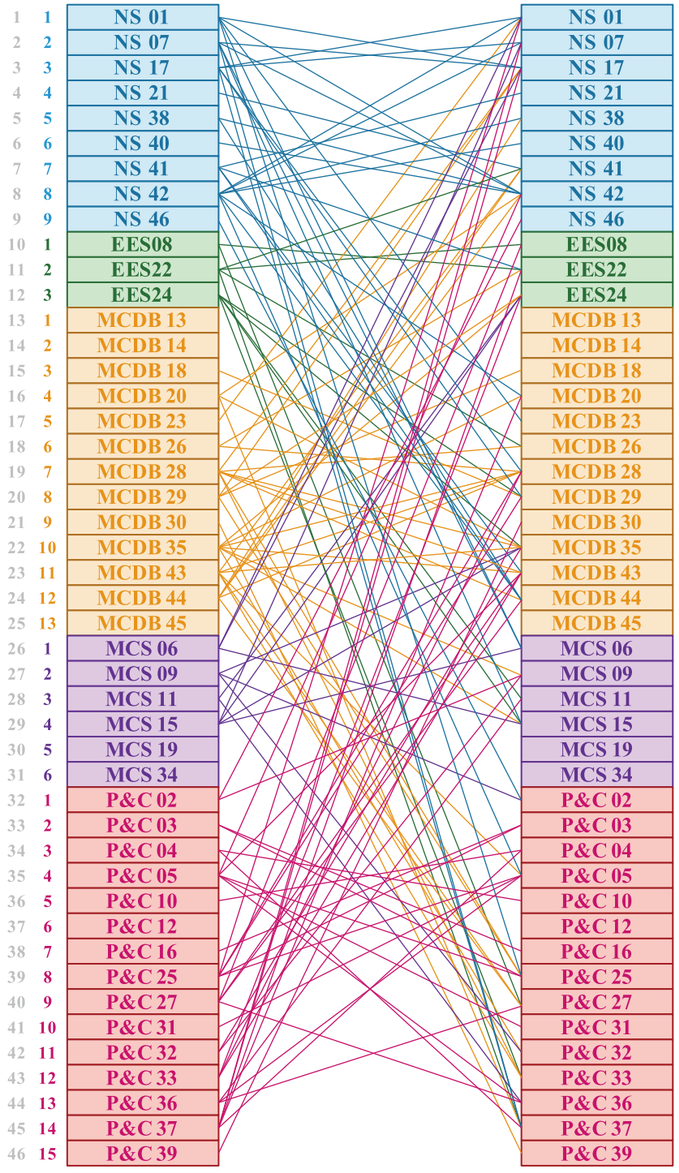
Furthermore, OIST Workshops have also contributed to the recruitment of researchers. Lecturers invited to OIST Workshops in the past are now established members of the OIST faculty.

Participants in 2013

	Lecturers	Tutors	Participants	Total
Australia	2	1	12	**15**
Austria	1	0	3	**4**
Belgium	0	0	2	**2**
Brazil	1	0	2	**3**
Canada	1	1	6	**8**
Czech Republic	0	0	2	**2**
China	3	0	9	**12**
Denmark	3	0	6	**9**
Finland	0	0	2	**2**
France	11	1	10	**22**
Germany	6	0	18	**24**
Hong Kong	0	0	2	**2**
India	4	0	14	**18**
Ireland	0	0	4	**4**
Israel	1	0	2	**3**
Italy	0	0	2	**2**
Kenya	0	0	1	**1**
Republic of Korea	2	0	7	**9**
Malaysia	0	0	2	**2**
Netherlands	0	1	3	**4**
Nepal	1	0	0	**1**
Philippines	0	0	1	**1**
Poland	0	0	2	**2**
Portugal	0	0	1	**1**
South Africa	0	0	1	**1**
Malta	0	0	1	**1**
Romania	0	0	2	**2**
Russian Federation	0	0	2	**2**
Saudi Arabia	0	0	3	**3**
Singapore	2	0	8	**10**
Spain	3	0	12	**15**
Sweden	1	0	3	**4**
Switzerland	0	0	5	**5**
Taiwan	4	0	10	**14**
United Kingdom	17	1	25	**43**
USA	41	7	50	**98**
Japan (Okinawa)	12	12	4	**28**
Japan (Outside Okinawa)	37	1	71	**109**
Total	**153**	**25**	**310**	**488**

OIST Faculty 2014

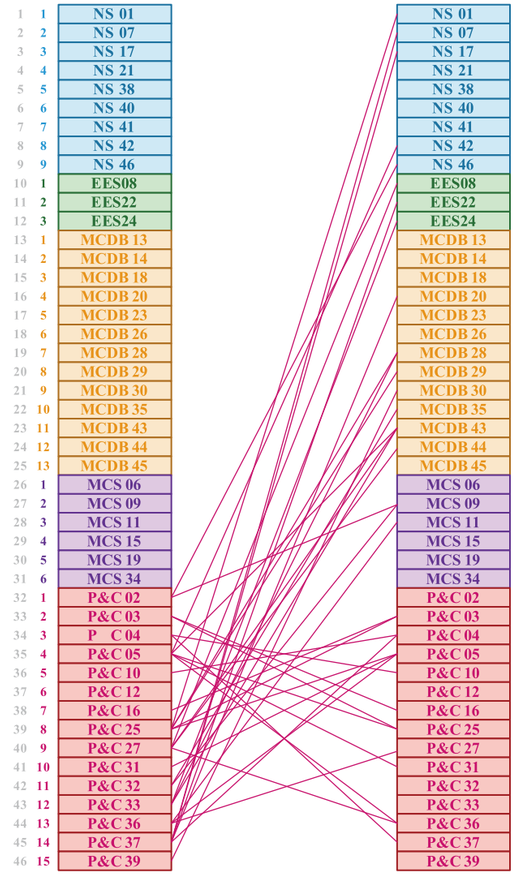
FY2014 Research Unit Collaborations



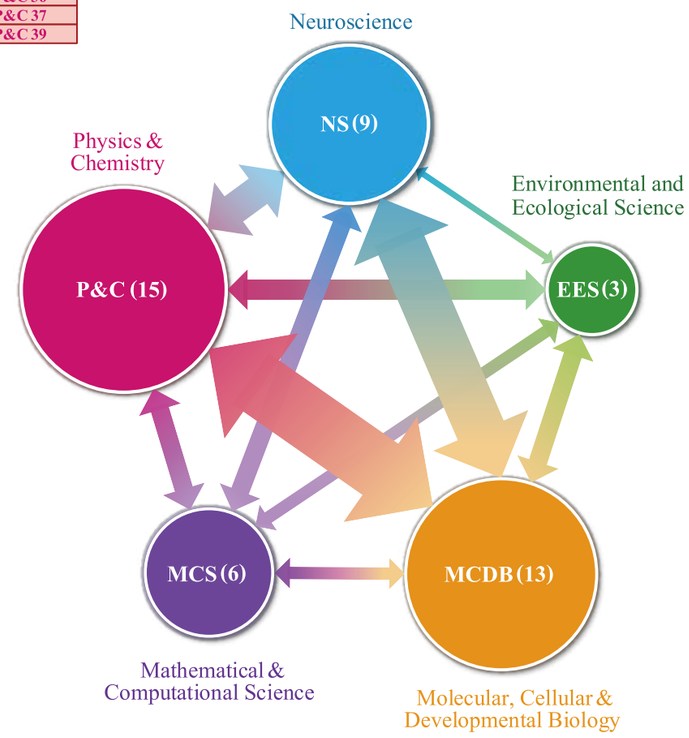
OIST Research Collaboration Diagram

At OIST, the open, integrated design of the laboratory buildings, the lack of departmental administrative boundaries, and an emphasis on shared equipment and resources have created an environment and support structures that arguably are unique in their effectiveness in promoting crossing of traditional disciplinary borders.

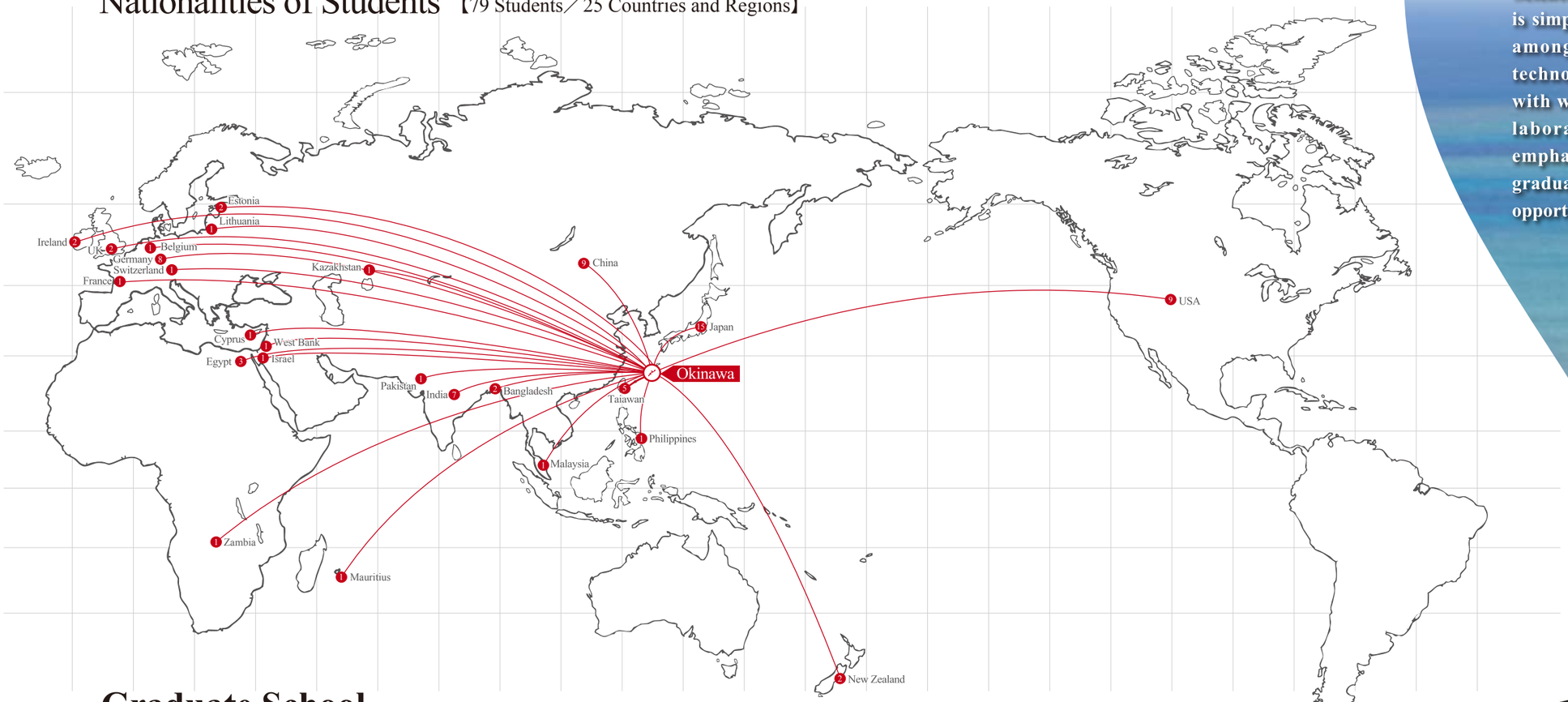
FY2014 Research Unit Collaborations
Physics & Chemistry



NS (Neuroscience)
EES (Environmental and Ecological Science)
MCDB (Molecular, Cellular & Developmental Biology)
MCS (Mathematical & Computational Science)
P & C (Physics & Chemistry)



Nationalities of Students 【79 Students／25 Countries and Regions】



Graduate School

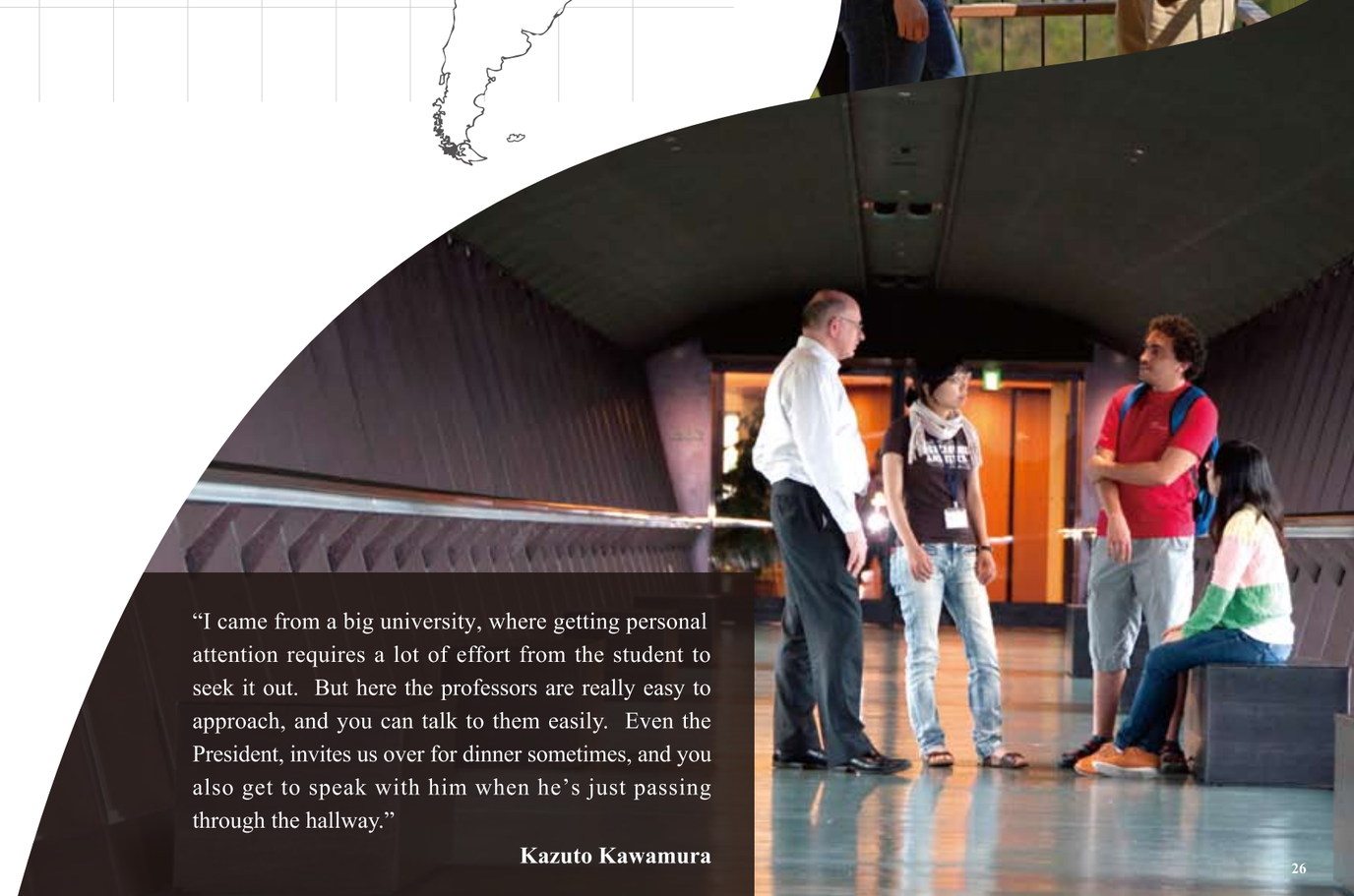
OIST has built a graduate program to attract the highest quality students from within Japan and around the world, to place OIST at the forefront of international interdisciplinary science education and research. The 79 graduate students come from 25 different countries and regions on four continents, demonstrating that OIST is already a known presence in the international science education community.

As a university that grants exclusively graduate degrees, students undertake individualized programs leading to a Ph.D. Education is tailor-made for each student based on his or her needs and interests. Before they begin, students are assigned an experienced faculty member to act as mentor, who guides them until they choose a thesis lab. Students take a customized schedule of classes in the first two years while simultaneously beginning research. Students can also work with an OIST professor in guided independent study if a particular scientific topic is not available as a class. With a faculty to student ratio of 2:1 students benefit from easy access to faculty expertise.

In the first three terms, students conduct a research project in different labs. Typically, two rotations fall within their chosen field, perhaps theoretical and experimental physics, and one far outside of it, such as ecology. This opportunity is facilitated by the lack of traditional departmental boundaries at OIST and the collaborative environment within the university. In the second year, students define their Ph.D. directions and begin work on their dissertation research.

"The educational vision of the Okinawa Institute of Science and Technology (OIST) Graduate University is simple: assemble a carefully selected group from amongst the very best international science and technology graduate students to work side by side with world-class faculty in modern, well-equipped laboratories; and provide an environment that emphasizes creativity, that provides individualized graduate training and that fosters cross-disciplinary opportunities."

Jonathan Dorfan



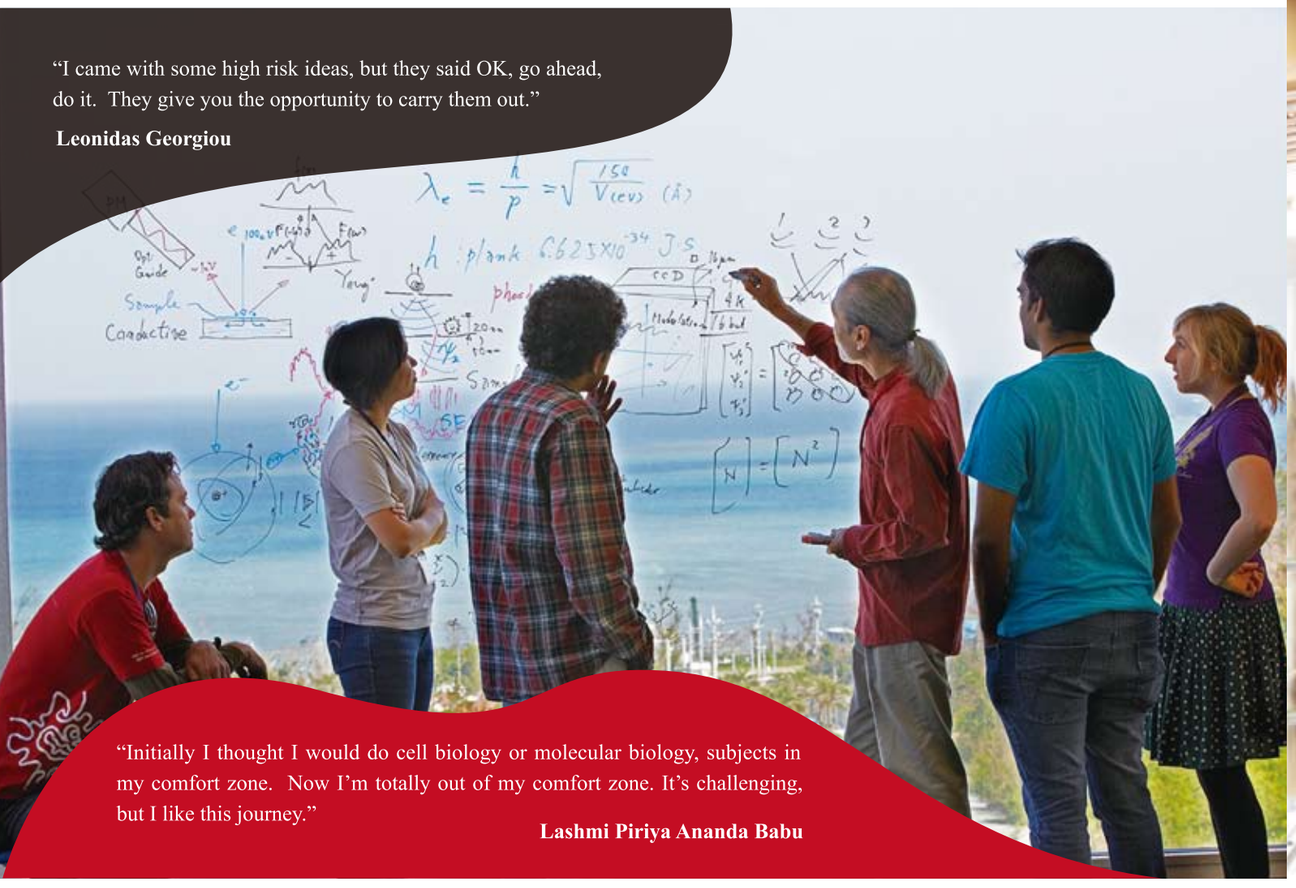
"I came from a big university, where getting personal attention requires a lot of effort from the student to seek it out. But here the professors are really easy to approach, and you can talk to them easily. Even the President, invites us over for dinner sometimes, and you also get to speak with him when he's just passing through the hallway."

Kazuto Kawamura

Interdisciplinary

OIST has a single academic graduate program promoting collaboration and interaction across traditional barriers and between disciplines. Students receive firm foundations in their core disciplines, but special emphasis is also given to ensure an education that is interdisciplinary. This is highlighted by the mandatory laboratory rotation that students have in a field that is outside their research subjects.

The absence of academic departments, a policy of broad access to all research equipment, and shared common space for faculty-led research units from widely differing disciplines remove traditional barriers to collaboration and promote cross-disciplinary research opportunities.



"I came with some high risk ideas, but they said OK, go ahead, do it. They give you the opportunity to carry them out."

Leonidas Georgiou

"Initially I thought I would do cell biology or molecular biology, subjects in my comfort zone. Now I'm totally out of my comfort zone. It's challenging, but I like this journey."

Lashmi Piriya Ananda Babu

Independence for Student Research

Considerable freedom is provided in the choice of thesis topics. Interdisciplinary collaboration, fostered by the emphasis on cooperation and interaction, is built into the architecture of the state-of-the-art laboratory buildings, which provide an outstanding environment for research and education. Access to this equipment and faculty studying a wide array of topics creates new avenues of unique interdisciplinary research for students.

Seminars and courses bring researchers to OIST on a regular basis. Students have exciting opportunities to interact with leaders in research from around the world and to meet other students and postdocs at the many international workshops and courses held at OIST.

"I am a Biology student, but I have learned math and computation. I can learn it here, and there's nothing to stop me from learning that."

Jiabao Chen

"I found I could move quicker into studying the brain. Because the environment is totally free, I can learn what I need."

Mohamed Abdelhack

"There's a lot of support for my own research, and I'm free to choose my own topic to study. I think there's more freedom here to explore different topics than at other places."

Simon Mekhail

International

The language of instruction and research is English and around half of the faculty, researchers, and graduate students come from outside of Japan, providing excellent preparation for a career as a scientist in the international research community. The academic year begins in September, making the school year match international programs. Students are encouraged to develop professional skills, travel internationally to keep abreast of new developments, disseminate their research findings, and tap into the extensive networks of the international OIST faculty members. These qualities will develop future career opportunities in leading research institutes and universities worldwide.

Innovator Free to Explore New Directions

Building devices from scratch has been at the core of Professor Tsumoru Shintake's career. "When I turned 16, I constructed a wind power generator that lit up the sign of a noodle shop that my parents owned." This year, the European Physical Society (EPS) has awarded Shintake the Gersch Budker Prize for constructing, in 2011, a facility called the SACLA X-Ray Free Electron Laser. Shintake, who now heads the Quantum Wave Microscopy Unit at OIST, is working on two entirely different projects, the development of clean energy technology and the construction of a revolutionary electron microscope, all from scratch.

Shintake's Sea Horse Project aims to harness power from the Kuroshio Current, which flows north past the Okinawan Islands and along mainland Japan's Pacific Coast. His team has already begun testing prototypes of an umbrella-shaped device with a propeller having meter-long blades that sweep through the water. "After seeing the March 2011 Great East Japan Earthquake and the subsequent Fukushima Daiichi nuclear disaster, I couldn't help but think about safe, inexpensive and environmentally friendly alternative energy alternatives," recalled Shitake. Ideally, 300 units, each 80 meters long and stationed 100 meters beneath the water's surface, would continually generate one gigawatt of energy in total, power equivalent to that of one nuclear reactor.

Shintake' s second research endeavor, the electron microscope, is revolutionary in a couple of ways. Unlike conventional electron microscopes, Shintake' s uses low-energy electrons to prevent damage to specimens. His design also eliminates lenses, which can distort images. Shintake uses only a detector to record electrons bouncing off the sample, and a computer to assemble the data into a 3D representation of the specimen. By maximizing the contrast between light and dark in an image, he is poised to uncover the tiniest scraps of life, including DNA and viruses. This new technology is also expected to obviate the need for time-consuming and difficult crystallographic techniques.

"When you start from zero, you end up building a device that is truly reliable because you understand the details," said Shintake. He adds, "the atmosphere at OIST is free and perfect for science to thrive. It is like having oxygen: without it, we will die. If scientists lose this free atmosphere, we won't survive."

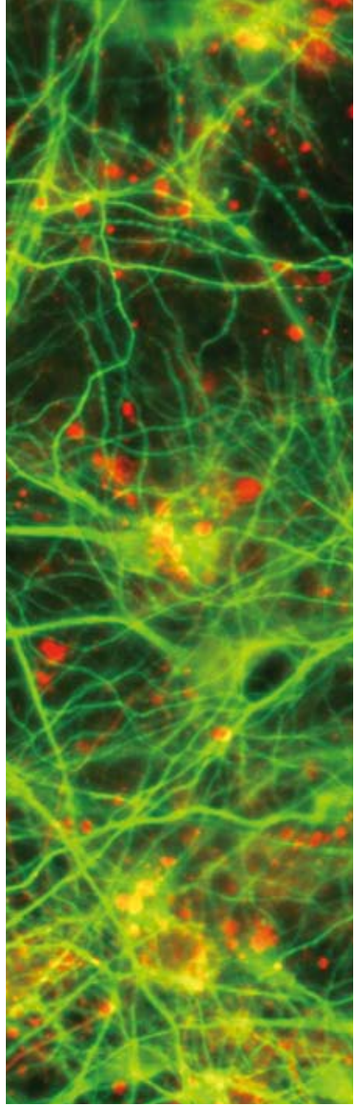
Industrial Relations in Okinawa

Establishing patenting procedures

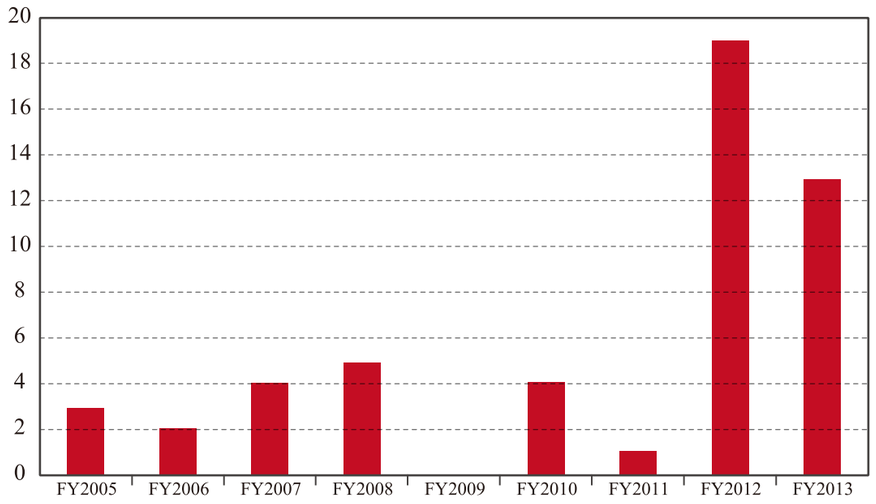
In 2011, the Technology Licensing Section was set up to patent inventions and commercialize OIST technologies. To manage the increasing number of inventions generated at OIST, the Section has established procedures for effective patenting. The proactive and English-based patenting procedure enables patent protection in major markets all over the world. This procedure uses a U.S. provisional patent application and a subsequent Patent Cooperation Treaty (PCT), which is an international, non-provisional application to secure the filing date, followed by patenting in individual countries including Japan. In addition, the global patenting process is expedited using the Patent Prosecution Highway, a fast track examination of patent applications that was recently introduced by Japan and is now becoming the world standard.

Intellectual property management system

OIST's focus is not on owning patents, but rather on using them to commercialize academic achievements as tangible products that contribute to society. This focus is also reflected in the software used to manage the intellectual property at OIST. Unlike typical software from Japan, its strength lies in managing licensing. Although OIST is the first user in Japan, it is commonly used in university technology licensing offices abroad.



Growing Number of OIST Patent Applications



Maturing Patents

The Technology Licensing Section's responsibility is to unleash the inherent potential of OIST inventions and ensure that the task is not left to individual researchers. To overcome the gap between academic inventions and technologies that can be commercialized, the Technology Licensing Section actively engages in developing early-stage inventions by organizing both domestic and overseas companies to perform necessary assays or simulations. This process has already matured individual inventions into strong patent applications. Lab 3, a third laboratory building now under construction, will offer incubation space for industrial partners and future startups.

Marketing and Networking

In 2011, the Business Development Section was established to further promote academia-industry relations. One of its main roles is to strengthen relationships with industry through joint/collaborative research projects. To conclude an agreement with private partners is a long process, and the first step was to make OIST visible to industry. The Section routinely goes to exhibitions within and outside of Japan to speak face-to-face with potential licensees, venture capitalists, patent attorneys, and other university licensors. The Section actively seeks one-on-one partnering using private meetings at major exhibitions including Bio Japan and Nanotech Japan. OIST also welcomes industry associations and individual companies to the campus to see and hear about OIST research. Several visits have resulted in agreements, demonstrating that this method works well and will be useful in the future as the number of visitors grows. Currently, OIST is in contact with 121 companies in various fields.

Ongoing Collaborations with Industrial Companies 2014

Field	Number
Agriculture	3
Bio	8
Business Association	2
Chemical	2
Construction	1
Drug	41
Energy	6
Environment	15
Research Institution	9
Service	1
Transportation	1
Finance	11
IT	5
Manufacturing	16
Total Number of Companies	**121**

Area	Number
Okinawa	43
Mainland Japan	76
Overseas	2
Total	**121**

Motivating OIST researchers and local talent toward commercialization

In 2012, with support from the Okinawa Prefectural Government and Okinawa Prefectural Federation of Chamber of Commerce and Industry, OIST was selected as one of the inaugural members of the Kauffman Global Partners Network. The network is supported by the Kauffman Foundation, based in Kansas City, and is one of the largest foundations in the U.S. devoted to entrepreneurship. Since then, OIST has hosted various workshops related to entrepreneurship.

Creating New Avenues for World-Class Research

The Sponsored Research Section was established at OIST to assist faculty with grant acquisition and management. Support offered by the Section helps researchers apply for grants within and outside of Japan, allowing faculty, postdocs and students to concentrate on research rather than grant administration. The Section has helped administer grants for researchers that are part of large-scale Japanese research projects, helped senior faculty with their duties as advisors of large grants, administered Japanese grants for two international researchers as part of larger collaborative projects, and helped with grants for senior faculty who have come to OIST to embark on new avenues of research and lend their expertise to young researchers. These activities will help to establish and grow external funding and increase exposure for OIST and its researchers at national and international levels, a vital step for OIST's growth.

Startup

The first startup from OIST will be launched in 2014. This will be the first step toward achieving OIST's goal of contributing to the self-sustaining development of Okinawa and the development of science and technology throughout the world. The venture company will use electron tomography technology invented by Prof. Ulf Skoglund, which integrates cryo-electron microscopy and an original 3-D reconstruction program. It will enable, for the first time, imaging of the structural dynamics of proteins at the molecular level. The venture company will provide invaluable data that can be used for drug development by pharmaceutical companies.

R&D Cluster

Integrated into the fabric of OIST's founding mission is the aspiration that it will contribute to the socio-economic prosperity of Okinawa. Like the components of an ecosystem, the success of OIST and Okinawa are interconnected. OIST is committed to enhancing Okinawa's innovation ecosystem by seeding the birth of an internationally competitive R&D cluster: a hub of world-class education, research, and industry that is open and deeply connected to society and to the local and global economies. The downstream benefits of fostering an R&D cluster are new jobs, dynamic ventures, novel products that meet mounting global needs, and a continual flow of people and creativity.

Since 2010, OIST has been working shoulder-to-shoulder with key stakeholders, leading discussions and strategic planning efforts around a bold vision for transforming Okinawa's socio-economic outlook, and by extension, that of Japan and the Asia-Pacific region.

Timeline and Milestones:

2010-2012

OIST organized 2 workshops in which 81 leading cluster experts from 7 countries generated 83 ideas to foster innovation and establish an international R&D cluster in Okinawa.

2012

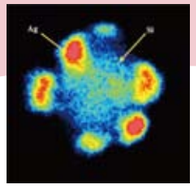
Memoranda of Understanding were formalized for OIST-government and OIST-academia partnerships for R&D cluster development.
Local government promoted the international R&D cluster concept in the "Okinawa 21st Century Vision Basic Plan", its 10-year policy document.

2013

The Japanese government promoted the international R&D cluster concept for Okinawa in its "Basic Policies for Economic and Fiscal Management and Reform."
OIST assembled a Task Force composed of academic-government-industry stakeholders to establish an autonomous promotion organization, responsible for planning, coordinating, and executing the international R&D cluster vision. The Task Force formed 3 working groups and conducted 3 meetings in FY2013.

2014

OIST organized a symposium with Sony Computer Science Laboratories (Sony CSL) on sustainable energy, an area where Okinawa, its R&D institutions, and Japan's high-tech industry can combine their collective strengths to build global expertise.



In Tiny Particles, Huge Potential for Industrial Application

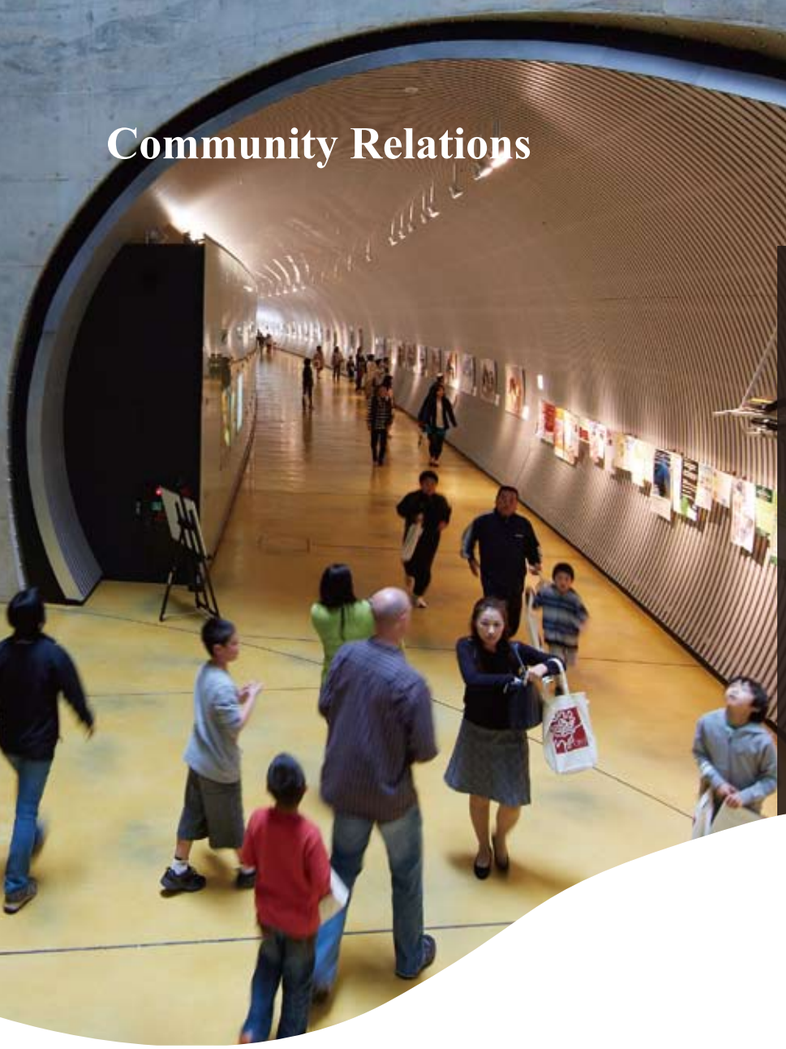
"We are like the United Nations. Ten people from different countries with a wide range of expertise working on making tiny nanoparticles with this device," said Professor Mukhles Sowwan, as he pointed to the octopus-like equipment sitting in his lab. The equipment, a nanoparticle deposition system, enables members of his Nanoparticles by Design Unit to design and fabricate nanoclusters of up to 5 atoms at a size, concentration, and composition of one's choice. "Everyone can make nanoparticles, but designing them for a specific purpose requires optimization of their properties."

Nanoparticles are tiny particles with a diameter of less than 1/10,000 that of a hair. Since magnetic, structural, electronic, chemical, optical, or other properties of elements differ in the ultra-small world, Sowwan and colleagues are using the nanoparticle deposition system to create nanoparticles with multiple desirable functionalities. Recently, the unit has succeeded in producing nanoparticles made of a core of iron and silver in a silicon shell for biomedical applications. The iron makes them magnetic, allowing researchers to move them around. The silver is excellent for imaging because excitation of silver creates a larger detection signal than the particle itself, enabling observation with conventional microscopy or medical imaging devices despite the particle's tiny size. The silicon prevents core breakdown and is biocompatible, meaning it can go into a patient without creating complications.

Applications of Sowwan's research are manifold, ranging from sensors, catalysts, targeted drug delivery, and clean energy applications, such as the microbial fuel cells being studied in the OIST Biological Systems Unit. Merely 2.5 years since the launch of his unit, Prof. Sowwan has already begun collaborative work with teams from Finland, France, U.S.A., and Okinawa.

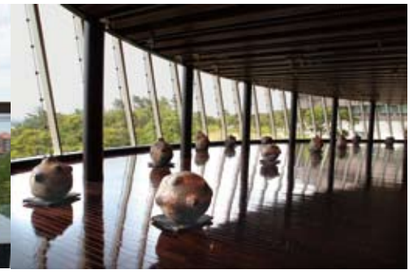
"Our research can only happen at OIST because this well-equipped, interdisciplinary university has no departments, freedom for research, and the environment that allows us to spend 100% of our time thinking about science," said Sowwan. His unit has biologists, chemists, engineers, mathematicians, and physicists, from France, Greece, India, Ireland, Japan, Palestine, Peru, South Korea, Spain, and the U.K. He is particularly grateful for the level of support OIST researchers receive from the University's administrative staff, and for the hospitality and kindness of the Okinawan people. "OIST is the best place for creativity."

Community Relations

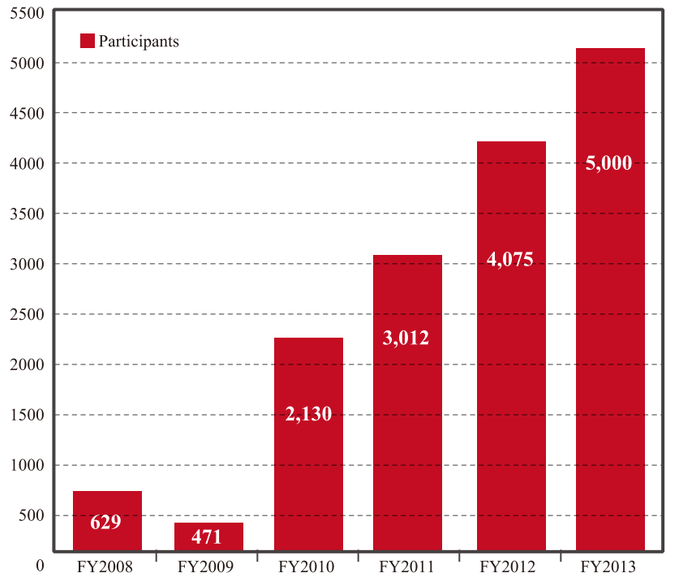


The number of visitors increased from 10,565 in FY2011 to 39,984 in FY2013.

Cultural Events



Open Campus Participants



OIST held Open Campus since FY2008. The number of participants increased from 629 up to 5000 in 6 yrs.

The World Comes to OIST

Their Majesties, the Emperor and the Empress of Japan Visit OIST

Minister of State for Okinawa and the Northern Territories Affairs, Science and Technology Policy, and Space Policy, Mr. Ichita Yamamoto.

Prime Minister Shinzo Abe and President Jonathan Dorfan

IN FOCUS NEWS

JAPAN

Okinawa goes recruiting

Research freedom proves trump card for interdisciplinary Japanese institute.

BY DAVID CYRANOSKI

If you're a young American or European scientist and want freedom to pursue your own research, where do you go? Some promising young researchers have made a surprising choice: a research institute on Okinawa, one of the most southerly and remote islands in Japan. After a decade of slow growth, the institute has a new president-elect, former Stanford University physicist Jonathan Dorfan, a bumper crop of new faculty, and plans to open its doors as a graduate university later this year.

For young researchers, freedom is scarce in Japanese academia, with its strict hierarchy. And Japan's universities have not had great success in attracting foreign faculty because they offer few lifetime positions for newcomers. Despite two decades of attempted internationalization, the proportion of foreign faculty members at Japanese universities hovers at around 3%. As for Okinawa, its weak infrastructure and moribund economy make it an unlikely spot for a world-class research institute.

The Japanese government hoped to invigorate both Japanese science and Okinawa when it conceived the Okinawa Institute of Science and Technology (OIST) in 2001 as an oasis of international, interdisciplinary research. Required to find 50% of its faculty and students from outside Japan, the institute has no departments and no hierarchy of junior and senior professors. Its president answers to an international board of governors made up of prominent scientists. Its resort-like facility, tucked into protected forests and overlooking the sea, is designed to foster mingling. And it pays top salaries and offers faculty generous start-up funding.

Under its first president, Nobel laureate Sydney Brenner, the OIST hired its first four research groups — all Japanese — in 2004 and eventually grew to about 25 faculty members, dominated by biologists. But critics viewed its remote location as a handicap and its cost, roughly US$100 million a year, as exorbitant. To gain accreditation as a graduate university and host graduate students, the institute would have to prove it could attract quality faculty.

Hired last July to lead the OIST once it becomes a university, Dorfan has plunged into that effort, taking on politics, administrative duties, public outreach and recruitment. He has introduced a tenure system, offering scientists — even foreigners — the opportunity of a secure lifelong career. Lavish funding and an idyllic setting, he says, will go only so far in overcoming fears about intellectual isolation and the challenge of attracting graduate students to a remote location. "Asking people to come here is not trivial. If we can't offer tenure, it would be suicide in terms of recruiting," says Dorfan.

Over three weeks in December 2010, 27 potential recruits visited the institute. "It's the biggest recruiting drive I know of," says Dorfan, and it became manageable only after Dorfan's wife suggested that candidates visit together and sit in on each other's job talks. "They weren't competing against each other. They were competing against a bar," he says.

Dorfan made 26 offers. So far, according to a list he provided to *Nature*, 20 candidates have accepted, including 11 physicists. Dorfan expects that this success will earn the OIST university accreditation this autumn; it will then start accepting graduate students for 2012. Eventually, the OIST aims to have a total of 2,400 scientists, including graduate students and 300 faculty in a wide range of specialities, although special strengths in marine science, neuroscience and imaging are already emerging.

With an average age of 41, most of the recruits are young, although the OIST has already offered some greying scientists a chance to continue — and even expand — their careers. In the two years since he was forced out of Kyoto University at retirement and hired by the OIST, marine biologist Nori Satoh has put together a project fitted to his new workplace: sequencing coral genomes in search of clues to why some local species suffered bleaching in 1998 after a particularly hot summer, whereas others resisted it.

Facilities are part of the allure, including a $9.2-million table-top synchrotron for structural analysis, electron microscopes and a $5-million coastal ocean-observing system. Tsumoru Shintake, whose group designed Japan's recently unveiled X-ray free-electron laser while at the Japanese research institute RIKEN, is one of the new recruits. He plans to build a new type of low-energy electron microscope to make three-dimensional images of DNA and other biological molecules in solution. The OIST also has two-photon microscopes and state-of-the-art gene sequencers. "I believe in instruments," says Dorfan.

But the main draw is freedom. Each principal investigator post comes with five years of guaranteed research funding, along with support for graduate students and postdocs. "I have been offered all the support needed to carry out the research I want to do," says Pinaki Chakraborty, a 31-year-old fluid mechanics specialist at the University of Illinois, Urbana-Champaign. "No strings attached."

Yves Eastcomte, a 26-year-old ecologist and postdoctoral researcher at the University of Michigan, echoes that perspective. "Once it sunk in how many resources I would have available [at the OIST], I realized I would need an incredible run with the National Science Foundation to match that in the US. I feel like my research success is now up to me instead of an anonymous grant-review panel." ■

> **"My research success is now up to me instead of an anonymous grant-review panel."**

The main building and labs of the $300-million Okinawa Institute campus will be finished next year.

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JAPAN

Windfall for Tiny University With Outsized Ambitions

TOKYO—Japan is doubling its bet on a young graduate university, based on a remote island, that has aspirations of becoming a research powerhouse. If approved by the Diet, the annual budget of the Okinawa Institute of Science and Technology (OIST) will jump from $110 million this year to $264 million in 2014. OIST's governors met last week with Japanese Prime Minister Shinzo Abe to outline expansion plans. "We said we admire and congratulate the government for being willing to try to realize the vision for this university," says neuroscientist Torsten Wiesel, a 1981 Nobel laureate who chairs OIST's board.

OIST opened for research in 2005 and began taking students last year. Now it intends to double its faculty roll to 100 within 7 years, and ultimately up it to 300—roughly the size of the California Institute of Technology (Caltech). Enrollment is slated to climb from 300 now to 1000. The unabashed hope is "to make OIST the best research university in the world," says Kuji Ono, a politician who conceived the institute a decade ago. "We have momentum now and we should capitalize on that by rapidly beginning to grow," says OIST President Jonathan Dorfan.

To chart a course for building a formidable institution from scratch, Ono assembled a Nobel-studded team of advisers. They recommended that OIST enroll only graduate students, recruit half its faculty from abroad, and emphasize interdisciplinary research and education. Government planners gave OIST greater autonomy than other universities by placing it directly under the prime minister's office rather than the education ministry. That privileged treatment riled some academics and politicians, who also criticized the decision to put the institute in Okinawa Prefecture, better known as a vacation destination than as a research hotbed.

OIST appears to have few detractors now. "We've been able to establish the key elements [that] success can be built on," says Dorfan, a physicist and former director of what is now the SLAC National Accelerator Laboratory in Menlo Park, California. One element, he says, is top-flight faculty members like Keshav Dani, a 34-year-old physicist who studied at Caltech and the University of California, Berkeley. Dani accepted a position at OIST over several tenure-track offers from top U.S. and European universities. When he first visited the campus, he says, "they laid out a fantastic vision and I was blown away." His startup package included an expensive laser setup for femtosecond spectroscopy.

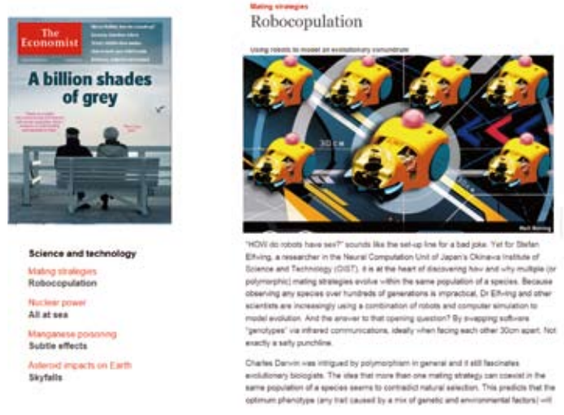
OIST also has a mandate to spur economic development in Okinawa. Toward that end, Dorfan says, the university in April will establish its first startup company, which will commercialize a technique that determines the molecular structure of proteins developed by OIST biologist Ulf Skoglund. The technique is expected to be used for drug discovery.

Dorfan says he understands why administrators at other universities might envy OIST's support. But by raising standards of research and setting a precedent for recruiting foreign talent, he argues, OIST is bound to benefit other schools in Japan as well.

–DENNIS NORMILE

Powerful patron. A doubled budget will allow OIST President Jonathan Dorfan, pictured with Prime Minister Shinzo Abe, to plan a major expansion.

Published by AAAS



Think Globally, Act Locally on ADHD Research

Okinawa's huge interest in attention deficit hyperactivity disorder (ADHD) came as a nice surprise for researchers in the OIST Human Developmental Neurobiology Unit when the university held a public lecture on this topic for the first time in 2012. The university's 500-seat auditorium was packed with parents of children with ADHD, educators, and nursery workers caring for children with ADHD. "I was encouraged to see so many in the audience," said Professor Gail Tripp who heads the unit. "Our research could improve the understanding and management of ADHD to achieve tangible benefits for affected children and their families."

ADHD is a neurodevelopmental disorder in which children exhibit short attention spans, elevated levels of motor activity, and impulsiveness. In one project, unit member Emi Furukawa works with colleagues in Brazil to study what is happening in the brains of people with ADHD. In recent research using functional magnetic resonance imaging (fMRI), the research team found opposite brain activity patterns between ADHD individuals and typically developing individuals during reward anticipation and delivery, providing insight into typical ADHD behavior. The work was a feat of international and cross-disciplinary collaboration in the fields of psychiatry, neuroimaging and neurobiology. Furukawa says, "I was able to work with mentors and collaborators who were patient to teach me and really took time to discuss across disciplines. I believe this was possible only with the kind of support OIST provides for its researchers and its emphasis on multidisciplinary research."

In another project, led by the unit's Okinawan-born researcher, Shizuka Shimabukuro, researchers are developing a parent training program specifically designed for Japanese parents of children with ADHD. The program, which incorporates known effective elements from overseas, offers parents strategies to improve their child's behavior by reinforcing appropriate behavior. Nineteen Japanese parents participated in a preliminary trial, and Shimabukuro is currently revising the program based on feedback she received. She also plans to work closely with other local organizations to foster a greater network of support services for families coping with ADHD. "Parents' needs are great, but the services available to them are very limited," said Shimabukuro. "I hope our program will be able to fill that void."

University Life

Child Development Center

Since the Child Development Center program opened in January 2013, over 70 children have attended the preschool and 25 children have participated in the After School/ Holiday Program. OIST is breaking new ground with child-centered programs that are bi-lingual, taught in both English and Japanese, catering to the needs of the culturally diverse population. Like a microcosm of OIST`s Graduate University, the children at the Child Development Center come from 23 different countries and have 18 different home languages. Professors, postdoctoral researchers, students and administrative staff with families, or with plans on having a family, are attracted to OIST because of the on-site family support offered to working parents.

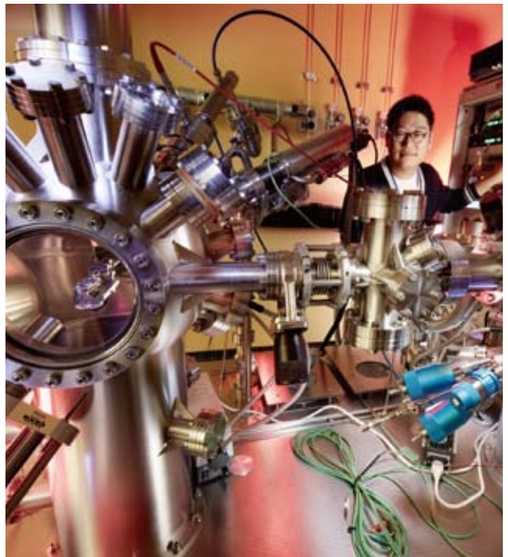
The Resource Center

The OIST Resource Center was created to help foreign faculty, staff and their families transition smoothly to life on Okinawa. The Center fosters a sense of enjoyment and stability among OIST employees and students by helping them solve quality-of-life issues, providing information about the university and surrounding areas, and creating opportunities for community-building. In addition to serving as a central information hub, the Center collaborates with local organizations to create meaningful interactive opportunities with the local population, facilitating a connection between OIST and its Okinawan neighbors.

Puzzling Together Our Energy Future

Organic solar cell research requires scientists well versed in materials science, device physics, electronic engineering and chemistry. “It’s like working on a jigsaw puzzle. If one piece is missing, the puzzle is never complete,” said Professor Yabing Qi, who leads the OIST Energy Materials and Surface Sciences Unit. With degrees in physics and applied science, Qi brings his cross-disciplinary experience to OIST. “The university has provided a platform. There is freedom to do innovative research, people with different fields of expertise, and a non-departmental structure.”

In two short years, Qi and his team have made advances in developing solar technology out of organic materials. Traditional silicon-based solar cells have several drawbacks, including expense, due to the cost of raw materials and usage limitations, because they are rigid and opaque. However, organic solar cells are more cost-efficient and easier to fabricate because of their transparency, flexibility, and reduced weight. They also accommodate a wider range of uses because they can be mounted on nearly any solid surface from a wall to a curved window.



Qi’s group has characterized flexible and transparent electrodes called Flextrodes in organic solar cells that were made with new materials including plastic, a conductive material, and zinc oxide. Flextrodes are made with the same inexpensive and common plastic found in disposable drink bottles. The team has also developed methods of cleaning the electrodes to restore their function after an extended period of storage.

“The level of support we receive from OIST’s administration is remarkable,” said Qi. His research requires a clean room. Any dust contaminating the thin flexible film can impair the efficiency of the solar cell. His group also uses an ultra-high vacuum instrument to investigate structural, electronic, and chemical properties of materials that can degrade the high efficiency of a solar cell. “The staff members help us with installation of state-of-the-art equipment and make sure that the clean room is dust-free.”

The pieces of the puzzle Qi is working on are coming together. Our clean energy future may be closer than we imagined.