

The Okinawa Institute of Science and Technology was inaugurated in November 2011. By conducting world-class research and education in science and technology, the OIST Graduate University aims to contribute to the self-sustaining development of Okinawa and to the academic advancement of worldwide science and technology.



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## Brenner Symposium

The early dawn's activities of Saturday the 19th November 2011, signaled the beginning of a busy day at the OIST main campus in Onna village. 400 dignitaries from Okinawa, mainland Japan and overseas were expected to attend the Inauguration Ceremony to be held at the OIST central courtyard celebrating the creation of the new graduate university.

First on the programme was the Brenner Symposium celebrating Dr. Sydney Brenner's contribution to the creation and development of OIST. The symposium began with greetings from Drs. Robert Baughman and Jerome Friedman, followed by Drs. Kenji Doya, Nori Satoh, Satoshi Mitarai and Alexander Mikheyev who spoke about their research illustrating the rich and varied future of OIST. Dr. Brenner concluded the symposium with an inspiring and enlightening speech on the history and vision of OIST. To conclude the symposium, Dr. Baughman presented Dr. Brenner with a framed photo of OIST buildings previously signed by all members of OIST Board of Governors.

The afternoon's threatening grey skies meant that the second half of the programme, the inauguration celebration, changed venue temporarily, to a 150-seat Lecture Hall with projectors screening the ceremony in the courtyard and in two large conference rooms. The ceremony began with a

welcome by OIST Graduate University President, Dr. Jonathan Dorfan, followed by speeches by OIST member of the Board of Governors, Dr. Akito Arima, Japanese Minister of State for Okinawa and Northern Territories Affairs, Mr. Tatsuo Kawabata, Governor of Okinawa Prefecture, Mr. Hirokazu Nakaima and a keynote speech by Massachusetts Institute of Technology (MIT) President Emeritus, Dr. Charles Vest. Dr. Vest concluded, "I congratulate President Dorfan and salute the forward thinking of the people of Okinawa and the Japanese government on their bold and visionary establishment of this new 21st century university. OIST has been born and will be nurtured in Okinawa. It will benefit Okinawa strongly as the years progress."

Guests were then escorted from the Lecture Hall out into the Centre Court where a special celebration had been planned. VIPs seated, the media ready and rain on standby, the spotlight was now on the performers. The sounds and movements of the traditional Okinawan drums and dance were followed by two human-powered dancing Lions and a Dragon that paved the way for a group of young Hip Hop dancers who moved robotically around the stage against a backdrop of OIST's Dr. Kenji Doya's research robots. Finally elegant ballerinas from the local gymnastics club closed the evening with the red-ribbons gymnastic performance, a tribute to the OIST Logo.





## Inauguration Ceremony

### A New 21st Century Research University

The Inauguration's keynote speaker Dr. Charles Vest, President of the U.S. National Academy of Engineering, gave an inspiring speech based on his experience as past President of Massachusetts Institute of Technology (MIT). His speech highlighted the move from brain drain to brain circulation and integration as "young people are becoming global citizens and now move around the globe studying or doing business in many different countries that present opportunities to them." He noted that OIST is tapping into this brain circulation and integration through its vision. His conclusion consisted of six basic lessons from the experiences of the 20th century research universities that a new 21st century university like OIST may wish consider. *The full speech can be found on the OIST Website.*

*"OIST with its international and interdisciplinary approach has a capacity to extend the boundaries of science beyond measure at this point of time. We are now engaged in the process of setting up an R&D Cluster in Okinawa to accelerate the transfer of scientific innovation to commercial exploitation." - Torsten Wiesel, Chair of the OIST Board of Governors.*

### Okinawa Triggers Internationalization of Japanese Universities

Dr. Akito Arima's passion for seeing Japanese universities becoming truly international institutions was echoed in his thorough speech that reflected his efforts, and that of the National Diet, the government and industry. Achieving internationalization meant that Japanese universities were open to external and independent assessments, comprise of strong international staff and use English as the primary language of research and education. The birth of OIST has triggered this hope with its five pillars; "Best in the world, International, Flexible, Global Network and Collaboration with Industry." *The full speech can be found on the OIST Website.*



*"I am delighted by the establishment of OIST. The OIST Graduate University can set new standards of excellence in international science education. Japan can become a global leader in this field." - Akito Arima, Vice Chair of the OIST Board of Governors.*

*"This is a historic day for education and research. I would like to acknowledge the outstanding vision of the Japanese government for setting up a new model of education that can transform graduate studies globally. The OIST Graduate University will conduct internationally outstanding research and education, thereby contributing centrally to the sustainable development of Okinawa." - Jonathan Dorfman, OIST President*

## Research Highlights at OIST

### Can You Teach Old Dogs New Tricks?



Dr. Yazaki-Sugiyama explains the critical period.

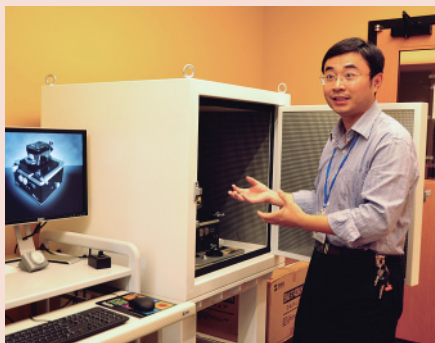
and what triggers this critical period to close is important in unraveling why it is difficult to learn new things when we are older.”

An amazing learning period occurs during the early lives of both humans and song birds. This period unfortunately disappears early in life and finding more about it could explain why learning a different language, or how to play a musical instrument when you are an adult, can at times feel like a mammoth task.

Infants can easily learn to make an audio sound from their exposure to them. The neurons in the infant’s brain are still flexible and are at a critical time period, the so-called neural plasticity period, during which neuronal circuits can be shaped according to what the baby hears.

Dr. Yoko Yazaki-Sugiyama, Assistant Professor leading the Neuronal Mechanism for Critical Period Unit says, “Understanding how experience shapes neuronal circuits during the early development stage

### A Smarter Way to Solar Power



Dr. Chi speaks about investigating organic materials.

nanotechnology to develop low-cost and high efficiency solar energy harvesting devices.

The looming energy concerns caused by diminishing availability of fossil fuels demands that nations consider alternative energy sources such as solar power. Assistant Professor Dr. Yabing Qi, who joined OIST recently as the leader of the OIST Energy Materials and Surface Sciences unit, is enthusiastic about the potential to develop hybrid solar cells that cost less to produce and are highly efficient.

Current solar panel cells are made of inorganic materials, polycrystalline silicon, that is expensive and time consuming to produce. Hybrid solar cells that Dr. Qi is investigating are made of a combination of both organic and inorganic materials. Dr. Qi’s research involves understanding the structure-property relationship in the solar cell component materials as well as exploring novel technologies such as

### Mobile Electrons Lead to Quantum Computers



Dr. Konstantinov refers to electrons on helium.

in heterostructures, we can describe and make changes to particles through quantum mechanics and consequentially find various applications that they could be used in such as quantum information processing.”

The mention of quantum computers can seem like something from the realm of science fiction. However, according to research being conducted by Dr. Denis Konstantinov, OIST’s newly appointed Associate Professor at the Quantum Dynamics Unit, this seemingly fictional idea can become reality.

Before coming to OIST, Dr. Konstantinov previously worked at the Low Temperature Physics Laboratory at RIKEN where he studied the quantum properties of electrons on helium. At OIST Dr. Konstantinov studies the behavior of complex quantum systems including electrons. His group aims to reveal and describe the systems’ unique properties and show how electrons on helium complement the electron gas that exists in semiconductor heterostructures. He explains that, “by understanding the nature of complimentary systems like interacting electrons on helium and electron gas

## Order Arises from Chaos

by Juliette Mutheu

### *Passion and Inspiration*

“I stuck to scientific research because it was more interesting than talking about BMWs,” says the youthful-looking, energetic and passionate Mexican mathematician, Dr. Tatiana Marquez-Lago, explaining why she left behind international business management to do full-time science. Dr. Marquez-Lago joined OIST in October as Assistant Professor heading the Integrative Systems Biology Unit.

“Before retiring, my mother worked as a language teacher and my father as an industrial engineer. He always had this hobby of solving mathematical problems and I suppose I followed in his footsteps and ended up in mathematical research.” Her mother

likens Dr. Marquez-Lago’s choice of profession to her great uncle, who was one of Einstein’s students.

As is the case with most young children, her interests were many, but unlike most children she went on to study at three Mexican tertiary institutions; International Business Management at the Universidad Panamericana, actuarial Science at the Universidad Nacional Autonoma de Mexico, and Archaeology at the Escuela Nacional de Antropologia e Historia. Throughout her bachelor’s in Actuarial Science, she mainly focused on dynamical systems, numerical analysis and mathematical biology. She continued on with this focus in her applied and computational mathematics MSc at the Simon Fraser University in

Canada and her PhD in Mathematics at the University of New Mexico in U.S.A, two universities with a long-standing tradition of excellence in numerical analysis. Her PhD’s specific focus was on cell signaling pathways and how to construct efficient stochastic algorithms to portray and analyze these biological systems.

### *It is All About the Noise*

Although her research sounds technical and complicated, her description of her PhD years; ones of thrill and intense learning in tranquil surroundings are enough to keep you intrigued. “I was blessed to work with world-renowned math professors; Bob Russell, Stanly Steinberg and Kevin Burrage. They were all very much in touch and directly involved in their research and



Dr. Marquez-Lago at her new office at OIST

their students or postdocs,” she says. “They always had time and were driven and dedicated to their groups, while having admirable work and life balance.” Dr. Marquez-Lago is keen to emulate these attributes within her new Unit at OIST.

The Integrative Systems Biology Unit is interdisciplinary combining stochastic modeling, multiscale methods, numerical analysis, and synthetic and systems biology. “Stochasticity or noise, in very short words means unpredictable,” says Dr. Marquez-Lago. “Well-structured, orderly systems such as gene expression, cell signaling or tissue movements arise from seemingly random interactions. The question we want to answer is how such ‘chaos’ leads to order.” She says. “Isn’t it mind boggling to imagine hearts pumping or the brain making decisions due to large groups of intrinsically unpredictable events?”

Stochasticity in biology is due to the inherent unpredictability of molecular collisions and chemical interactions. These processes are random and one can never say with absolute certainty when they will occur. Certain behaviors are also random at the cellular level, but how order arises from this chaotic system is hard to understand even at simpler biological levels.

In her Unit’s wet lab, Dr. Marquez-Lago aims to create synthetic circuits that can be externally controlled, providing a better understanding of the role of noise in biological systems and how key biological decisions are made. By doing so, one can utilize the power of theoretical approaches to construct and understand biological functions. Many times, this implies consecutive iterations between the dry and wet labs, refining mathematical models with experimental findings and vice versa.

If this technique can be mastered, one could in principle tailor biological functions predicted by mathematical models, a key concept within the emerging field of personalized medicine. Controlling the levels at which proteins are produced and signals transmitted is one of the goals of synthetic and systems biology and relevant to pharmaceutical research.

Dr Marquez-Lago’s Unit is split into two. One half will focus on stochastic and multiscaled modelling and will enlist mathematicians or engineers with an interest in biology. The other half will deal with experimental biology and will enlist biologists or chemical engineers with an interest in biological modeling.

### An Award-Magnet

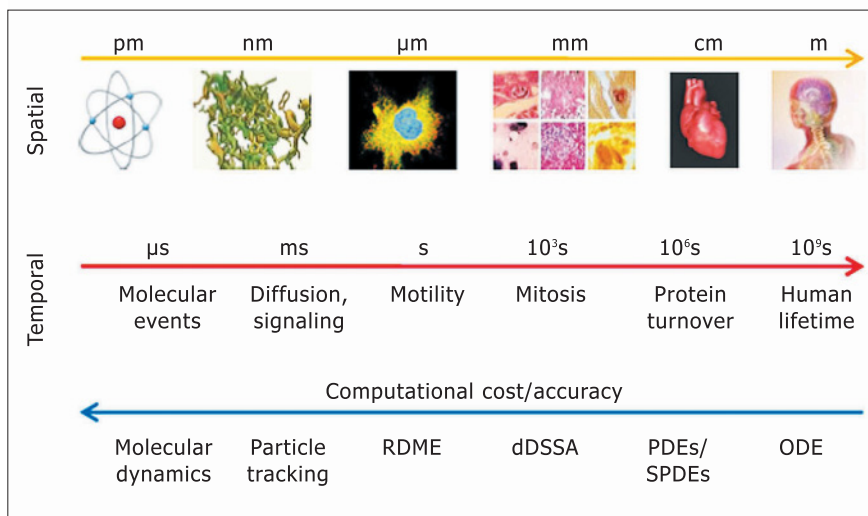
Growing up in Mexico, Dr. Marquez-Lago attended a Japanese elementary and secondary school that sparked her interest in the Japanese culture. “Recently, I received a number of offers to work in America, Switzerland and Mexico but when the offer to work in Japan came my way, I did not hesitate. I always had a wish to live and work in Japan,” she says.

This is not the first time Dr. Marquez-Lago has been to Japan. In 2005, she participated at the international conference on Scientific Computation And Differential Equations (SCICADE) held in Nagoya. Here she had the honor of being awarded the Inaugural John Butcher Award in Numerical Analysis. The world-renowned mathematician, John Butcher, known for his work in numerical methods, personally presented Dr. Marquez-Lago with the award.

Aside from the John Butcher award she has also received numerous distinctions. Her award magnetism begun in 2000, when she received the Mexican National Council on Science and Technology (CONACyT) scholarship worth up to USD 250,000 followed in 2002 with the Society for Industrial and Applied Mathematics (SIAM) award on her student thesis and presentation and in 2004 an award as a Fellow of the Consortium of the Americas for Interdisciplinary science. Recently she received the 2011 National System of Researchers (SNI) Level 1 CONACyT award.

The SNI award from the government of Mexico is given to established Mexican and international scientists. In September 2011, she received news that the Mexican government would like to honor her with the accolade, distinguishing her as one of the best young researchers in her field.

Nevertheless, one award that she ought



The scope of research of the Integrative Systems Biology Unit goes from molecular to organ level

to receive is as a most travelled young scientist. Her love for the outdoors and experiencing different countries has meant that at such a young age she has visited a total of 50 countries and already been to five of the six continents. Her excitement when she launches into talk of countries visited is no different to when she launches into how stochasticity can be explained

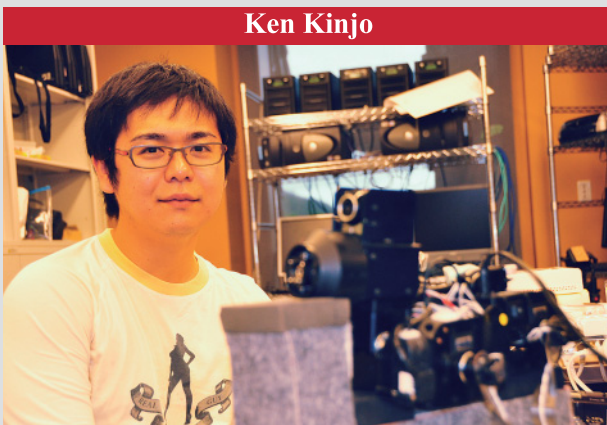


Dr. Marquez-Lago in Namibia

through mathematical computation. But she warns, “Beware! Stochasticity can be so addictive that you may want to become a researcher in the field of integrative systems biology!”

## Student Focus

### Ken Kinjo



A few years ago, Professor Kenji Doya gave a lecture to a group of visiting high school students and little did he know that his talk would inspire one of these students to study bioengineering and consequently end up working at his research unit. That student is Okinawan-born Ken Kinjo who upon completion of his masters enrolled as an engineering PhD student at the Graduate School of Information Science, Nara Institute of Science and Technology. Since January 2010, Ken has been working closely with Prof. Doya at his Neural Computation Unit in OIST.

I am Okinawan and have grown up and studied in Okinawa. In 2004, as a student in a local Okinawan high school affiliated to Showa Pharmaceutical University, I attended a series of lectures organized by OIST. Prof. Doya was one of the speakers at these lectures and I remember vividly being intrigued and interested in his explanation of using engineering to develop robots that can help understand how human or animal brains work. It was an inspirational talk that made me consider engineering as a career option.

After high school, I decided to pursue engineering and enrolled to study at the Biophysical Engineering Division in the Department of System Science, School of Engineering Science at Osaka University. My focus was on robotic functioning as well as neuroscience. I found this very rewarding as I started to learn how robots are built and work, as well as to begin to think about how the brain in animals such as monkeys function and apply this understanding to robotic

functioning. The chance to assist in research on monkeys was unique as robot researchers are sometimes not directly exposed to this other side of animal research. In my case, I had the best of both worlds.

When I heard of the opportunity to work in Prof. Doya’s Unit, as a graduate student research assistant I jumped at the prospect. In the unit, I have been learning about algorithms, set of formulas, applicable to autonomous robot control. I am especially interested in reinforcement learning and optimal control. In reinforcement learning, a robot learns about the environment by interacting with it directly, and selects actions that minimize the expected cumulative cost which is given from the environment. This problem is expressed as a non-linear Bellman equation, which is very difficult to solve. However, American cognitive neuroscientist, Emanuel Todorov invented a theory of linearly solvable reinforcement learning, a class of control problems for which the Bellman equation can be made linear.

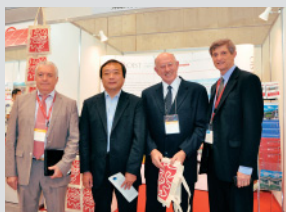
One severe problem of Todorov's method is that the environmental dynamics is assumed to be known in advance. This assumption prevents Todorov’s method from being applied widely as in real systems it is difficult to obtain environmental dynamics in advance. To overcome this problem, I am currently exploring how to combine the estimated environment dynamics, based on collected data when robot behaves arbitrarily, with Todorov method.

I find this research intriguing and doing a PhD with Prof. Doya is definitely high on my list. I am happy that I had the opportunity to attend that lecture a few years ago, which helped me think of a career in scientific research. I am also pleased with the presence of such an international university in Okinawa. I love the Okinawan Eisa festivals and playing the drum and dancing the Eisa, are some of my favorite pastimes. Being able to work in a scientific area that intrigues and excites me as well as letting me have the opportunity to enjoy Okinawan culture is definitely a big bonus for me.

## OIST Prominent at BioJapan 2011

By Kaoru Natori

OIST was at the forefront at BioJapan 2011 held October 5-7 in Yokohama, the largest meeting of biotechnology industry in Japan. OIST had a very popular booth in the exhibition hall and on the first day of the meeting, OIST President, Dr. Jonathan Dorfan gave a sponsored seminar "Promoting Technology and Innovation on Okinawa" to a packed conference room. Mr. Yoshio Okada from the Okinawa Industry Promotion Public Corporation also gave a talk entitled "The Condition of the Bio Cluster in Okinawa." Together, they explained how a combination of highly imaginative academic minds and sophisticated research infrastructure at the new university can generate scientific breakthroughs in diverse areas, a driving force for innovation and technology development on Okinawa. BioJapan2011 was a great opportunity for OIST to introduce itself to the worldwide bio industry community.



## Diplomats Gather at OIST

By Hisashi Gakiya

On October 6th, diplomats from 11 embassies in Tokyo representing Austria, Bangladesh, Bulgaria, India, Indonesia, Laos, Mongolia, Pakistan, Russia, Slovakia and Thailand, visited OIST. This visit was part of "Okinawa Industry Tour" arranged by the Institute for International Studies and Training, and its main subject was to introduce the industries of Okinawa. OIST researchers from Bangladesh, India, Pakistan, and Russia were also invited to meet the group, and conversations in many different languages flew across the room. H.E. Mr. Noor Muhammad Jadmani, Ambassador of the Embassy of the Islamic Republic of Pakistan, stated his impression of OIST, "I am so happy to see friends from South Asia are really here. The number of people, and the number of countries which are right now being accommodated here, is very impressive."



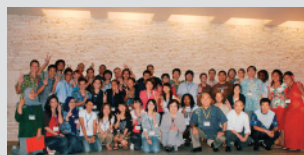
## Move Adapt or Drown

By Juliette Muthu

In July 2010, Mr. Seiji Maehara, the then Minister for Okinawa Affairs, called for youth involvement in discussions around the impact of science on Pacific society. The call by Mr. Maehara resulted in a collaborative effort by OIST and the University of Ryukyus to organize a four-day APYSEF. The forum brought together some of the brightest students from 14 Asia-Pacific islands and 8 young scientific experts in the fields of ecology, reef biology and Pacific island management as panelists. 34 university students attending the Asia-Pacific Youth Science Exchange Forum (APYSEF) at OIST had three concluding words to say to developed and developing nations, 'Move, Adapt or Drown!' From the discussions with scientific experts, student poster presentations, and vivid accounts of problems facing the youth and their island communities, some major threats challenging Pacific communities were identified. These included climate change, overfishing, and land-based ocean pollution. Some of the solutions identified included, raising public awareness about climate change impacts both at local and global scale, formulation of better economic infrastructure not completely reliant on fishing and the transmission of cultural practices and traditional ecological knowledge.

Paul Bump of the University of Hawaii, USA, said, "The biggest thing I am taking out of this is being able to put a face to the country and the problem, these are real personal issues with real people connected to these problems but solutions exist and all we need is real actions!" The students were not shy to develop an accurate well-structured resolution plan.

This forum was a great way to bring youth together and engage them in existing scientific information and let them make their future trajectory, the path that they want to see overnments, organizations and their own communities take. There can be no doubt that if the world wants to see real change then the youth need to be involved.



## Facebook



# OIST

## Live & New

The buzzword around OIST is NEW, new buildings, new name, new logo, new website and now a new OIST Facebook page. OIST joined the huge worldwide Facebook community with its new graduate university page: [Okinawa Institute of Science and Technology Graduate University](#). It's alive and it's growing. Be sure to have your say, visit the Facebook page now. 

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### Onna Campus

1919-1 Tancha, Onna-son, Okinawa 904-0495, Japan  
TEL : +81-98-966-8711  
FAX : +81-98-966-2887

### Seaside House

7542 Onna, Onna-son, Okinawa 904-0411, Japan  
TEL : +81-98-966-8712  
FAX : +81-98-966-8715

### Research Laboratory

12-22 Suzaki, Uruma-shi, Okinawa 904-2234, Japan  
TEL : +81-98-921-3835  
FAX : +81-98-921-3836

