

KU Today

KAGOSHIMA UNIVERSITY NEWSLETTER

学部紹介特集

Special Issue Faculty of Agriculture



Spring
2013

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KUToday is a biannual publication to present information about Kagoshima University to a wider international audience. Each edition will feature one faculty for prospective overseas students as well as other topics such as educational programmes, research and alumni information. Some articles are translations from the Japanese-language publication, Kadai Journal, upon which KUToday is loosely based. Any comments or suggestions about KUToday will be warmly received.

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A Note on Names
Following convention East Asian names appearing in KU Today are written family name followed by given name.



AGRICULTURE FROM TEMPERATE AREAS TO THE SUB-TROPICS

Securing the necessary amount of food and ensuring its quality is becoming the most serious issue of the 21st century with the rapid increase in the world's population. Japan faces a lot of challenges such as self-sufficiency in agricultural and marine products, food safety and security, revitalization of rural communities and building harmony between human communities and nature. Agricultural science must, therefore, address the important food, environment and health issues mentioned above on a domestic and international scale.

The Faculty of Agriculture of Kagoshima University is located in one of the leading food production bases in Japan. We have been actively involved in education and research of a wide range of pressing issues. We have tackled such areas as development of

nature-friendly food production techniques, exploration into biotic function, attainment of higher food safety levels, and conservation as well as restoration of natural ecosystems. We have been proposing creative methods to bring new life to rural communities to live up to such social expectations. We are fortunate to be located in an area blessed with many different natural environments extending from temperate to subtropical zones, thanks to the long-stretched expanse of Kagoshima Prefecture over several hundred kilometres.

We have commenced an integrated education system. It provides humanity-enriched field study and aims to develop creative talents with well-rounded characters. Our on-site practice should enrich the applied skills of our students, and enhance their perspectives on globalization with a pioneering spirit.



TOMINAGA Shigeto, Dean

BSc and MSc Programmes		
Agricultural Sciences & Natural Resources	Biochemical Science & Technology	Environmental Sciences & Technology
<ul style="list-style-type: none"> • Agronomy • Horticultural Science • Plant Pathology & Entomology • Animal Science • Agricultural Economics & Management 	<ul style="list-style-type: none"> • Biochemistry & Biotechnology • Food Science & Biochemistry • Agronomical & Food Chemistry • Shōchū Science & Technology 	<ul style="list-style-type: none"> • Forest Ecology & Management • Watershed Management & Forest Products Technology • Environmental Systems Science • Land & Water Conservation Engineering
PhD in United Graduate School of Agricultural Sciences		
<ul style="list-style-type: none"> • Science of Bioresource Production 	<ul style="list-style-type: none"> • Biological Science & Technology 	<ul style="list-style-type: none"> • Resources & Environmental Sciences of Agriculture, Forestry & Fisheries
Facilities		
<ul style="list-style-type: none"> • Experimental Farms 	<ul style="list-style-type: none"> • University Forests 	<ul style="list-style-type: none"> • Education and Research Center for Fermentation Studies



Agricultural Sciences and Natural Resources



A Sakurajima daikon – the largest radish in the world

The cultivation of crops and production of livestock are fundamental to human survival and prosperity. And now more than ever, efficient and sustainable methods of agricultural production are in demand. The Department of Agricultural Sciences and Natural Resources comprises five courses: 1) Agronomy, 2) Horticultural Science, 3) Plant Pathology and Entomology, 4) Animal Science, 5) Agricultural Economics and Management. Our research focuses on technological improvements to animal and plant production, development of pest management systems taking advantage of the bio-ecological environment, plant breeding making use of bio-technology, management and economic analysis of agricultural production and distribution process etc. The education mission of this department is to educate students who can play an active role not only at the local level but also globally.

The Agronomy course deals with the stable food supply and rich food culture from southern Kyūshū to the world. Taking advantage of our location blessed with diverse genetic resources, we offer various academic programs related to crop production. Our curriculum ranges from practical farm operations to biotechnology that employs sophisticated genetic engineering. Our research projects focus on stable food supply and sustainable agriculture making full use of local environments and genetic resources from temperate to torrid zones. We commit ourselves to contributing to the world through agriculture.



Sakurajima Satsumas
The smallest satsumas in the world

The Horticultural Science course treats fruits, flowers and vegetables which are essential to our physical and mental health. Through our research and education concerning these horticultural plants, we are striving for cultural development and the enrichment of people's lives. Our studies focusing on physiological and ecological analyses of horticultural plants, development of new growing techniques, or the breeding of new cultivars, are always designed to take full advantage of Kagoshima's environmental characteristics.

The Plant Pathology and Entomology course conducts studies of taxonomy, ecology, physiology and molecular biology of plant pathogens, pest insects and parasitoids from a holistic point of view with the aims of conserving plant resources and enhancing agricultural productivity. We regard germs and pests as factors of the bio-environment and thus are aiming at coexistence between them and plants.

The Animal Science course carries out research and education in the field of biotechnology, focusing on the development and use of animal genetic resources by means of selective breeding, embryo and genetic engineering, the transfer of fertilized ova, chromosomal analysis, and so on. We also investigate animal behavior and communication and are aiming at the development of livestock production systems that are in harmony with the environment.



The Agricultural Economics and Management course deals with food and agriculture issues by social science methodologies. Food and agricultural policies are closely linked with the world trade system. Agricultural business and marketing is global in scope. Farmers need advanced knowledge about the farm management and consumers look for food safety and environmental protection of rural area. We approach these issues adopting social science methodologies, and our students can learn not only economic theory and management analysis but also information processing and strategies for rural research.

Plant Breeding ICHITANI Katsuyuki - Associate Professor

My laboratory studies the genetics of crops, especially rice and foxtail millet, and its application to crop improvement. We have many accessions of these crops, evaluating their agronomic traits and genetic relationship among them. We genetically dissect useful and interesting characters by crossing, and locate the genes of interest on their respective chromosomes with the aid of DNA markers. One of our major interests is the genes conferring post-zygotic reproductive barriers such as hybrid weakness, hybrid chlorosis and hybrid breakdown in rice. These phenomena occur in hybrids derived from crosses between two normal strains and are caused by a pair of genes. They are obstacles to overcome for plant breeders acquiring a new gene combination via hybridization. They have also been of great interest for scientists studying evolution and speciation. However, physiological and molecular mechanism of these phenomena has remained unclear. To understand the mechanism, we selected a map-based cloning strategy to identify the causal genes. We have located three pairs of these genes on the rice genome, narrowing down the area of

interest via high-resolution linkage analysis. The distribution of these genes among rice germplasm was known to be skewed. Linkage disequilibrium of these genes and neighboring genes and DNA markers are also studied to acquire useful information on rice varietal differentiation.



Biochemical Science and Technology



Protein crystals

In recent decades, life science and food technology research has enabled enormous breakthroughs in our understanding of fundamental molecular and cellular processes,

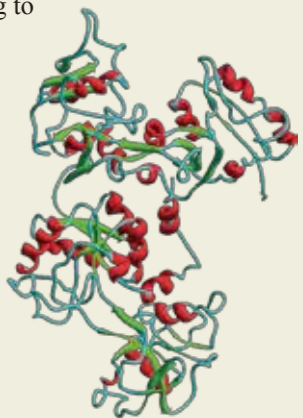
mechanisms of life and helping disease prevention by using food-derived molecules. The programmes in the department of Biochemical Science & Technology are complementary. For the promotion of agrosience and better human welfare, the department of Biochemical Science and Technology has four courses covering a broad range of topics of life science, food biotechnology and environmental science: 1) Biochemistry and Biotechnology, 2) Food Science and Biochemistry, 3) Agrochemical and Food Chemistry, 4) Shōchū Science and Technology.

The department is involved in undergraduate programs and offers graduate programs (MSc in Biochemical Science and Technology) leading to the PhD program in the United Graduate School of Agricultural Sciences.

The specific research topic in the Biochemistry and Biotechnology course is the study of the structure and functions of biomolecules from plant and micro-organisms, at a molecular level, for the development of new biomaterials with health benefits. In the Food Science and

Biochemistry course, food-derived bio-active molecules with health promoting activities and disease prevention actions are being explored at molecular and cellular levels to enhance the health of humans as well as animals. In the Agrochemical and Food Chemistry course, soil and environmental sciences, plant nutrition, fertilizers, postharvest physiology and preservation of vegetables and fruits, and genetic control of plants are being studied for the stable provision of high-quality food products and maintenance of natural environment. In the Shōchū Science and Technology course, fermentation technology and microbiology studies are being undertaken for the development of a new shōchū (Kagoshima's traditional distilled alcoholic beverage), referring to the regional characteristics of Kagoshima's culture. Students in the 3rd grade of the Shōchū Science and Technology course, carry out their dissertation research at the Education and Research Centre for Fermentation Studies.

The department of Biochemical Science and Technology has a good reputation with industry in Japan and overseas. In addition, the department has strong industry collaboration links that help to



Ovotransferrin (OTf) - an iron-binding protein found in egg albumen



ensure graduates have extensive hands-on experience in the working life of food and life scientists.

Knowledge about genomic manipulation, studies of protein-protein interactions and the characterisation of molecular structures have become central in modern life science research and food technology. This knowledge forms the basis of the molecular understanding of health and disease. It finds important applications in innovative health care, in the pharmaceutical industry and agribusiness and in so-called 'red' biotechnology, and is the focus of the department of Biochemical Science & Technology programme. In summary, the major educational and research focus in the department of Biochemical Science & Technology is to increase knowledge of the mechanisms of cell functions, explore therapeutic molecules in foods, and sustain a friendly environment, which can lead to cleaner industry, better medicines, new methods for combating diseases and isolating enzymes for the development of

improved food and foodstuffs.

Some of the hi-tech instruments employed in the research at the department of Biochemical Science & Technology are shown in the photos. Protein crystallization technique employed to characterize molecular structures of proteins, Biacore for the study of molecule-molecule or molecule-cell interactions, and the taste sensing system, which is a device to evaluate taste using sensors that mimic the human tongue. The high standard of research facilities in the department ensures excellent job prospects in industry, government and academia.



Biacore

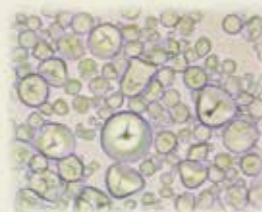


Taste sensing system

Applied Carbohydrate Chemistry

KITAHARA Kanefumi - Associate Professor
FUJITA Kiyotaka - Assistant Professor

Our research interests relate to the basic and applied chemistry of carbohydrate resources and the carbohydrate-related enzymes. Here, we briefly introduce two of our recent research topics: (1) Novel sweet potato starch having unique properties; and (2) exploration of the metabolic pathway of indigestible carbohydrates by intestinal bacteria in human colons.



New sweet potato starch having a slow retrogradation property

Sweet potato is one of the important starch resources in the tropics and warm regions of the world. In Japan, Kagoshima is one of the leading districts which produce sweet potatoes. In order to promote sweet potato utilization, we have collaborated with a research institute of the National Agriculture and Food Research Organization of Japan to develop sweet potato breed lines having unique starch properties. As a result of effort, we found a promising sweet potato line whose starch paste showed very much slower retrogradation compared to the starches of ordinary sweet potatoes. We found that the unique starch of the newly developed sweet potato had other interesting properties, such as a low gelatinization temperature and high susceptibility to chemical and enzymatic degradation. These technological advantages of the newly developed starch offer high potential for its applications in the food industry and are expected to promote sweet potato utilization as well as activation of the regional economy. **Bifidobacterium longum**, an intestinal bacterium, metabolizes human-indigestible carbohydrates as carbon

sources in human colons. For example, β -L-arabinofuranosides, hydroxyproline-linked sugar chains of extensin found in plant cell walls, cannot be digested by humans. Despite the broad distribution of β -L-arabinofuranosyl sugars in the plant kingdom, their degradative enzymes are yet to be found. Recently, we cloned and characterized the first degradative enzymes for the β -L-arabinofuranosides from *B. longum*. The enzymes are α -L-arabinofuranosidase, β -L-arabinobiosidase, and β -L-arabinofuranosidase. These enzymes are encoded in a conserved gene cluster on several *B. longum* genomes, but not in other intestinal bacteria, which implies a unique strategy of *B. longum* for acquiring carbon sources in human colons. We are working to explore the whole metabolic pathway of the plant glycoproteins and polysaccharides in *B. longum*. This study would contribute to the understanding of the molecular bases of prebiotics and probiotics in human health.



High performance anion-exchange chromatograph equipped with pulsed amperometric detector (for analysis of sugars and polysaccharides.)



Rapid Visco Analyzer (for analysis of starch pasting properties.)

Soil Science

SAKAI Masao - Professor
IKENAGA Makoto - Assistant Professor

A number of bacteria have already been isolated from soil, however, the portion (approx. 1%) of total bacteria is still small. The remaining 99% are known to be unculturable or yet-unexploited bacteria. This is because most are under the state of VBNC (Viable But Non-Culturable). Attention is being widely paid to the understandings of the community structure and functioning of bacteria for use in next-generation agricultural technology, which is focusing on carbon neutral energy, and low applications of chemical pesticides and fertilizers.

Our primary research interest is to investigate the functioning bacteria in the composing process and their role in the material cycle for producing replicable organic fertilizers. We are also involved in investigating the endophyte bacteria associated with agricultural plants using our original molecular technique. The subsequent metagenomic



analysis gives us a high potential of detecting useful bacteria for plant growth as a microbial resource.

Our laboratory conducts collaborative research with the Northeast Institute of Geography and Agroecology, Chinese Academy of Sciences in Harbin, Heilongjiang Province. We also exchange faculty and graduate students to promote the international relationship between Japan and China.



Environmental Sciences and Technology



This department provides education and research programs concerning conservation of the natural resources and living environment, improvement of agricultural and forest environments taking into consideration ecology, wood production, and post-harvesting technology. The department comprises four courses as follows: 1) Forest

Ecology and Management for studies on management and the utilization of forest resources, the dynamics of forest ecosystems, and forest policy; 2) Watershed Management and Forest Product Technology for studies on the effective utilization of bio-materials such as timber, improvement of the comfort of dwellings, use of forests in soil and water conservation, and prediction and prevention of sediment disasters; 3) Environmental Systems Science for studies on the automatization and systematization of agricultural machinery, high quality storage and processing systems for agricultural products, and monitoring technology for agricultural environments; and 4) Land and Water Conservation Engineering for studies on the effective utilization and conservation of water and land resources, technology to prevent land degradation, and rural development in harmony with natural environments.

The Forest Ecology and Management course provides research and educational activities encompassing forest ecology and management, including silviculture and conservation. We study not only the forests relatively close



to us in the southern parts of Kyūshū and in the Nansei islands, but also the forests of the world, focusing on how to achieve sustainable coexistence between forests and mankind.

The Watershed Management and Forest Product Technology course provides education and conducts research in the following areas: effective utilization of bio-materials such as timber, development of wood-based materials, improvement of the comfort of dwellings, use of forests in watershed management for soil and water conservation, re-vegetation on landslide scars and devastated land, prediction of sediment disasters and disaster prevention.

In order to establish a sustainable regional resource system, the Environmental Systems Science course is engaged in research and education in the following areas: systematization and enhancement of agricultural production technology, development of utilization of biomass resource and natural energy, food safety science and reproduction technology of organic waste, development of environment information technology in production of agriculture and

forestry industries and analysis of ecological information.

The Land and Water Conservation Engineering course's education and research efforts focus on the securing of water supplies for irrigation, on response strategies to prevent land degradation, on farmland reclamation, and on technologies for the utilization of water and land resources in ways that meet the requirements of people's lives while also respecting the natural ecology. We aim, in particular, for environmental conservation on a global scale.



Food and Biosystems Science

KAWANO Sumio - Professor
KAMITANI Yoshinori - Associate Professor

Our research area is concerned with post-harvest technology/engineering in agriculture such as sterilization and hygienic control for food safety, and nondestructive quality evaluation. Research that has been performed is as follows:

Sterilization and hygienic control for food safety using electrolyzed water

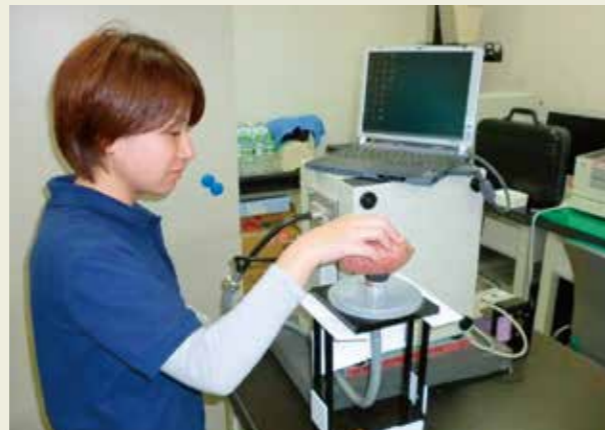
The effect of electrolyzed water on sterilization and hygienic control for food safety has been investigated. Slightly acidic electrolyzed (SAE) water has demonstrated to be an effective disinfecting agent and can be used as alternative for NaOCl (a food additive) in reducing microbial contamination on fresh fruits and vegetables. The major advantages of using SAE water as an antimicrobial agent include its high antimicrobial activity at low available chlorine concentration and at a near-neutral pH value of 5-6.5. This kind of study is very important for food safety.

Nondestructive quality evaluation using near infrared (NIR) spectroscopy

NIR spectroscopy is a promising method for the food industry because it has the ability to measure chemical components in foods such as water, protein and fat. Therefore, applications of NIR spectroscopy to agricultural products and foods have been studied.

1) Nondestructive measurement of the sweetness of sweet potatoes. Sweetness is a very important quality of sweet potatoes. A nondestructive technique of measuring the sweetness has been developed. It is possible to make a

calibration model for measuring sugars and starch in uncooked potatoes and then estimate the sweetness of steamed potatoes from the NIR estimated chemical constituents. 2) Rapid determination of the chemical compositions of liquid type foods (orange juice, vegetable juice and others) and beverages (mineral water, milk, drink and others) using a capped test tube as a sample cell. 3) Rapid determination of the chemical compositions of methane fermented residual liquid using the NIR method mentioned above. 4) Noninvasive blood glucose measurement using NIR spectroscopy in the intertance method.



NIR spectra acquisition of a sweet potato using an intertance probe

Facilities

Knowledge and techniques obtained through lectures and experiments can be tested in the field and put into practice and thus agriculture and forestry can be studied in a more comprehensive manner.



Experimental Farm

Education and research are conducted here, making use of Kagoshima's fertile land. This is where the information, theories and practices learned in class can be put to work in the field. Taking full advantage of southern Kyūshū's warm climate and the agricultural diversity of the prefecture, students receive training in a broad range of production activities closely connected with various geographical areas - raising crops, horticulture, production of fodder and animal husbandry.

Kagoshima University's Experimental Farm comprises the campus farm and three additional facilities situated in suitable locations around the prefecture: an orchard, an experimental field for tropical and sub-tropical produce and a livestock farm. Each student is assigned their own plot of cultivated land as well as crops and takes responsibility for the whole production process, which allows them to practice, observe and manage it as well as to establish an organic connection between lectures and experiments and field work through personal experience. The ultimate goal of the training is to foster graduates who can contribute to the development of agriculture while at the same time respecting each student's individuality and giving high value to their creativity. This is because through such training every student can get intimately and personally involved in the science of agriculture and can much more easily and visibly offer their own degree of contribution.



The University Forest

The University Forest is an outdoor classroom where various educational and research activities related to forestry and environmental studies are conducted. The two forests, at Takakuma and Sata, were both designated in December 1909.

The Takakuma forest is a 3,066ha area located in Tarumizu on the Ōsumi Peninsula side of Kagoshima Prefecture. Its elevation ranges from 100m to 885m above sea level with a yearly average temperature of 14°-15°C, and an annual rainfall averaging at 2,800mm. The warm temperate climate supports permanent evergreen broadleaf vegetation. The geology of the area is dominated by the Shimanto belt layers and throughout the region volcanic ash soil as well as pumice rock have formed deposits several metres deep. The forest comprises 1,470 ha of natural forest and a tree plantation of 1,512 ha, and in the latter Japanese cedar trees (*Cryptomeria japonica*) show solid growth. Through the use of these abundant resources the training of forestry engineers is advancing.

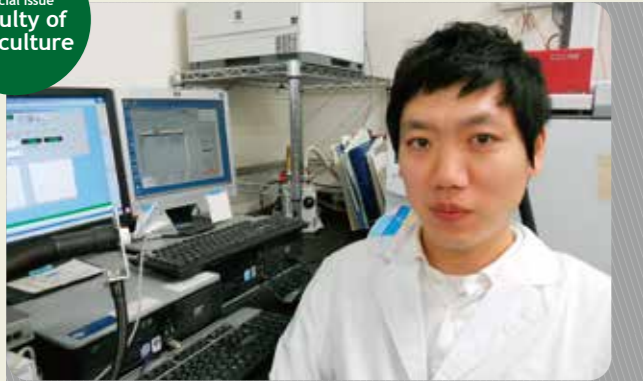


Education and Research Centre for Fermentation Studies (ERCFS)

The Centre was established with the aim of teaching a wide scope of techniques ranging from basic knowledge about the specifics of micro-organisms used in fermentation and distillation of the local alcoholic beverage, shōchū, (like yeast and its extract) to the practical application in the manufacturing process as well as the history and culture of shōchū production and other fermentation-based foodstuffs. Also, through this "hands-on" education, the culture and manufacture techniques of fermented foodstuffs is preserved and capable graduates able to become leaders in the development of new technology are being trained.



Student Voice



KIM Hyunmin (Republic of Korea)
Msc student

I studied food and nutrition in Sahmyook University in Republic of Korea. After graduation, I was looking for a university laboratory to study advanced food microbiology, when I found the Education and Research Centre for Fermentation Studies in Kagoshima University. That is the only centre researching distilled alcohol in Japan.

Since I studied Asian alcoholic beverages at my university in Korea, I have an interest in *kōji* rice malt which is the common material needed to make the alcoholic beverages throughout the Asian region. I thought that Japanese *kōji* has a superior microbiology and a structured method for manufacturing. Therefore, I made a decision to apply for the graduate

school without hesitation. Now, I have been studying about *shōchū* (the traditional Japanese distilled alcoholic beverage made from sweet potato) manufacturing in Kagoshima University since April 2012. In the beginning, it was really hard to get used to the atmosphere of the centre because it was a bit different from my previous university in Korea. Furthermore, there were so many difficulties researching in a foreign country. But now, I have got used to the environment of the centre and feel the sense of being belonging to the people and the laboratory because the Japanese people are very nice and helpful like old friends.

It is such a good experience studying in Kagoshima University. So far, I have taken classes on the history of *shōchū*, the alcoholic beverage tax act in Japan, and manufacturing methods etc. I do research on *shōchū* manufacturing using unused resources in Japan and Korea for my master's dissertation.

Having the opportunity of learning in Kagoshima University, I feel that *soju* (Korean distilled alcohol) industry has the possibility of advancement. After returning home, I would like to contribute to the development of *soju* industry, and also wish to cooperate and further promote the relationship of alcohol industries between Korea and Japan (Kagoshima).



The United Graduate School of Agricultural Science

The United Graduate School of Agricultural Science was established in 1988 as a doctoral programme in agricultural and fishery sciences. Currently research facilities at Saga University and the University of the Ryukyus are also cooperating in the programme, with the administrative headquarters at Kagoshima University. Through the school's distinctive research and education in biological science and food science, we aim to produce highly competent and educated researchers with up-to-the-minute fields of study in food production, development of biological resources, maintenance of biological resources and environment in agriculture, forestry and fisheries in Kyūshū, nationwide and other sub-tropical and tropical regions. With its highly-specialised staff, the school is made up of three departments covering nine courses: (Science of Bioresource Production: Tropical Bioresource and Plant Resource Production, Animal Resource Production, Regional and Global Resource Economics;

Biological Science and Technology: Bioscience and Biotechnology, Food Science and Nutrition, Advanced Life Science; Resource and Environmental Science of Agriculture, Forestry and Fisheries: Environmental Science and Conservation Biology, Regional Resource Environment Engineering, Fisheries Science on Resources and Environments) Students who reach the required levels are awarded a PhD in either Agriculture, Forestry or Fishery Technology from Kagoshima University. So far, over 800 students have received their doctorates and they are now working as leading professionals in universities, research institutes, government agencies and companies throughout the world. Half of the students enrolled at the school are from overseas giving the programme a very international atmosphere. We actively accept overseas students, especially those from Asian and African countries, to study about agriculture and fisheries in East Asia.



Sea Turtle Research Society

Watanabe Mizuki, President, BSc student,
Faculty of Fisheries



Have you ever seen a wild sea turtle laying her eggs on the beach? While many people have probably seen this on TV, most have never seen this spectacle with their own eyes. If you come to Kagoshima University and go home without ever seeing a sea turtle, it's the same as going to Disneyland and never meeting Mickey Mouse! Leaving without seeing the sea turtles in their natural environment would be a terrible waste. Kagoshima is not only Japan's number one but also one of the world's most famous nesting sites for loggerhead sea turtles.

Why have we chosen to research sea turtles? The answer lies in the sea turtle's three main points of interest. Firstly, sea turtles are critically endangered, secondly, the life of the sea turtle in the wild is still largely unknown and finally, sea turtles have the power to move people. The causes of sea turtle endangerment include destruction of their nesting grounds, excessive use of lights, lamps and fireworks at beaches, taking sea turtle eggs for human consumption, sea turtles getting caught in fishing nets the vast majority of which are caused by humans. Even if many people have heard about the sea turtle's endangered status, the number of people taking action and actively researching ways to protect sea turtles in the wild is quite few. Our society volunteers at local Primary schools to teach children about the sea turtle's plight. Together with the children, we observe the sea turtles laying their eggs on the beach, allowing us to understand the life of the sea turtle in its natural habitat more.

Sea turtles born on the beaches of Japan ride the ocean currents through Hawaii to the food rich areas off the American west coast, where they grow to maturity. Once mature, they return to the beaches of Japan to lay their own eggs. How many years does it take the turtles to mature? What's the estimated lifespan of a sea turtle? Where do they spend their time in the ocean? There are many precise ecological details about sea turtles that we still don't completely understand. In reality, a clear reason of even why they are so endangered has yet to be found. With what little



we know about sea turtles, humans cannot adequately protect them. We tag the turtles that lay their eggs at the Fukiagehama Beach in Kagoshima Prefecture in order to determine what route they swim when returning from laying their eggs.

Throughout the world, the sea turtle has often become a symbol of divinity and seen as a mystical creature. In Hawaii, the green sea turtle is seen as the guardian angel of the sea named Honu. While often seen as a hindrance by fishing industries, fishermen in Japan see the sea turtle as a messenger from god and value their presence. Sea turtles are not ferocious and have no claws or fangs. They struggle to breath whilst crawling up the beach, using all their power they dig a hole using their hind legs, then shed tears whilst laying their eggs in the sand, a sight that will resonate with any human (In reality, the sea turtle's tears are not due to pain or emotion but rather concentrated sea water to protect their eyes from the sand). We believe sea turtles are a key indicator species of global environmental issues. For example, problems affecting oceans and shorelines caused by global warming, dumping at sea and the construction of sea walls also affect the ecology of the sea turtles. Research into sea turtles and their surroundings may provide us with a clue to finding the answers to these ecological problems.



Kagoshima Prefecture boasts Japan's best breeding grounds for loggerhead turtles and the students of Kagoshima University are probably the closest to sea turtles in Japan. The volunteer conservation work we do will directly impact sea turtles living in the wild. Kagoshima University students can experience and learn about this great natural beauty directly in the field. And if you come to Kagoshima University, together we can watch the sea turtles as they lay their eggs on the beach. It is a sight that words cannot even begin to describe.



Teaching cleft lip/cleft palate treatment as a strategy to the next generation

Professor Nakamura Norifumi of the Graduate School of Dental and Medical Science spent 2 years in Indonesia, participating in medical care and support projects. After returning to Japan, he has taken part in a number of activities: not just surgery, but ranging from language practice for developing children to offering support for parents of children with cleft lips or palates. Furthermore he travels several times a year around SE Asia and Africa, offering medical assistance in the field.

Cleft lip (or cleft palate) is a congenital disease in newborn infants - a fissure (cleft) in their upper lip and jaw - which is said to affect 1 in 500 Japanese babies. If left untreated, the patients become victims of prejudice and discrimination from a very early age and may develop social and speaking disabilities. Nowadays medical technology has advanced and this problem can be almost completely resolved before reaching adulthood. In Kagoshima University too, a mixed team of orthodontists and language specialists has been formed to perform the appropriate surgeries and treatments to restore mouth and jaw functions and appearance to the same level as that of children unaffected by cleft lips or cleft palates.

2-year cleft lip and cleft palate medical care cooperation in Indonesia

When working at Kyushu University's Dental Faculty's affiliated hospital, Professor Nakamura Norifumi was dispatched by the medical office to a children's hospital in Indonesia. Overseeing cleft lip and palate surgery and training a local team of cleft lip/palate specialists were his goals. "I wasn't proficient at cleft lip and palate surgery before I was sent there, so it was hard. The conditions in Indonesia are different from those in Japan; there are many patients who grew to adulthood without surgery. But still, with no-one to rely on over there for 2 years I honed my abilities while performing surgeries. There were successes and there were failures, but every time I'd think thoroughly about the reasons why they happened and I'd teach that to the young local doctors in a systematic and comprehensible manner".

Professor Nakamura has continued to work as a cleft lip/palate specialist after his return to Japan. "I've been



Professor Nakamura performing surgery in Ethiopia. Due to power outages a penlight was used for illumination (January 2011)

taught that all people are equal and have the same rights, but the existence of such a large disparity only because of a different place of birth came as a shock to me. In the wake of my 2-year dispatch I started thinking that it would be good if university scholars concentrate not only on innovative studies but also undertake work for the elimination of disparity. I was in a different field of study before but after my return to Japan I have concentrated my efforts on cleft lip/palate research." Nowadays Professor Nakamura makes several visits a year to Indonesia, Vietnam and other countries where he continues his technology and technique transfer to local specialists. This year he also participated in medical support activities in Ethiopia.

Research into teaching easy-to-understand treatment techniques

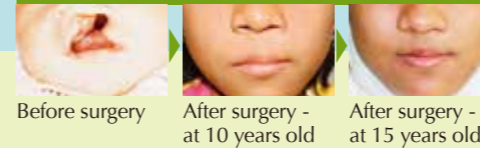
Professor Nakamura is presently developing a strategy on how to assess the condition of each cleft lip/palate patient and what treatment to recommend. When working at the hospital in Indonesia, he would get unsatisfactory results when applying Japan-taught surgery techniques. Professor Nakamura recalls those moments: "It was because of learning through imitation that things went badly. But if you understand the reason which brought about the problem, then you can solve the problem itself. From that point on I began to think that the way the illness is contracted and treated must be kept visible and understandable."

It is said that cleft lip/palate surgery is at a very high level in Japan, but that is mainly due to the skilled hands of the doctors. However, when a highly qualified expert passes away, his technique disappears as well. Thus young physicians have to start acquiring knowledge and



Professor Nakamura with one of his Indonesian patients (middle), 15 years ago

Progress in one of Professor Nakamura's Indonesian child patients



technical expertise from scratch through trial and error. This not only takes a long time, but also impedes the progress of medical care. "If we could share our techniques with many people, the time young people lose due to repeating mistakes will decrease and they will reach our level more quickly. Also they can use the time saved to advance beyond the present level, which is connected to progress. I believe this is my mission in life - to find in what way to leave intuitive and clearly visible treatment techniques."

Devising treatment strategies for each patient

Professor Nakamura continues to summarise in his research papers the different types of cleft lip/palate deformities according to the part of the face they affect (lips, palate, nose) as well as the strategies on how to treat them. Treatment techniques and procedures also vary in relation to the patient's age and each patient is monitored for 10 years after surgery - the successful techniques are thus preserved and the failures rectified.

There are children with cleft palate/lip experiencing difficulties in pronunciation or having malocclusion (when the teeth do not touch or grow properly). For their sake language practice and reconstructive dental care are offered at Kagoshima University and, if necessary, psychologists are also available. Thus children with cleft lip/palate can receive comprehensive medical care from the moment of their birth. In addition, in 2006 Professor Nakamura organized the Momiji Kai Association for parents of children with cleft lips or palates. There the parents can meet and exchange information, and it also provides support for parents who blame themselves or have difficulties in the relationships with their children - this also contributes to the healthy development of the children.

In order to convey his experience in cleft lip/palate treatment to the next generation, Professor Nakamura is also engaged in student education. "My father, who was a teacher, used to live by the maxim that when you neglect just one person, education loses its power of enlightenment. This also applies to medical care. I aim to continue researching how to cure afflictions through kind-hearted and dedicated care for everyone".



Professor Nakamura examines a child

NAKAMURA Norifumi

Graduate School of Dental and Medical Science
Facial Reconstruction Surgery Course
Professor of Oral and Maxillofacial Surgery

Born in 1958 in Fukuoka Prefecture. Graduated in 1982 from Kyushu University Faculty of Dental Science. Worked as medical staff in Kyushu University Affiliate Dental Hospital (1st Oral Surgery Dept.) and Fukuoka Japanese Red Cross Hospital, among others. Became assistant at Kyushu University Faculty of Dental Science's Oral Surgery Course. Received his PhD in Dentistry in 1991. From April 1995 he spent 2 years at Indonesia's Harapan Kita Maternity and Children's Hospital, Cleft Lip and Palate Clinic, lending medical support and assistance. Afterwards he held successive jobs as lecturer at Kyushu University Affiliate Dental Hospital (1st Oral Surgery Dept.) and chief of the Cleft Lip/Palate Centre at the Department of Advanced Medical Science. Joined Kagoshima University in 2005 as a specialist in Oral and Maxillofacial Surgery.

Academic Award Laureate at the 43rd Congress of Korean Association of Maxillofacial Plastic and Reconstructive Surgery in 2004, recipient of the Golden Ribbon at the 51st Congress of Japanese Society of Oral and Maxillofacial Surgeons in 2006, laureate of Best International Basic Science Poster Presentation Award at the 2007 89th Annual Meeting, Scientific Session & Exhibition of American Association of Oral and Maxillofacial Surgeons (AAOMS)

Mt. Sakurajima from the observatory

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Data analysis



Videoing and thermographic imaging of Mt. Sakurajima



Seabed monitoring off the Miyazaki coast

Nansei-Tōko Observatory for Earthquakes and Volcanoes

A hub for earthquake and volcanic eruption prediction

The Nansei-Tōko Observatory for Earthquakes and Volcanoes was established by the Faculty of Science in 1991 to collect data to be used in the prediction of future earthquakes and volcanic eruptions. The observatory moved out of the city centre to the leafy suburbs of Yoshino in 1994, an ideal location for its research overlooking the active volcano of Mt. Sakurajima and on a clear day with views of Mt. Kaimon at the foot of the Satsuma Peninsula and the Kirshima mountain range to the north.

The observatory's research concentrates on the islands and volcanoes of the Nansei-Tōko area, which includes southern Kyūshū and the Nansei Islands, which stretch from Tanegashima in the north through to Yonaguni in the far south-west neighbouring Taiwan. Research also looks at the movement of the earth's crust throughout the area covering the large closely-spaced calderas of Aso, Kakutō, Aira, Ata and Kikai as well as the Okinawa trough and the Philippine Sea plate. From 2009, the observatory became part of the national system for earthquake and volcanic eruption prediction.

The observatory has 21 earthquake monitoring sites, which send back continuous data on tectonic and volcanic activity for analysis. Also, in order to accurately understand the earthquakes and movement of the earth's crust, the observatory teams up with

similar departments at Hokkaidō University, Tōhoku University, Tōkyō University and Kyūshū University to monitor the seabed every year in the seas around Kyūshū and the Nansei Islands.

The observatory is also used for teaching undergraduate and postgraduate students and its data is used widely in student dissertations. Third year undergraduate students of Earth and Environmental Sciences (Faculty of Science) also get to monitor and analyse the actual data as part of their geophysics courses.

Recently using the knowledge they have so far of monitoring the seabed, they have begun joint research with Kyōto University on a survey of the seabed around Mt. Sakurajima. In the future new volcanic surveying is being planned using precision control instruments developed for earthquake prediction using Mt. Sakurajima as a basis.



For more information:

<http://leopard.sci.kagoshima-u.ac.jp/noev/home.htm>

留
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生

RESEARCHING WITH A BABY IN THE HOUSE

Janice Ragaza

PhD student in the Faculty of Fisheries



On 8 June 2011, God decided to bless me with a gift. I named him Lucas Anthony, which means flourishing light.

Being a mother is a tough job. Being a mother and a doctoral degree student at the same time is even tougher. Being a mother and a doctoral degree student at the same time while alone in a foreign country is the toughest!

I am Janice Alano Ragaza, a third year doctoral degree student in the Laboratory of Aquatic Animal Nutrition. Balancing my time between research and motherhood has been my daily battle since Anthony was born. I had to wake up early each morning to prepare him for hoikuen (day care), take him there, and literally run to my laboratory. I am so grateful for Kagoshima City's day care center service that is available to any working or studying parents. When Anthony got sick on days when I had to do

experimental analysis or attend required seminars, I had to ask favours from close friends to take care of him during my absence. My fellow Filipino students and laboratory colleagues were more than willing to offer their help. None of this has been possible without the support of my academic supervisors, Professor Koshio Shunsuke, Professor Ishikawa Manabu and Professor Yokoyama Saichiro, the love and understanding of my parents, and my constant faith and trust in God.

Motherhood and a PhD degree might seem to be two opposing tasks – impossible to do and gain simultaneously, but with a support group, any impossibility is probable!

This March, I will be receiving my PhD diploma. Having a child is never a reason to quit school or to stop pursuing your dreams. Anthony has been my daily inspiration to reach this goal. He is, after all, my flourishing light!



Chibueze Chioma Ezinne

PhD Student in Graduate School of Medical and Dental Sciences

I have to acknowledge first and foremost that the journey so far has been quite hectic to say the least, full of ups and

downs but the joys eventually make up for it all, hence I will describe it as a worthwhile.

The first and biggest challenge was learning Japanese. This was essential in order to be able to communicate well with my son's pre-school teachers and to understand my university lectures. Initially, the conversation was usually one word at a time, and there were occasions I ran out of words to translate my opinion or thoughts at that time. It was very funny and frustrating at first but with time persistence paid off. Communication with my son's teacher is much easier now as it is slightly casual, but with the university professors and colleagues in the laboratory, I still get tongue tied!

The next daunting challenge is when illness strikes, especially in the flu season. I must say that every working parent lives in fear of such periods as the rule is a seeming 'isolation' of the child to contain the illness. Although there exist vaccinations to combat this, the child must be in good health to take such vaccinations as slight illnesses such as colds may dampen the immune system thus predisposing the child

to negative effects of the vaccine. Now, realistically that is not so possible because in the kindergarten there is always one child or the other with a cold and as they play with other children, they spread it. Thus, when you fix appointments for a vaccination and the child has a cold you have to postpone until the child is okay and eventually may end up not being vaccinated hence susceptible to the flu. In times past we have had two major incidents where I had to take a seemingly imposed holiday of one week each, then experiments and plans tend to pile up, which can be very strenuous, though that scarcely happens.

Next, carrying out wifely duties too - taking the child to school, taking the child to hospital, preparing food, extracurricular activities inclusive. All these have to be done within the short time available each day. I must say I wouldn't have been able to accomplish all this in my strength if not for help from Jehovah God. Additionally, the support from my husband has been indispensable and encouraging. Lastly, support from my laboratory sensei and secretary, my tutor and friends too have been very helpful. The lessons learnt (persistence, punctuality, time management etc.) are worth the effort put in and most of all signs of support from my son (a smile, a kiss now and then) make up a whole lot for everything, hence I would not mind towing the same path again if the hands of the clock were reversed.



From Garbage to Eco-Sweets

Ōmae Yoshikazu, Professor
Faculty of Law, Economics and Humanities



The Kagoshima University Sustainable Campus Project (SCP) is about "Eco-Sweets." We developed a cardboard box composter which made compost from garbage, and passed the composters out to Kagoshima residents. They made compost at their homes by themselves and cultivated pumpkin and peanuts together with us. JA Green Kagoshima, the agricultural cooperative association which helped us plan Eco-Sweets, took charge of the agricultural work, and carried out the primary processing of crops. In turn, sweets stores in Kagoshima purchased the pumpkin paste produced, and made Eco-Sweets to sell. The last saved 10 yen per Eco-Sweet, and kept them as the Citizen Green Fund to be used for activities the following year.

The SCP was started out life as the Ecological Campus Project made up of students studying under me in the Faculty of Law, Economics and Humanities. Since we had no environmental technology, we tried to build a sustainable system centering on people. As a result of various investigations, it was put forward that a garbage recycling system could be built. I thought that I would develop a cheap and convenient composter first. However I did not have a laboratory just an office in which to conduct experiments to turn kitchen garbage to compost secretly. I say, secretly, but I am sure from the smell, someone may have suspected there was a dead in the office. Of course, there is no dead body just a lot of compost. The cardboard box composter took over about five years to develop.



Once I had acquired the technology of composting, I wanted to grow crops this time using the compost. I asked to borrow a field from the Faculty of Agriculture, and began cultivating of sweet potatoes. Looking back at it now, it was actually quite difficult to work with another faculty. With the help of Kagoshima University Co-op, the potatoes produced were made into tempura or mixed with rice and sold in the university cafeteria. This was in 2007. There was a big change in 2009. Until then, we decided to expand from tempura, mixed rice and bread to cakes. The reason was that we thought it would be more interesting to offer the high-value-added goods which people don't normally connect with kitchen garbage. We asked for the cooperation

of off-campus cake shops and various sweets were made, and sold on the campus. With this expansion, the project name was changed to the Sustainable Campus Project.

Another big decision was made in 2011. The management of the sweets production was handed over to a network of off-campus stores. Although the profits went to the stores, we were happy that the new system progressed in direction of constructing a recycling society, where kitchen garbage was recycled by local people into compost and then ultimately into delicious sweets. In 2012, Eco-Sweets were sold for two weeks in October in Kagoshima. About 16,000 were sold and the Citizen Green Fund grew to 160,000 yen. The number of participating sweets stores was 52. The amount of compost used was 4.7 tonnes. The number of people who participated in the activity exceeded 800. Two years ago, I would never have imagined such outstanding figures. Our project was placed first in an environmental contest of Kagoshima Prefecture.

Evaluation of the project is increasing. I think there are five factors behind this. First, we have the up-cycle. Not only is kitchen garbage recycled, but products with a higher added value are being produced. The Eco-Sweets as a result of this up-cycle surprised everyone, which in turn stimulates attractiveness in consumers. The second is that Eco-Sweets have a rich back story. Local people participate in all processes, and local businesses also manufacture and sells sweet. Of course, local people also enjoy the finished product. We also wanted to incorporate the sweet designs made by children and so from some 500 designs gathered and about ten Eco-Sweets were made and sold. Next is having thrown away independent management and having connected the sweets stores by a network. Networking of the shops increased the kind of sweets markedly and has led to expansion of the business model. The fourth was the proposal of a new paste. Pumpkins are usually pasted after peeling. However, we made paste without peeling them. The rejection rate was reduced by 30 point by this, but by it, we also succeeded in a differentiation of Eco-Sweets. Using tea leaves, a high-class feeling was added to the cakes and cookies. As a result stores soon sold out of sweets made with



the peel-still-on paste. Finally there is the fund which comes from the profits of sweets sold. This system made possible for all participants to share the fruits of the project. A participant's small contribution, whether it is money, labour or idea,



Catering to the Spiritual Life of Kagoshima's Foreign Students

Nakatani Sumie, Associate Professor, Center for International Planning

Kagoshima University presently welcomes foreign students from some thirty countries representing many different faiths, among them Buddhists, Christians, and Muslims. Some students are very strict in their religious norms and customs, while others are more flexible to adapt to Japanese culture.



For Muslim students, the Satsuma Islamic Culture Centre (SICC) offers opportunities for congregation. The center functions as an interfaith community, civil organization, and academic group to serve the well-being, encourage dialogue, and build coalitions that promote justice and mutual understanding in Kagoshima. It hopes to build a masjid in the future as a place for Muslims to practice their activities. Members have donated much time and expertise for the mission. You can find out more about the SICC in the previous issue of KU Today at http://kokusai.kuas.kagoshima-u.ac.jp/kucip/files/KUtoDay_3.pdf

For Christians, there are many churches in Kagoshima, one of the most popular Catholic ones being St. Xavier's Cathedral in the city centre in the memorial place where Christianity was first brought into Japan by St. Xavier. It provides a morning worship service every Sunday. In the evening, a gathering called Kagoshima Celebration is held at the International Students Hall on the university campus with anyone welcome to attend.



Kagoshima Celebration with pastor Bill Petite

Greetings from the followers of Jesus Christ at Kagoshima Celebration! Kagoshima Celebration is an International English Worship Service for those who believe that Jesus Christ died on the cross for their sin, was buried, rose bodily from the dead on the third day and is coming again. Meetings consist of worship, Bible study and prayer and those who attend normally stay to eat a meal together.

Each Sunday night people from a variety of different countries and backgrounds come but Japanese from Kagoshima who might want to learn more about Jesus Christ – or just practice their English – are welcome to take part as well. Over the years, Kagoshima Celebration has provided a community of brothers and sisters in Christ who help and encourage one another. Relationships that start with the Sunday evening service grow into friendships that will last a lifetime. For more information visit <http://www.geocities.jp/kiboubc/>.

becomes fruitful as a fund. Thus, anyone can participate in an Eco-Sweets project easily.

Although there are also many difficulties, we plan to continue with the activity. I would like to involve those who are interested in environment or not, and make Eco-Sweets into an event representative of Kagoshima.



Professor awarded ¥300 million funding for gene therapy research from the Ministry of Health, Labour and Welfare



In recent years, the development of gene therapy has become pressing for cancer treatment. However, the method of transducing therapeutic genes into cancer cells using replication-defective viral vectors was not producing the results everyone had at first hoped for. To overcome these problems, the vectors were replicated in the cancer cells alone, leading to the development of treatment

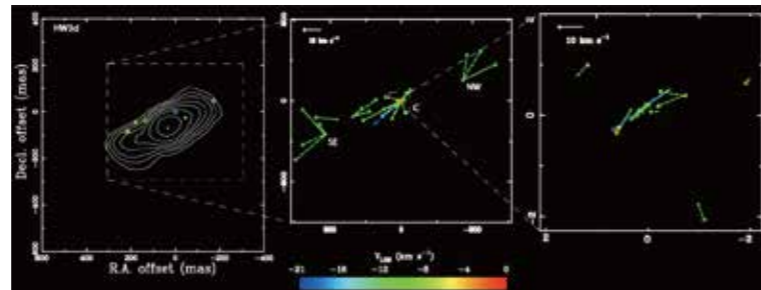
using a cancer-killing oncolytic virus, clinical trials of which are being carried out chiefly in the United States. Professor Kosai Kenichirō, (Department of Gene Therapy and Regenerative Medicine, Graduate School of Medical and Dental Sciences) is the first in Japan to develop and patent the next generation of oncolytic virus, a conditionally-replicating adenovirus with multiple tumour-specific factors (m-CRA), which has improved its therapeutic effects and safety.

PhD student finds evidence of birth of giant star

Chibueze James Okwe's research in the Department of Physics & Astronomy, Graduate School of Science & Engineering focuses on how giant (massive) stars are formed. The Sun is a star, and to give an idea of its size, it can swallow 1 million Earths, yet in astronomy we refer to it as a yellow dwarf because of its relatively small size. Giant stars are stars that are 8 or more times bigger than the Sun. Such massive stars form in a slightly different way compared to their low-mass counterparts like the Sun.

Stars are generally made up of gas and dust. High-mass stars form in regions in space where there is a huge amount of gas and dust, known as dense molecular clouds. One of these, Cepheus A, is a massive star-forming region. In simple terms, using an observational technique called very long baseline interferometry (VLBI), which involves using multiple radio telescopes to observe the same source simultaneously, James investigates the motion of the materials and physical conditions around the forming giant star. Tracing such motion provides us with useful clues on how high-mass stars form. This can be done by monitoring star formation indicators called masers.

Masers (microwave amplification by stimulated emission of radiation) are the simply microwave equivalent of lasers (light). James observed the



relative change in the position of masers that are emitted at the frequency of 22 GHz, called water masers, in Cepheus A and successfully traced the relative motion of the maser features associated with HW3d (one of the objects in Cepheus A). As can be seen in the figure, the solid and dashed arrow lines represent the motion (velocity) and direction of each of the water maser features. This is an indication of how materials move in the region. Water masers in HW3d are seen to be moving away from the two opposite sides of the center of the object represented by the white contour. These are outflows from the two poles of the central star in HW3d, usually called bipolar outflow.

This discovery by James is the first ever convincing evidence of the present of a very young giant star, more than 10 times the mass of the Sun, in HW3d of Cepheus A. Details can be found in Chibueze et al. 2012, *The Astrophysical Journal*, 748, 146.

Kuroshio Current's relation with cyclone paths and Tōkyō snowfall revealed

The Kuroshio Current brings an enormous amount of heat from lower latitudes to mid-latitudes, where it influences the atmosphere by supplying heat. Dr. Nakamura Hirohiko, associate professor in the Faculty of Fisheries, analyzing surface weather charts from between 1969–2009, revealed that the tracks of the south-coast cyclones that advance along the south coast of Japan varied substantially in association with the bimodal paths of the Kuroshio Current. When it takes a large-meander path, the cyclone is located away from the south coast of Japan, while the cyclone comes ashore on the south coast when it takes a straight path (see figures). This is the first study using observed data to report that the behavior of extra-tropical cyclones is influenced by the variability in oceanic currents. The study, furthermore, revealed that snowfall in Tōkyō caused by south-coast cyclones is more frequent for the meander than the straight path state because the former state can act to decrease the air temperatures in Tōkyō. This evidence is promising in the development of forecasting techniques for heavy

snowfalls in Tōkyō that can have a serious effect on the socio-economic activity of the Japanese capital. Details of the study can be found in Nakamura et al. 2012, *J.Climate* 25-21, 7772-7779. doi:10.1175/JCLI-D-12-00326.

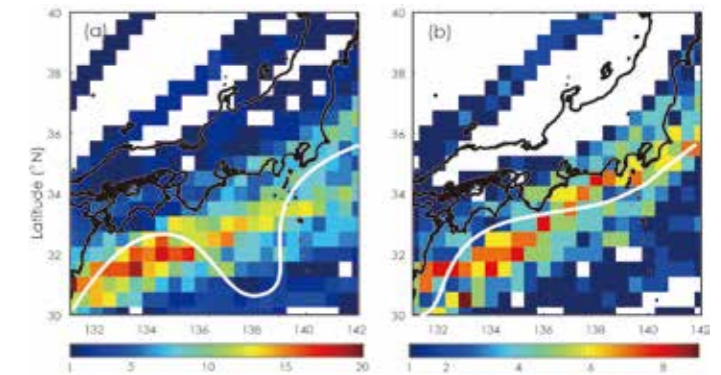
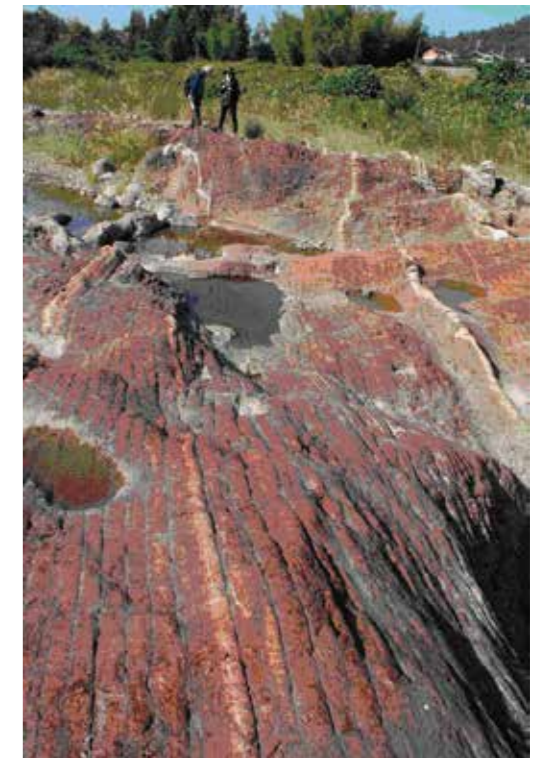


Figure caption:
Frequency distribution of cyclone tracks on a 0.5° × 0.5° grid with respect to the Kuroshio Current: (a) the large-meander path and (b) the straight path. White thick solid lines in (a) and (b) denote the typical large-meander and straight paths, respectively.

Evidence of asteroid impact in Canada discovered in Japan

Dr. Onoue Tetsuji, assistant professor in the Graduate School of Science and Engineering, found materials which he assumes were ejected from an asteroid impact that occurred in Canada approximately 215 million years ago. The apparent remnants are tiny spheroids that he found in samples taken from ancient sedimentary rock along the Kiso River in Sakahogi, Gifu Prefecture. The samples contain an anomalously high abundance of iridium and other platinum group elements which are very rare in the earth's crust but abundant in meteorite material. From the age-date of the sediments, the 100km-diameter Manicouagan Crater in Canada is assumed to be the source of the spheroids in Gifu. This correlates with research showing that the Manicouagan impact had a global effect. However, analysis of microfossils in the sediment suggests that pelagic plankton were able to survive the late Triassic extinction triggered by this asteroid impact. The article was published in *PNAS* and can be found online at www.pnas.org/content/early/2012/10/31/1209486109.



At Sakahogi where the discovery was made



YAKUSHIMA AND THE YAKUSUGI CEDAR

屋久島と屋久杉

Teraoka Yukio, Professor, Faculty of Agriculture

The island of Yakushima lies 60 km of Cape Sata-misaki, the southernmost point of Kyūshū. It is circular in shape and has an area of about 500 km². There are more than 40 mountains over 1,000m on the island, with Mt. Miyanouradake, at 1,935m, the highest mountain in Kyūshū. It is for this reason that Yakushima is often called *yōjō arupusu*, literally the Floating Alps.

Yakushima was formed as an island by a granite mass rising from the bottom of the sea 14 million years ago. The island's location puts it in the subtropical climate region, and so at sea level it has a warm climate with an average temperature of 20° Celsius. The mountainous area, however, has a climate corresponding more to cool temperate or sub-boreal climate conditions. The mean annual precipitation is 4,400 mm at sea level and more than 8,000 mm in the mountains. This means that there is unique forest vegetation ranging from subtropical to cool temperate. Because of this geological landscape and precious natural environment and resources, Yakushima was placed on the World Natural Heritage List under the World Heritage Convention in December 1993.

Of particular interest is the Japanese cedar (*Cryptomeria japonica*), an endemic



Jōmon-sugi / Photograph by the Author

coniferous tree species that has its southern limit of natural distribution on Yakushima. The cedar trees that are more than 1,000 years old are known as *yakusugi*, and many of the large ones more than 2,000 years old are given individual names from their characteristics. The *Yayoi-sugi*, *Daiō-sugi* and *Jōmon-sugi* are all famous examples. Since the wood of the *yakusugi* contains a high amount of resin compared to ordinary cedars found elsewhere in Japan, *yakusugi* trunks remain on the forest floor for hundreds years after the trees have died or been knocked down in the wind. *Yakusugi* timber is prized for its very high quality because of its durability and unique texture. It is used for traditional wood crafts.

At present it is prohibited to fell *yakusugi* trees so all the wood used in craft works are taken from debris of former harvesting operations such as stumps or wind-broken trunks. Of particular interest are the natural Japanese cedar trees that are over 1,000 years old.

* Front Cover



Summer on Campus

Photograph by Terazono Izumi,
Skilled Assistant in Faculty of Agriculture

Afternoon in high summer.
Goats walk between the paddy fields of
the Faculty of Agriculture's
Experimental Farm with Mt. Sakurajima
in the background.