

THE MAGIC OF KAGOSHIMA BAY

鹿児島湾深海底の魅力

Ohtomi Jun, Professor, Faculty of Fisheries

EXPLORING
KAGOSHIMA

Surveying the bay floor using an ROV



A deep-water mud shrimp from Kagoshima Bay

Kagoshima Bay is a deep water semi-enclosed bay with a maximum depth of over 230m. For those of us who live in Kagoshima, the bay is just an expanse of blue water that stretches out from the foot of Mt. Sakurajima, but its greatest appeal lies out of sight, deep beneath the waves.

In the northeast of the bay, located on the northern side of Sakurajima, just a few kilometres from the shore, there is a submarine volcanic crater named Wakamiko, which is over 200m deep. It is an active caldera dotted with vents emitting hot water over 200 degrees Celsius. This volcanic water contains high amounts of carbon dioxide and during the summer, when the upper and lower layers of seawater in the bay do not mix, the carbon dioxide becomes trapped in the lower layers creating an acidic water mass with a pH lower than 7. Recently, this area has become the focus of attention, because deposits of the rare metal, antimony, have been found there.

To the south of Sakurajima, where the bay is at its deepest, small-scale bottom seine is the main fishing activity. This traditional fishing method, which uses nets that reach up to 2,000m in length, catches mainly deep-water mud shrimps (*Solenocera melantho*). It is extremely unusual for this kind of deep-sea shrimp to live not only in inlets but also in such high densities, which is the reason why Kagoshima Bay is the only place in the world where these shrimps are fished as the target species. The bottom seine fishing has also uncovered shrimps new to science as well as those not previously recorded in Japan before.

Recently, Kagoshima University has teamed up with Japan Broadcasting Corporation (NHK) to survey the sea floor using an ROV (a remotely-operated underwater vehicle) and observe both the bay's rare metals and its rare shrimps first hand. The depths of Kagoshima Bay are truly a unique place – the more they are researched, the more mysteries that come to light.

*Front Cover

Sakuragaoka Campus of
Medical and Dental Sciences

The campus is located on a hill above the city with scenic views of Mt. Sakurajima and Kagoshima Bay. One of the buildings of the university hospital has a heliport for patient transportation.

Ohtomi Jun

Born in Hyōgo Prefecture in 1963. Completed his PhD (Agriculture) at the University of Tokyo in 1991.

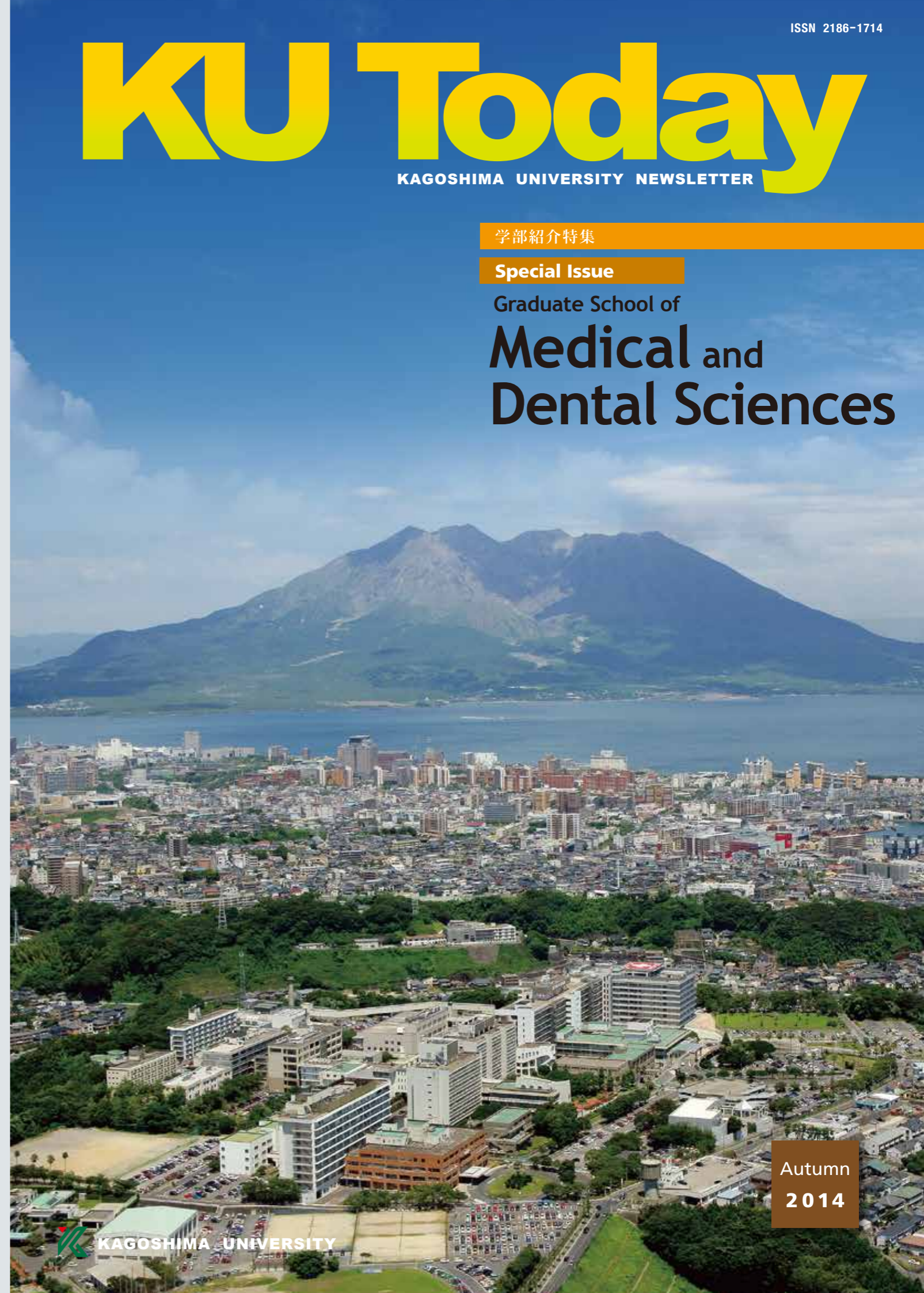
Specialises in fisheries biology.

学部紹介特集

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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.

CONTENTS

	SPECIAL ISSUE GRADUATE SCHOOL OF MEDICAL AND DENTAL SCIENCES	1
	CAMPUS WALK AROUND KAGOSHIMA UNIVERSITY MEDICAL AND DENTAL HOSPITAL	9
	DISCOVER KU AUTOMATED DESIGN OF SECURE 2D BARCODES	10
	EXTRACURRICULAR ACTIVITY THE MARINE ECOLOGICAL RESEARCH SOCIETY <i>Miyamae Yūki, BSc student, Faculty of Fisheries</i>	12
	INTERNATIONAL COMMUNITY ALUMNI IN BANGLADESH AGRICULTURAL UNIVERSITY <i>Zordar Faruque Ahmed, Professor, Department of Fisheries Management, BAU</i>	13
	INTERNATIONAL PROGRAMME LEARNING FIELDWORK SKILLS ON YAKUSHIMA	14
	FACES AND SNAPSHOTS	16
	EXPLORING KAGOSHIMA THE MAGIC OF KAGOSHIMA BAY <i>Ohtomi Jun, Professor, Faculty of Fisheries</i>	18



Graduate School of Medical and Dental Sciences



TORII, Mitsuo
Dean of Graduate School of
Medical and Dental Sciences

SUPPORTING DEVELOPMENTS IN MEDICINE AND DENTISTRY WITH YOUR RESEARCH.

Kagoshima University Graduate School of Medical and Dental Sciences was established in 2003 after the consolidation of the Graduate School of Medical Science and the Graduate School of Dental Science with the objective of disease prevention and cutting-edge medicine through collaboration in medical and dental research, the integration of clinical and fundamental research and the use of the case by case approach. The educational goal of the school is to train researchers in the planning and conducting of world-class research. Another goal is to train highly competent researchers and educators in life medicine who have a broad perspective, can co-ordinate joint research efforts, will continue to care about the social implications of their research, and will uphold a high standard of medical ethics.

The school was divided into 2 courses (doctoral course), Health Science and Advanced Treatment Science, offering 14 majors. In 2004, the Medical Science course (master course) was added and the Centre for Chronic Viral Diseases was opened. A further 5 majors were offered: medical joint materials, system biology in thromboregulation, the near-future organ medicine creation, molecular frontier surgery and HGF tissue repair and regeneration.

While tackling the universal problems of medical and dental research each of the majors also offers research at a global level, research that is high in creativity and research that is region specific. In addition, the majors in international and community medicine, regeneration and transplantation and space environmental medicine offer flexible research that is both start-of-the-art and region specific.

Some of the highly creative research that has been conducted so far at our graduate school and contributed to society in many ways includes research on HAM caused by HTLV-1 (HTLV-1 associated myelopathy), research on citrulline deficiency and Fabry's disease. Moreover research with a local flavour has been conducted such as research on longevity based on the Amami islands, research on space environment medicine as well as research into the use of miniature pigs for organ transplantation. Moreover

our graduate school is active in inter-faculty research with the other 9 faculties and 10 post-graduate schools of Kagoshima University, as well as conducting international research across the East Asian and South Pacific regions; in particular we are aiming to establish research links with the Muslim world. In the future we want to put extra efforts into becoming one of the main research and educational facilities in Japan for fundamental and clinical cancer and translational research as well as for lesser known areas such as psychosomatic medicine and rehabilitation. These will be promoted by the school's Centre for the Research of Advanced Diagnosis and Therapy of Cancer and Centre for Integrative Life Sciences.

Our post-graduate and PhD courses with their high levels of internationalization and computerization offer majors that answer to the varying needs of our students to produce graduates with a high sense of ethics to work as either medical researchers or medical professionals.

医とは何か

Advanced Therapeutics Course (Doctoral course)

OZAWA, Masayuki / Director of Advanced Therapeutics Course

This course includes 8 fields, which consist of 44 departments. We aim to develop the research capability of our graduate students and offer them comprehensive medical knowledge so that they can engage in research activities independently. In addition, we endeavor to foster scientists who are able to provide intellectual leadership in the fields of medical and dental sciences in the 21st century.

Field	Department
Neurology	Laboratory for Neuroanatomy Physiology Neurology and Geriatrics Neurosurgery Anatomy for Oral Science Gross Anatomy Section
Sensory Organology	Ophthalmology Dermatology Otolaryngology, Head and Neck Surgery
Neuro-musculoskeletal Disorder	Gene Therapy and Regenerative Medicine Orthopaedic Surgery Rehabilitation and Physical Medicine
Cardiovascular and Respiratory Disorders	Laboratory and Vascular Medicine Cardiovascular, Respiratory and Metabolic Medicine General Thoracic Surgery Cardiovascular and Gastroenterological Surgery Pulmonary Medicine
Functional Biology and Pharmacology	Physiology Biochemistry and Molecular Biology Pharmacology Anaesthesiology and Critical Care Medicine Clinical Pharmacy and Pharmacology Applied Pharmacology Oral Physiology
Oral and Maxillofacial Rehabilitation	Biomaterials Science Fixed Prosthodontics Oral and Maxillofacial Prosthodontics (Removable prosthodontics) Restorative Dentistry and Endodontology Periodontology Maxillofacial Diagnostic and Surgical Science Oral and Maxillofacial Surgery Dental Anaesthesiology
Oncology	Molecular and Cellular Pathology Radiology Human Pathology Digestive Surgery, Breast and Thyroid Surgery Urology Molecular Oncology Oral Pathology Maxillofacial Radiology
Regeneration and Transplantation	Cancer and Regeneration Organ Replacement and Xenotransplant Surgery Research Section Department of Gene Expression Regulation
Cooperative Department of Innovative Medicine	Neurohumoral Biology Haematooncology

Biomedical research for developing innovative therapy and its clinical application

KOSAI, Ken-ichirō / Professor, Gene Therapy and Regenerative Medicine



The principle of our research is the development of novel biotechnologies for innovative therapies, particularly in the field of gene therapy and regenerative medicine, i.e., viral vectors and stem cells, and an identification of molecular mechanisms in biomedical science.

Our goal is the contribution to the scientific innovation and the promotion of the national welfare.

One of our projects is gene-viro-therapy for cancer. Cancer is the leading cause of death worldwide, and the development of a novel innovative therapy is an urgent need. To this end, we developed an original method for the efficient generation of conditionally replicating adenovirus that can specifically target tumor with multiple factors (m-CRAs). Based on this methodology, we developed survivin-responsive m-CRAs (Surv.m-CRAs), of which viral replication element was transcriptionally regulated by the promoter of survivin gene. In accordance with the biological feature that the survivin is expressed in high levels in cancerous but not normal tissues, Surv.m-CRAs conferred cancer-selective viral replication and induction of cell death in a broad range of cancer types. Intratumoral injections of Surv.m-CRAs are therapeutic for xenografted human tumors in animal models. We further succeeded in increasing cancer specificity without reduced anti-cancer effects of Surv.m-CRAs, to facilitate systemic administration against metastatic disseminated cancers. We also developed other types of m-CRAs.

On the other hand, the current topic in oncology is cancer stem cell (CSCs), which are highly tumorigenic and resistant to conventional radiochemotherapies. We elucidated the unique therapeutic features of Surv.m-CRA, i.e., not only its therapeutic effectiveness against all cell populations but also its increased effectiveness against CSCs, suggesting that Surv.m-CRA is promising anti-cancer agent. Other two challenging researches are the development of the new CSCs-targeting m-CRAs and the biotechnology to purify a single CSC. The former may potentially eradicate the intractable cancers, and the latter may efficiently identify molecular mechanism of CSCs.

Not only the therapeutic potentials but also the originality of the technologies are absolutely necessary for allowing their clinical development. In this regard, we have not only published high quality scientific papers but also acquired several international patents. Our achievements have been evaluated so highly that large public grants from ministries and agencies are supporting our pre-clinical studies toward clinical application. We have a plan to perform a clinical trial of Surv.m-CRAs for cancer patients (phase I safety study) in Kagoshima University Hospital in

2015. This will be the first GCP-level first-in-human clinical trial in this field in Japan and is so valuable.

We are working on several projects in regenerative medicine. One is in vivo regenerative medicine using heparin-binding epidermal growth factor-like growth factor (HB-EGF) for liver diseases, including fulminant hepatic failure (FHF), of which mortality is high due to there being no effective therapy. We identified that hepatocyte growth factor (HGF) had potent therapeutic effects for FHF, and that HB-EGF had furthermore potent cytoprotective and regenerate activities than HGF. We acquired the international patents, and wish to clinically develop HB-EGF for innovative medicine for liver diseases. The other research is the development of biotechnology of human ES cells and iPS cells for regenerative medicine. We are generating novel viral vector systems that can target and treat stem cell-derived tumor, which is the obstacle to clinical application. We are also working on efficient cardiomyogenic differentiation of iPS cells. The most challenging and ongoing research of us is the development of “direct reprogramming” technology, which directly converts the cell type, e.g., from fibroblasts to cardiomyocytes, by transducing several genes of transcriptional factors.

Other research projects are molecular biology studies related to epigenetic MeCP2 gene in Rett syndrome (neurodegenerative disease) and CD9 (a membrane protein) gene, and gene therapy studies for various diseases in heart, liver and so on.

Whereas foreign students and researchers have been working in our laboratory, a Japanese graduate student, who completed thesis study, is working in USA on an international collaborative study. We are pleased to accept foreign students in our laboratory and/or to perform international collaborative studies.



Health Research Course

NISHIO, Yoshihiko / Director of Health Research Course

The Health Research Course is comprised of five departments and 28 divisions. Its aim is to understand the integrated mechanisms and pathophysiology of lifestyle-related diseases, interaction with the environment, or social problems by the elucidation of the basic mechanisms of life through collaboration between basic research and clinical studies. The course also aims to promote the development of science and techniques for the prevention, diagnostics and treatment of diseases.

As an example of the activities of the Health Research Course, descriptions of two core projects can be found on the following page.



Field	Department
Human and Environmental Sciences	Hygiene and Health Promotion Medicine Digestive Disease and Lifestyle-related Disease Diabetes, Metabolism and Endocrinology Epidemiology and Preventive Medicine Medical Informatics
Social and Behavioral Medicine	Legal Medicine Psychiatry Psychosomatic Internal Medicine Psychosomatic Dentistry Centre for Innovation in Medical and Dental Education Dental Education
Infection and Immunity	Microbiology Immunology Chronic Viral Diseases Antiviral Chemotherapy Persistent and Oncogenic Viruses Molecular Pathology Haematology and Immunology
Developmental Medicine	Biochemistry and Genetics Reproductive Pathophysiology and Obstey-Gynaecology Paediatric Surgery Paediatrics Oral Biochemistry Oral Microbiology Preventive Dentistry Orthodontics and Dentofacial Orthopaedics Paediatric Dentistry
Island Medicine and International Health	International Island Medicine Community-based Medicine
Cooperative Department of Space Environmental Medicine	Space Environmental Medicine

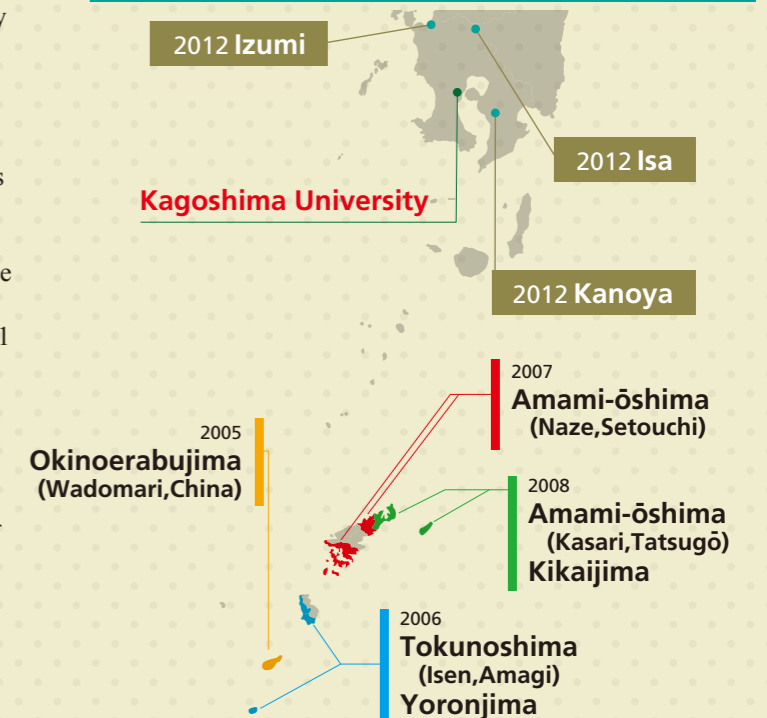
Genome-cohort study in the islands of Kagoshima

TAKEZAKI, Toshiro / Professor, International Island Medicine

Kagoshima Prefecture has 28 islands with residents living, and their population size is the largest in Japan. The Department of International Island and Community Medicine was newly established in 2002, with consideration to this geographical feature.

The prevention of lifestyle-related diseases, i.e. non-communicable diseases (NCD), is increasing the impact of its importance in Japan. As medical resources are limited in remote island regions, its prevention should be required with higher priority there. Our department is conducting a genome-cohort study on five islands in Amami and three mainland regions of Kagoshima since 2005. We have already recruited 7,871 subjects from general population who attended the health checkup program of local government. This cohort study is a part of Japan Multi-Institutional Collaborative Cohort Study (J-MICC study), which focuses on cancer prevention. Our study has reported that the proportion of atherosclerosis is relatively lower in the Amami island population than the Kagoshima mainland population and some representative Japanese (J Atheroscler Thromb, 19: 69, 2012); and the combination effect of genetic background for serum HDL-cholesterol levels in the Japanese population (PLOS ONE 8: e82046, 2013). A follow-up study will be done until 2025.

Study areas for genome-cohort study N=7,871



Translational research for obesity and emaciation

INUI, Akio / Professor, Psychosomatic Internal Medicine



In order to elucidate the mechanisms of emaciation and its extreme opposite pathophysiologic state, obesity, from the viewpoint of an abnormality of the appetite-regulating peptides, this core project develops a translational research for cachexia. In this project, we test the effects of herbal medicine and functional foods on the signal pathways of the appetite-regulating peptides, and establish the basics in molecular biology and the clinical role as a complementary medicine.

Since Kagoshima University possesses the advantage of the technology for the production of peptides or antibodies, we will produce a peptide and antibody to enhance or shut out the signal of ghrelin, a peptide stimulating appetite, or leptin, a peptide derived from adipocytes and stimulating satiety centre. In particular, the study will proceed on the molecular mechanisms of enhancing the ghrelin signal using Citrus unshiu peel (flavone) and the rhizome of *Atractylodes chinensis* (atracylodin). Furthermore, we will identify low molecular biomarkers such as amino acids, lipids, or organic acids of cachexia including anorexia nervosa using recently developed metabolome analysis collaborating with Kobe University and examine the abnormality of the signal of appetite-regulating peptides comprehensively in these pathologic states.

Endowed courses

- Medical Joint Materials (KYOCERA Medical Material Inc.)
- Systems Biology in Thromboregulation (Cooperation with Medipolis Research Institute)
- The Near-Future Organ Medicine Creation Course (Kusunokikai)
- Molecular Frontier Surgery
- HGF Tissue Repair and Regenerative Medicine

JASSO Scholarship Programme

Towards a joint research network for neuroscience in Asia

ARITA, Kazunori / Professor, Neurosurgery Department

Outline

The essential part of both the government's and academia's push to establish joint research networks with institutions throughout Asia is undoubtedly human resource development. As a step in achieving a sustainable network, this programme enables exemplary overseas students who have the capability and drive to contribute to the development of neuroscience in their respective countries in the future to experience Kagoshima University's cutting-edge science to further that drive based around the Kagoshima Neuroscience Research Association which covers both laboratories and clinics in the hospital. At the same time it also gives Japanese students motivation to actively contribute to globalisation by mixing with overseas students while fostering the future Japanese side of these joint research networks. The programme, which was started in 2013, takes students from overseas exchange universities in China, Indonesia, Bangladesh and so in the fields such as neurosurgery, neuroscience, neurophysiology, and information system engineering.

Currently

From October 2013 until March 2014, three students from the Faculty of Medicine of Diponegoro University in Semarang, Indonesia, joined the neurosurgery department at Kagoshima University. The students took part in a neurosurgery conference, observed operations and conducted 2 case studies each. During their stay in Kagoshima, they also spent time at the university's rehabilitation hospital in Kirishima seeing how the rehabilitation is carried out and taking part in Professor Kuwaki's experiments. The students also had the opportunity to present the findings of their case studies, and publish them as second authors. A further two students will be arriving from Diponegoro in October 2014.



Tri Uji Rahayu, Diponegoro University, Indonesia

It was such a great experience to exchange culture and make friends with many foreign students as well as Japanese students. Living abroad for the first time of course I experienced some culture shock, especially about food and prayer. I did not realize before I came that it could be difficult to get halal food or find a place to pray, but then it has caused almost no trouble later due to the help of my Muslim friends. At first, the language problem also could

be a bit hectic sometime, luckily almost all of the neurosurgery staff can speak English very nicely.

I studied about neurosurgery, neuroradiology, neurorehabilitation and neurophysiology in Sakuragaoka Hospital. These were very good experiences. My research theme is about the orexin neuron in the mouse brain. I learned many things from Professor Arita, the other members of faculty and my labmates, for which I am very grateful. I hope all the knowledge that I get in Kagoshima can be useful for myself and my country. Thank you!



Ashari, Diponegoro University, Indonesia

I had been thinking that it would be a good chance for me to study abroad and to go out of my comfort zone (in my case, Indonesia), which are the reasons why I decided to join this scholarship programme. This is the first time for me to study abroad, and Kagoshima is the first city that I visited. I have been here for six months and I feel proud of having had the opportunity to study in Kagoshima University. Beside that, I really want to know about Japanese culture. Japan is a developed country which has a high-level working environment, so the totality of work is required here. Japanese people are very kind, respectful, polite, helpful and hard-working, which is the most important thing that I have learned from them.

Six months is a short time but there are so many things I have studied in Kagoshima University, especially I could see technically-advanced instruments. I have studied about neurosurgery, neuroradiology, neurophysiology, done some experiments in Kagoshima University Hospital and I also had the opportunity to study about neurorehabilitation in Kirishima. In addition, I am doing some research using mice on the confirmation of 3 Methylindole induce anosmia effect. These are great experiences for me.

I would like to express my thanks to Professor Arita, all the staff of the Neurosurgery Department especially Dr. Fujio Sensei and Dr Yamahata. And to our tutor, I am grateful for the help for the last six months. I have had a wonderful time with all of you.



Fajar Herbowo Niantiaro, Diponegoro University, Indonesia

The main purpose of joining this program was to gain knowledge of neuroscience, especially neurosurgery. In the middle of my stay, our professor also gave us the opportunity to learn neuro-rehabilitation in Kirishima which is one of the best centres in Japan. He also gave us chance to write a scientific paper, which we are planning to publish.

jobs with passion and never feel pessimistic. Another good thing is that they respect older people and can work well together. It makes a special chemistry between one another, making the transfer of knowledge from the older to the younger happen in the right way.

Every day, I routinely went to Kagoshima University Hospital. The daily activity started at 7am visiting the in-patients with the professor, then I stayed in the operation theatre to observe surgery until lunchtime. After lunch, I continued to the neurosurgery department office to arrange the scientific paper. I felt more excited by my daily routine activities than I have ever done before. I also learned some points about the Japanese spirit. The Japanese are mostly workaholic. They do their

Japan is a very developed, sophisticated country without ignoring its culture. Japanese cuisine is one of the world heritages that should be preserved. The kind of food and its preparation are unique. Sushi and sashimi, which are extremely delicious, became some of my favorite dishes. Even in only 6 months, I was able to participate in almost all activities. I was never faced with any significant obstacles during my time there, either technical or financial. I hope to be re-invited and return again to Japan to further my study. I am especially grateful Professor Arita who was in charge of our time in Japan, all the neurosurgery staff of Kagoshima University and the Japanese Government.



Table 1 Overseas student enrolment in the Graduate School of Medical and Dental Sciences by year

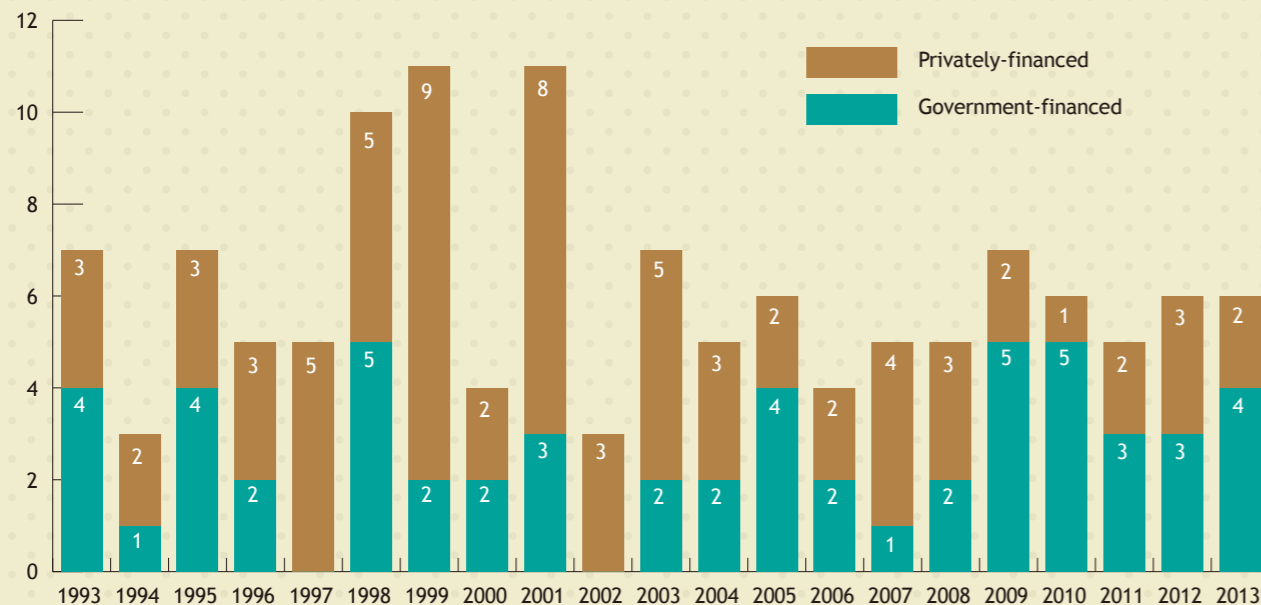
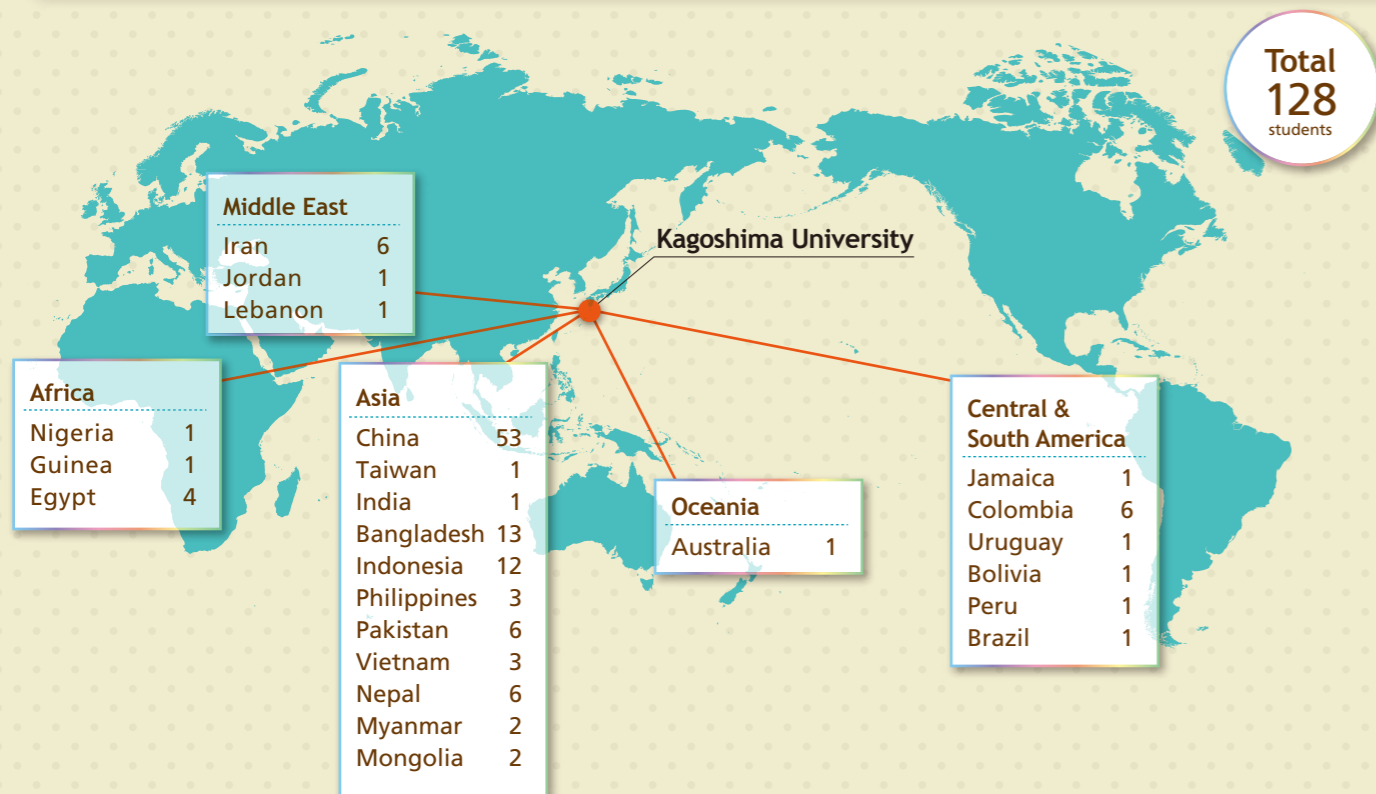


Table 2 Breakdown of overseas students enrolled from 1993 to 2013 by country



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Kagoshima University Medical and Dental Hospital

Providing comprehensive care for the 21st century

Comprising 36 clinical departments with 715 beds, Kagoshima University Medical and Dental Hospital aims to provide high level medical treatment and training for medical students.

As Kagoshima's only advanced treatment hospital, it has specialist cancer, AIDS, liver disease and maternity departments as well as being the final step for medical treatment in Kagoshima Prefecture.

From 2005, planning was started on the redevelopment of facilities, which had changed little since the hospital moved to its present location more than 40 years ago, in order to provide comprehensive care for the 21st century by improving the amenities for both patients and students.

Work started on the new central building in 2007 and was finished in June 2009. This houses operating theatres, intensive care units, testing units, materials departments and it contributes greatly to the consistent operation of the hospital.

From April 2011 work was also started on the new ward wing, which was finished in July 2013. The wing is earthquake proof as well as being energy efficient and having power sources that can be used in times of natural disasters. Also to improve environment for patients, there is an increased number of private rooms, en suite rooms and rooms with higher ceilings. What is more the day rooms on each floor all have wonderful views Mt. Sakurajima and Kinko Bay. The kitchens are on the ground floor, the first floor holds the mental care centre, the second to sixth floors are all general wards. The seventh floor houses the clinical research centre, simulators for training on endoscopic surgery and ultrasound scans, practice wards for nursing training and team treatment, as well as other seminar rooms, lounges and napping rooms. The roof also has a helipad for the air ambulance.

With these steps it is expected that the emergency capability of the hospital will be strengthened and patient transportation time will be shortened.





Imitating Natural Evolution for Automated Design of Secure 2D Barcodes

QR codes are all around us. Yet even though they are easy to use, they are easily replicated causing security issues. Professor Ono from the Graduate School of Science and Engineering is developing the technology to detect illegally replicated QR codes by using digital watermarks

A two-dimensional barcode is a square code which stores information vertically and horizontally. These codes have become increasingly familiar with the spread of mobile phones. The phone's camera function can be used to read the data and access websites, and they can also be used as authentication media of airplane boarding pass or event tickets. These 2D barcodes contain ten or hundred times more information than a normal barcode, yet despite being convenient and easy to use, they can also be unlawfully copied, which could threaten the security of our society.

Authentication using digital watermarks

Ono Satoshi, associate professor in the Graduate School of Science and Engineering, is working on developing technology to detect 2D barcode copies using digital watermarks, in conjunction with Denso Wave, which developed the original QR code, and AT Communications, whose LogoQ is a QR code embellished with colours and photos. Together they are aiming to develop QR codes that cannot be photocopied or photographed by mobile phones. Professor Ono's main field of expertise is artificial intelligence – the development of giving systems human-like intelligence and enabling them to solve problems.

“Even though QR codes are regularly used for personal confirmation purposes such as boarding passes, there is no technology to verify their authenticity. I became interested in this, when I heard from AT Communications that even though there is a need for it, no-one was involved in researching it. QR code research is close to the field of image processing, but I want to be able to apply my knowledge of artificial intelligence to it,” says Professor Ono.

The key to detecting copied QR codes will be the digital watermark. These watermarks are very intricate patterns in intermediate colours which in frequency analysis fall into the category of high frequency information. They are very difficult for photocopiers and

mobile phone cameras to reproduce. “For example, when a normal photocopier tries to reproduce intermediate colours, there are discrepancies how the shading is done. If we analyse a copied QR code using wavelet conversion, we find dots and lines have appeared on the digital watermark destroying its high frequency information and making it difficult to read,” explains Professor Ono. An international patent application has been made for this technology, and patents have already been granted in Japan, the US and Korea.

Developing automated design for digital watermarks

Professor Ono is also putting his knowledge of artificial intelligence to good use in the development of an automated design system for the digital watermarks. Using an algorithm that imitates biological evolution, he is trying to design a secure 2D barcode. First of all, the system generates a lot of QR codes with embedded watermarks using many different patterns and colours. Next the system replicates the codes on photocopiers and mobile phone cameras and assesses the watermarks. Repeating this process many times over and crossing watermarks that are difficult to replicate, the system is able to come up with the perfect example. In this way, the QR code watermark resembles a living organism, which passes through changes similar to genetic evolution to arrive at the perfect individual.

Professor Ono also has his sights set on developing a system for computers to automatically generate an appropriate watermark when designers design QR codes in the future. “A programme allows the computer to automatically combine the simple components and it sometimes comes up with solutions to previously unsolvable problems in ways that wouldn't occur to a human researcher. This kind of emergent work is what I am aiming at.”



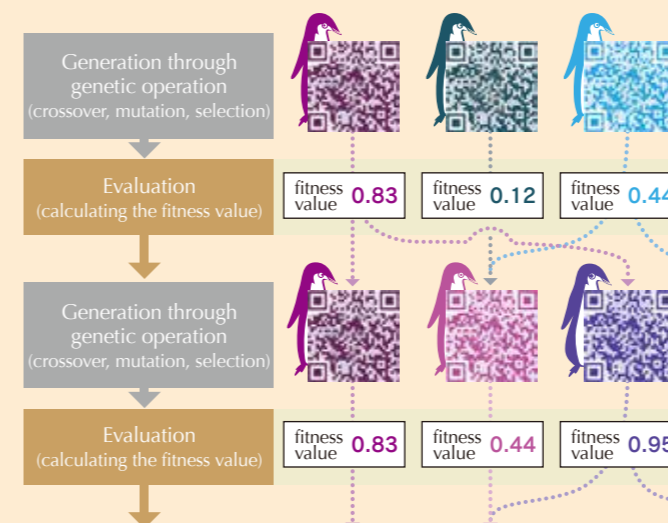
A normal QR code (left) and embellished LogoQ QRcodes.

A QR code with an electronic watermark and a reproduction



Watermarking scheme design using genetic algorithm

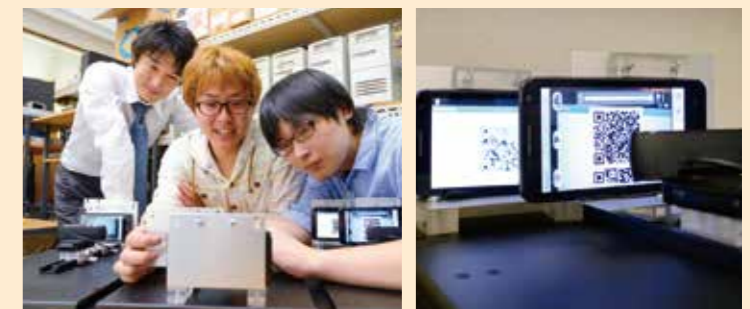
(Fitness value of 1.00 is best)



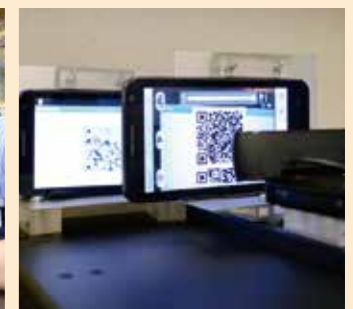
Ono Satoshi, Associate Professor

Information Science and Biomedical Engineering,
Graduate School of Science and Engineering

Born in Sendai, Miyagi Prefecture in 1975. Graduated with a PhD in Engineering from University of Tsukuba in 2002. Started working at Kagoshima University in 2003. Became Associate Professor in 2010. Specialises in computer science, artificial intelligence, evolutionary computation. Member of IEEE, Information Processing Society of Japan (IPSI), the Japanese Society for Artificial Intelligence (JSAI), and the Institute of Electronics, Information and Communication Engineers (IEICE). Secretary and journal editor of the IPSJ's Mathematical modelling and Problem Solving SIG. Won the 2010 ISPI SIG Research Award, AROB Best Paper Award 2010, the Society for Art and Science's 8th Best Paper Award, the 2008 JSAI Research Award, 2008 IEICE Information and Communication Management Research Award.



Students are heavily involved in the experiments. Professor Ono says that it rather than relying on rote learning, as students learn to think for themselves they find studying become more enjoyable.



Equipment for reproducing QR codes on mobile phones enabling the automated design of highly versatile digital watermarks that can be used on any phone.



The Marine Ecological Research Society

Miyamae Yūki, BSc student, Faculty of Fisheries

The Marine Ecological Research Society is a diving club with over 60 years of history. Our main activity is skin-diving, which we do on the weekends in the ocean around Sakurajima and Bōnotsu on the mainland. During the longer holiday periods, we travel to Amami Ōshima and stay in community centres for around a week. Have you ever been diving? It is such a fun activity. You can see beautiful scenery, various life forms and experience the grandeur of nature that only those who dive know. It was only after entering this club that I came to understand just how great diving was and how wonderful the seas of Kagoshima are.

Our club is divided into 4 teams. The fish team who looks at various species of fish. The shell team who looks at various shellfish, sea slugs, octopuses and squid. The coral team who looks at corals, sea anemones and jellyfish. And finally the seaside animal team who looks at prawns, crabs, sea cucumbers and sea urchins. When we go diving we split into these 4 teams and go off to observe the various sea life. Even at the same diving spot you can find different life forms every time you go under the water, so every time is new and interesting. We learn about each creature we find by photographing, comparing them to books about known sea life in that area categorizing them in lists. By doing this we can understand more about the creatures and the area by looking at past lists that previous club members have made. As can be seen on a map of Kagoshima Prefecture, it is surrounded by the sea and there many many diving spots. Of course there

is not just the mainland but also the many islands in Kagoshima, with different forms of sea life in each area, attracting divers from all over the country.

Amongst all these diving spots I especially recommend the seas around the small island of Kakeroma in the Amami Islands. The seas here are just so beautiful and you can't understand just how so until you visit the island for yourself. There are also far more sea creatures there than there are here in Kagoshima. Every Golden Week (national holidays in May), when we go to the Amami Islands for about a week, we take our own food and cook for ourselves and sleep together under one roof. The islands, with their superb nature, are so relaxing and have a wonderful atmosphere and the people who are always so kind and welcoming to us.

I believe I have been able to have these great experiences because I came to Kagoshima. Please come here and try diving in the beautiful seas at least once, it could change your life.



Kagoshima University Alumni in Bangladesh Agricultural University

Zordar Faruque Ahmed, Professor,
Department of Fisheries Management, Bangladesh Agricultural University

The enrolment of M.A. Mazid, a Bangladesh Agricultural University (BAU) graduate turned lecturer in the Department of Fisheries Technology at BAU as a postgraduate student in the Faculty of Fisheries of Kagoshima University in 1977, saw the birth of the relationship between two universities. To this day, several graduates and researchers, mainly teachers of Bangladesh Agricultural University are proud of having been alumni of Kagoshima University.

Bangladesh Agricultural University is the premier seat of higher agricultural education and research in Bangladesh. It was established as the nation's only university of its kind in 1961 realising the recommendations made by the Commission of National Education and the Food and Agriculture Commission in 1959 with a view to produce graduates having skills and expertise to help emancipate poverty and hunger, and make the country self-reliant in food production. The university offers degrees at the undergraduate, master's and PhD levels, and aims to be a centre of excellence for agricultural education and research, and to set an example for global communities to follow. Its scholastic activities encompass all the domains of agricultural sciences having positive effects on terrestrial and aquatic productivity. The university principally undertakes to provide quality higher agricultural education and to produce, on one hand, first-rate crop producers, dairy and poultry experts, veterinary doctors, and fisheries and aquaculture scholars, and on the other hand, to generate agricultural scientists and researchers for shouldering the responsibilities of the agricultural development of the country. It is a residential university designed for higher education and research in agriculture and all of its branches including conduct of examinations, offering degrees and granting affiliation. The university also functions to provide higher learning in all branches of agricultural sciences as a profession-based education, to conduct basic and applied research in various aspects of agricultural problems faced by farmers, change-agents and agro-industrialists with a view to recommending possible measures for solving them.

Furthermore, the university plans and arranges extension and related nation-building activities at different levels and in different forms facilitating training for personnel of different government and non-government organisations and also for farmers and farm-leaders on various aspects of agriculture and rural development, and creates facilities for bilateral and multilateral cooperation and collaboration with institutes or organisations both at home and overseas.

Charged with enormous tasks and responsibilities of academics and research, BAU has been keen to have qualified teachers with higher academic degrees from distinguished foreign universities to fulfil its underlined objectives successfully. Starting with M.A. Mazid's enrolment over 35 years ago, by now there are about twelve teachers from BAU who have obtained their postgraduate degrees from Kagoshima University. Over the years the opportunity of pursuing higher education at Kagoshima University has been very successful and gives enormous benefits in both lecturing and research at BAU. We believe that the experience and knowledge gained from our education and research have greatly influenced our whole approach to agricultural development work in Bangladesh, and the lessons we have learnt can be applied to other countries as well. The signing of the Memorandum of Understanding recently between our two institutions was a great pleasure for us, and we look forward to continued close academic links over the coming years.





Learning fieldwork skills on Yakushima

Yakushima Environmental Culture in the General Education Course

Aiba Shin-ichirō (Science), Sakamaki Yoshitaka (Agriculture), Kuwahara Sueo (Humanities)



World Natural Heritage Site - Yakushima

Yakushima became Japan's first World Natural Heritage Site in 1993. The island is some 135km south of Kagoshima City and is 130km around and 500km² in area. From coast to peak, it reaches almost 2000m, culminating in Kyushu's highest point, Mt. Miyanouradake (1936m). With the differences in temperature this causes, a wide variety of vegetation and plants can be found in vertical distribution up the island, from the banyan trees and strangler figs in the sub-tropical forests, to the laurels and oaks in the warm-temperate evergreen forests, to the fir trees in the cool-temperate coniferous forests, and finally the low scrub of dwarf-bamboo and rhododendrons in the sub-alpine areas. The island is also blessed with 4000-10000mm of annual rainfall giving it unique forest vegetation including Japanese cedar trees which grow to several thousand years old. The



Rhododendron tashiroi, the most widespread rhododendron in Yakushima

island is also home to endemic species such as the Yakushima macaque and a variety of sika deer, as well as the endangered Izu Islands thrush and Ryukyu robin. Yakushima also has the largest sea turtle nesting site in Japan. It was the fact that people live side by side with this unique ecosystem that enabled the island to be registered as Natural Heritage Site.

Identifying problems and coming up with solutions
The Yakushima Environmental Culture course was started in 2012 to look at this symbiosis between man and the island's unique nature. The World Heritage Site of Yakushima, one of Kagoshima Prefecture's many islands, provides an ideal stage for students to learn the basics of fieldwork, where they can investigate the characteristics of the locale and the issues it faces. The programme is split into four parts, vegetation, wildlife, industry and lifestyle, each taught as intensive seminars by specialists in the field. Professor Emeritus Kado



Kandelia obovata, mangrove tree one of the subtropical plants in coastal areas.

Hisayoshi, who started the programme, says, "Yakushima is Kagoshima's asset. However, Kagoshima University has thus far not taken advantage of what the island has to offer in terms of its educational value. It is very important that we provide students the opportunity to learn about areas, their problems and how to solve them." In order to make sure that the programme would be a lasting endeavour, the university's Education Centre and the Yakushima Environmental and Cultural Foundation signed an agreement in March 2012. On the island, the students' fieldwork includes guided tours given by staff from the Yakushima Environmental and Cultural Learning Centre as well as lectures of the local experts.

Reporting the results, discussing with experts

In May 2014, students who participated in part one of the programme on vegetation, visited Seibu Rindō track and



Kigensugi, a giant Japanese cedar
Cryptomeria japonica

Yakusugi Land and learnt about low-altitude and high-altitude vegetation and its relationship to people. As well as becoming enthralled by the wonderful natural scenery, the students were able to understand how it was created from a long history of symbiosis between man and nature. They also could see the difficulties being faced with how to conserve the island's forests. On report presentation day, the students discussed with experts about many problems that Yakushima has, such as the effect on the vegetation of the increasing numbers of tourists after the island became a World Heritage Site, the damage caused by increasing numbers of Yaku sika deer, and whether some of the deer should be culled as a measure to protect the ecosystem. The answers to all of these questions are not simple, but through the fieldwork the students were able to realise that Yakushima is not just a wonderful place to visit, but that it is also facing its own set of problems. It was written in the reports that they continue to think of Yakushima issues and hope to visit again.



Yaku sika deer

Cutter club claim victory

The Kagoshima University cutter club won the first prize in the 58th All Japan Cutter Championships which were held on 31st May in Ashiyahama Beach in Hyōgo Prefecture, central Japan. Victory in the national championships was their first in 23 years and only the third time in the club's history. The 14 man side had to race over a 2km course and proceeded through the preliminary rounds in closely fought battles to take the final in the eleven team championships.

Final race times

1st	Kagoshima University	11m 12s96
2nd	National Defense Academy	11m 16s07
3rd	Japan Coast Guard Academy	11m 16s22
4th	Tokyo University for Marine Science and Technology	11m 27s35



The champion tossing their oars



Team members with the championship flag



Renewal of academic exchange agreement between University of Malaysia Sabah and Kagoshima University

Foreign Guests to Kagoshima University

In the first half of 2014, the university received courtesy visits from the following overseas universities and institutions.

- Federal University Ndufu-Alike Ikwa, Nigeria
- Indian Embassy, Tokyo
- State Administration of Foreign Experts Affairs, China
- National Kaohsiung First University of Science and Technology, Taiwan
- University of Georgia, USA
- University of Malaysia Sabah

Fruits of Japan-USA joint research published in Science Magazine

The research has been conducted since 1984 in two laboratories of Science and Dentistry, led by Dr. Kiyohara Sadao, executive board member of Kagoshima University, ex-Professor, Graduate School of Science and Engineering and Dr. Harada Shūitsu, Professor, Graduate School of Medical and Dental Sciences. In the paper titled "Marine teleost locates live prey through pH sensing," it is reported that the Japanese sea catfish (*Plotosus japonicus*) senses local pH-associated increases in H⁺/CO₂

equating to a decrease of ≤ 0.1 pH unit in ambient seawater. The research group demonstrated that these sensors, located on the external body of the fish, detect undamaged cryptic respiring prey, such as polychaete worms. Sensitivity becomes maximal at the natural pH of seawater (pH 8.1 to 8.2) and decreases dramatically in seawater with a pH <8.0. Details of the research can be found at Caprio et al. 2014, *Science*, 344(6188): 1154-56. <http://www.sciencemag.org/content/344/6188/1154>

KSAT2 Mission Completed

Project supervisor Professor Nishio Masanori (Graduate School of Science and Engineering) announced at a press conference that the made-in-Kagoshima KSAT2 mini-satellite that had been launched on 28th February on the H-IIA 23 rocket had re-entered the Earth's atmosphere on 18th May after a two and a half month mission.



Following on from the disappointment of the failed KSAT1 mission, KSAT2's power and communication abilities were strengthened enabling the satellite to be used for research in satellite tracking, pantograph boom development, signal synchronisation between satellites and the ground, and measuring atmospheric water vapour distribution using radio waves.

He went on to say that he hoped 2nd year MSc student, Morita Daiki, who acted as project manager would soon be able present the findings of the research and go on to run a project using 1000 mini-satellites.

Professor Nishio added that he was pleased that this research would act as a stepping stone for the next generation of science and engineering researchers, whilst dean and project representative, Professor Kondō Eiji, said that he hopes that the tremendous amount of motivation this kind of programme gives would increase the innovation and creativity of the students.



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The mission was however not a complete success. Attempts to receive data and photographs taken by the onboard camera unfortunately failed, providing all concerned with new impetus to work towards improvements for next time.

State of the art equipment in the Joint Faculty of Veterinary Medicine

As part of its goal of improving the standard of its educational scope, the Veterinary Teaching Hospital has installed state of the art equipment such as a CT scanner for large animals and a superconductivity 3 Tesla MRI. Two mobile hospitals were also equipped with blood testing machines, endoscopes, and operation tables etc. These new facilities will enable large animals to be operated on outside of the hospital and also help the students in their field research.

