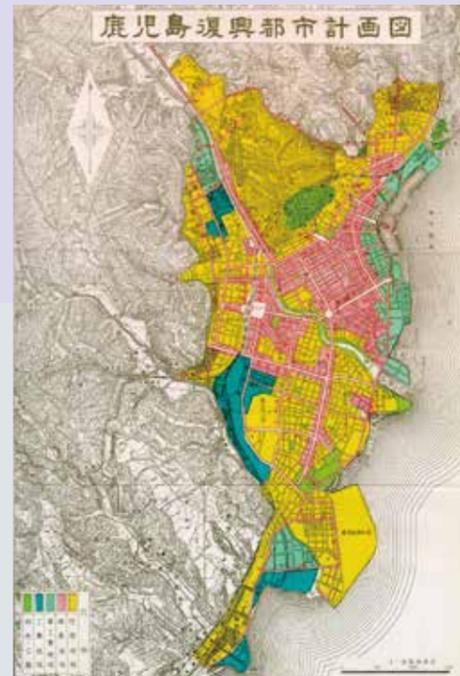


TRACING BACK THE DEVELOPMENT OF KAGOSHIMA CITY

鹿児島市の都市づくりの軌跡をたどる

Professor Kikata Junne,
Graduate School of Science and Engineering



Map for the city's redevelopment after the war



Small, leafy park in the city

reconstruction can be contributed to the efforts of the engineer, Kajiyama Asajirō, who had played an active role in the Korean Peninsula before and during the war. Kajiyama was a civil engineer who specialised in water supply and whose talents saw him appointed as section chief of city planning in Keijō Prefecture (modern day Seoul) where he gained extensive experience in land readjustment projects. After the war he returned to his hometown of Ishiki, Kagoshima, and contributed greatly to the reconstruction of Kagoshima City.

Kagoshima City also has many important urban assets, including the vital tram network that connects the suburbs of Taniyama with downtown. Those assets were developed by the urban planners who, with the power of foresight, seized a golden opportunity to transform the city after destruction. Kagoshima provides us with an exemplary case to learn about urban planning and city reconstruction. I believe these topics will become increasingly important in a post-disaster society, as we must know more about the city at our feet and how those who experienced great disasters rose up from the ashes.

Kikata Junne

Born 1968 in Gifu Prefecture. Received master's degree in March of 1994 from Tokyo University of the Arts, Graduate School of Fine Arts, specializing in architecture. Doctor of engineering. Major field construction and urban planning. Published several books

EXPLORING KAGOSHIMA

Kagoshima is not only a beautiful picturesque city but also an important centre of historical change. With its many historical sites and cultural assets, it attracts many tourists each year. However even though Kagoshima is an old castle town, the layout of the city we see today was developed with modern urban planning, which is highlighted through a history of reconstruction from disasters and war destruction.

The history of Kagoshima's modern urban planning can be traced back to the City Planning Act of 1923. In April 1933 a city park plan was quickly drawn up, however at this time there were no official government guidelines for park planning. So the Kagoshima Regional Committee came up with their own original policy and plan that established the importance of small downtown city parks. The head of the committee explained that Kagoshima is already a city within a natural environment of mountains and seas and rather than having larger parks in the suburbs, smaller downtown parks were needed as areas where children could play. The realisation of this planning strategy is demonstrated by the several small parks that surround the university.

The current city framework, in which Kagoshima-Chūō Station functions as a gateway, came about as part of the city reconstruction plan after the end of the Pacific War. Kagoshima was the first city in the country to start implementing this post-war reconstruction plan, and accomplished it without any of the problems that impeded implementation of similar plans in other city centres such as Tokyo, due to the scaling-down of such reconstruction projects in 1949. Much of the success in the city's

*Front Cover



Students on veterinary training

学部紹介特集

Special Issue
Joint Faculty of
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Welcome to the Joint Faculty of Veterinary Medicine



Mochizuki Masami, Dean

Among the 16 veterinary schools in Japan, Kagoshima University exists in the best geographical area for veterinary education. The school is located in the centre of Kagoshima City with a population of more than 600,000, and surrounded by an eminent stock-raising zone. Therefore, there are plenty of companion and livestock animals available for education and clinical training. Seventy five years have passed since veterinary education began at Kagoshima University, and this nurturing educational environment along with years of assiduous efforts have brought about the programme's current success.

In April 2012, Kagoshima University established the first joint courses of veterinary medicine with Yamaguchi University as a partner. The most distinctive feature of this programme is that students at both universities take the same subjects according to the same syllabus and class schedule. Parts of the



lectures are performed using real-time bidirectional remote instruction technology, which allows for the use of both universities' advantages, thus giving students a highly specialised education. Furthermore, the faculty has been pursuing the international standards of veterinary education by working towards EAEVE (European Association of Establishments for Veterinary Education) approval along with Hokkaido University and Obihiro University of Agriculture and Veterinary Medicine.

We believe that the Joint Faculty of Veterinary Medicine is one of the more unique faculties of Kagoshima University. Our basic idea of what veterinary education ought to be consists of pursuing animal life science, conducting scientific research into environments and societies where humans and animals coexist, learning to respect life through animal bioethics, and contributing to the creation of an abundant global society. Under this principle, along with our educational objectives, admission, curriculum and diploma policies, we promise that we will make the best effort to provide veterinary education that meets global standards.

Educational Programme

The joint faculty is a collaborative veterinary educational programme that was established by Kagoshima University and Yamaguchi University in 2012. The first of its kind in Japan, it builds on the strengths of both universities to provide equal educational and research opportunities to the students at either institution.

The efforts and strengths of the two universities—Advanced Livestock Medicine at Kagoshima, and Public Health Science at Yamaguchi—are the basis for our international level veterinary programme, designed to prepare students to meet diversified social needs through a multidisciplinary education built upon three core focuses in veterinary medicine.

The primary distinguishing characteristic of our programme is the fact that students at both universities take the same educational courses under the same syllabus and schedule. Lectures and practical study



sessions utilise a real-time, bidirectional remote instruction system that has been installed at both universities. Faculty members and students also travel between the two campuses to participate in lectures and practical study sessions.

THREE COURSES IN VETERINARY MEDICINE

In the Joint Faculty of Veterinary Medicine, first-year students take general courses and basic courses and review their knowledge in the foundation of veterinary medicine.

From their second year to their fifth year, students take uniform courses, which comprise the core of their specialised education, in order to master the knowledge and skills they will need as veterinarians. Uniform courses consist of basic veterinary courses, applied veterinary courses, and clinical veterinary courses. From their fourth to sixth years, students take more evolved specialised courses, selected from Animal Life Science, Disease Control, Companion Animal Clinical Veterinary Medicine, and Farm Animal Clinical Veterinary Medicine.

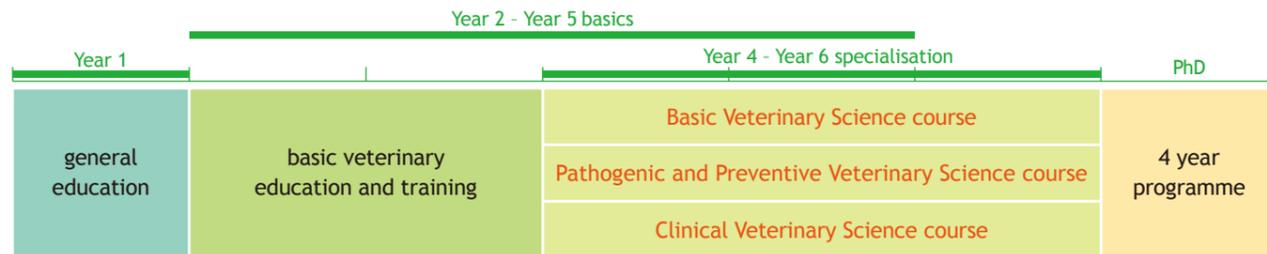


Fig. Programme Overview

Basic Veterinary Science

Basic Veterinary Science is dedicated to research and education in basic biology, which forms the foundation for every aspect of clinical medicine and life science. The course covers a wide range of interests in anatomy, physiology, behavioral biology, and drug action mechanisms in companion and laboratory animals, both small and large, and exploit macroscopic, molecular, and genetic approaches to better understand the life phenomena of animals.



Pathogenic and Preventive Veterinary Science

This course educates students on pathogens such as viruses, bacteria, protozoa, parasites, arthropods etc. and looks at health studies from both the animal and the human points of view. It includes technical training regarding: veterinary microbiology, zoonosis, avian diseases, fish diseases, parasitology, toxicology, immunology, veterinary pathology, animal hygiene, veterinary sanitation, food hygiene, food science, environmental hygienics and veterinary epidemiology. Research focuses on the analyses of animal pathogens. The faculty's Transboundary Animal Diseases Research Centre is also active in the research carried out.



Clinical Veterinary Science

This course includes study into disease prevention in domestic animals and ways to increase their productivity and mobility, along with a look at the diagnosis and treatment of all sorts of diseases that affect domestic and wild animals through research into pathophysiology, molecular biology, regenerative medicine etc.

Using our newly-created curriculum, students carry out more detailed work on pathology, diagnostics and treatment for domestic and farm animals on site within the faculty's veterinary teaching hospital. Kagoshima Prefecture not only provides a good place for clinical education for companion animals in the city, but also for farm animals in the surrounding countryside and allows the faculty to contribute significantly to society. The faculty's Equine Medical Centre, the only such university based equine specialised medical facility in Japan, provides substantial education and hands-on

training for the students. For those who have graduated, we have regular seminars for professional vets from the local area, as well as a programme for interns at the veterinary hospital.



Ongoing surgery in the truck



A surgery truck equipped with a mobile operating room - makes it possible to perform surgery on livestock animals. The only one in Japan is owned by Kagoshima University.

PHD IN VETERINARY SCIENCE

The United Graduate School of Veterinary Science at Yamaguchi University, is a four-year PhD programme hosted by Kagoshima University, Yamaguchi University's Joint Faculty of Veterinary Medicine as well as Tottori University's Faculty of Agriculture's School of Veterinary Medicine and their Veterinary Teaching Hospital. Students belong to one of three major courses and earn a doctorate in veterinary medicine. After being assigned to their primary advisor's university, students receive research guidance such as special lectures, special seminars, special lab sessions, common seminars, and the authoring of their thesis.



TRANSBOUNDARY ANIMAL DISEASES RESEARCH CENTRE

Transboundary Animal Diseases (TAD) refer to those diseases that international organizations, such as the Food and Agriculture Organization of the United Nations and the World Organisation for Animal Health, define as highly contagious, having the potential for very rapid spread irrespective of national borders, causing serious socio-economic and possibly public health consequences and that require global cooperation to suppress. Examples of such diseases include avian influenza, foot-and-mouth, classical swine fever, African swine fever and rinderpest. Particularly since 2011, with several global and domestic outbreaks of avian flu and foot-and-mouth, there has been a great need for education and disease control. Spurred by this need to



combat global outbreaks, the centre was established in 2011.

Principle Research

The TAD centre conducts in-depth research into the nature, epidemiology, diagnosis and treatment of several viruses including influenza, foot-and-mouth, classical swine fever and rabies.

Advanced Containment Laboratory

The advanced containment laboratory is a biosafety level 3 (BSL) enclosed laboratory facility constructed in April 2014 using subsidies provided by the national university reform scheme. This laboratory allows for advanced research to be carried out on volatile viruses, such as the highly pathogenic avian influenza virus and rabies, that could not be conducted in conventional facilities. The laboratory contributed to the provision of a definitive diagnosis during an outbreak of avian influenza amongst the wild bird population in Kagoshima Prefecture in winter 2014/15.

VETERINARY TEACHING HOSPITAL

As an educational facility that is affiliated with the Joint Faculty of Veterinary Medicine, the Veterinary Teaching Hospital is dedicated to educating future veterinarians. By serving as a key regional animal treatment facility that conducts research into animal diagnosis and treatment, it is also open to the surrounding community. Currently, the hospital treats farm and companion animals, with services for the former including an artificial insemination clinic for livestock. Treatment of companion animals is offered by departments of general practice, internal medicine, infectious disease, oncology, neurology, urology, soft tissue surgery, orthopedics, and genetic examination. The facility also provides a full range of medical care for horses through the Equine Medical Centre, which opened in 2008. As part of its mission, the hospital also provides opportunities for veterinarians to study clinical veterinary medicine through the examination of animals.



Right: Performing a CT scan on a horse

Research Topics

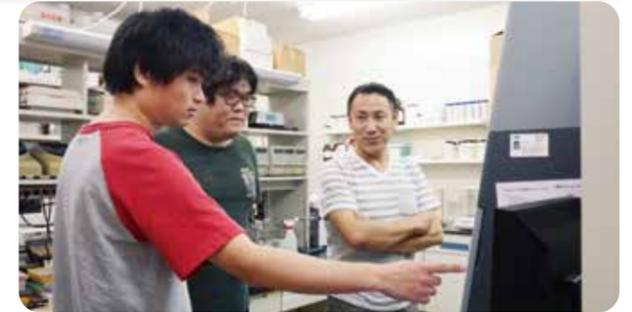
Infectious Diseases

Dr. Tanaka Tetsuya, Associate Professor

Ticks are blood-sucking arthropods related to spiders and scorpions that parasitise humans and animals worldwide. Similar to mosquitoes, they can transmit a wide variety of diseases. The aim of the studies in our laboratory is to understand the different aspects of tick biology, particularly of the hard tick *Haemaphysalis longicornis*, and their interaction with the different infectious agents that they may transmit, such as viruses, bacteria and protozoan parasites. Deep understanding of ticks and the microorganisms they transmit is important in controlling tick infestation and the spread of diseases.

Key Research Themes:

- Identification of different tick molecules that are crucial to tick physiology and immunity.



- Gene functional studies through RNA interference (RNAi).
- Molecular studies on the interaction of ticks with infectious agents, including viruses, bacteria and protozoan parasites.
- Metagenomic analysis of tick microbiome.
- Identification of potential tick antigens that can be targeted for tick and/or pathogen control.
- Molecular detection of infectious agents from ticks collected in the field.

Functional Nutrients

Dr. Kanouchi Hiroaki, Associate Professor

My research focuses on functional foods. Functional foods are important sources in the prevention, management and treatment of chronic diseases in the modern age. For example vitamin B6 is required for amino acid metabolism in living organisms; however could it also be considered a viable treatment for illnesses? As a result of this thinking, it has been discovered that vitamin B6 is effective against breast and colon cancer. However the mechanisms behind the reasons why B6 is effective for fighting cancer are still being researched.

Recently, along a similar line to vitamin B6, there has been a lot of attention paid to pot brewed black rice vinegar. Black vinegar is a traditional Japanese product produced using handmade methods and its nitrogen content is far higher than that of normal grain vinegar. The components that house the nitrogen are primarily composed of amino acids; however what those components are exactly has yet to be understood. Animal trials have shown that black vinegar has several health benefits and is effective in combatting high blood pressure, cancer and diabetes. Therefore my research group thought that it may also be effective in treating the progress of dementia and so tested this hypothesis using laboratory mice. The experiment involved giving mice suffering early stage dementia doses of black vinegar, and the results showed the vinegar suppressed the decline in cognitive function within the mice. Mice suffering from dementia displayed an accumulation of insoluble proteins in the brain, but results from the experimental group showed



that vinegar had suppressed the accumulation. To understand exactly what effect the black vinegar was having, we used DNA microarray to identify the gene change within the brain. Although the gene that was related to cognitive function was not found, it became clear that many of the genes within the affected mice taking black vinegar has changed to resemble those of a healthy mouse. There is an implication that the black vinegar intake contributes to the genes reverting back to a younger healthier state. It was also discovered that the intake of black vinegar induced HSP70, the gene responsible for the suppression of the accumulation of insoluble protein. It has been shown in animal tests that a direct dose of the HSP70 gene has led to subject improvement, so we believe that there is the possibility that the intake of black vinegar follows a similar process. We have the hope that one day black vinegar, with its differing mechanism of action from the readily used donepezil, will serve as a new preventative medicine for dementia. We hope to push forward with the verification of black vinegar's usefulness against dementia in both humans and companion animals.

I have talked about black vinegar as a functional food, but there is a vast variety of foods in Asia that may have unknown medical properties. I wish to continue research in this area and use what I learn to contribute to the lives of both people and animals.

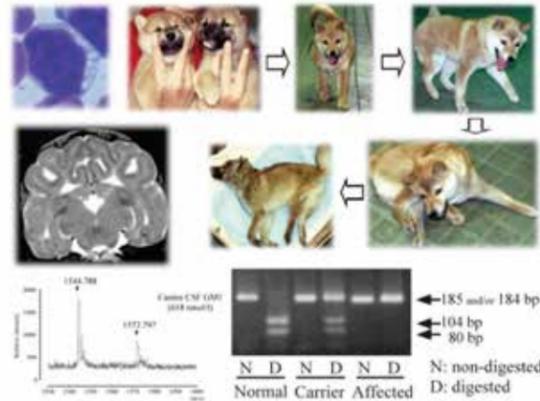
Genetic Diseases and Disorders in Animals

Dr. Yamato Osamu, Professor

My laboratory (Clinical Pathology) is a very unique laboratory studying a variety of genetic disorders and traits in domestic and wild animals using both clinical and molecular techniques. There are all kinds of disorders and traits studied here, especially lysosomal storage diseases (e.g. gangliosidosis, mucopolysaccharidosis, and neuronal ceroid lipofuscinosis), inherited neurodegenerative disorders, other inborn errors in metabolism, erythrocyte enzymopathies, pharmacogenetic traits associated with drug intoxication, and inherited eye diseases. As a representative example, the following figure shows several research aspects regarding GM1 gangliosidosis in Shiba Inu dogs. I first identified this canine disease in 2000 and since then have clarified its clinical, clinico-pathological, pathological, biochemical, and molecular characteristics. I have also developed several diagnostic methods and identified biochemical and MRI biomarkers to estimate the disease's progression. Now, studies on its prevention and novel therapeutic methods are being undertaken.

Many samples and information on animals affected or suspected with genetic diseases and disorders are

routinely introduced to my laboratory from veterinarians across Japan and also from abroad. The laboratory staff is investigating several issues on a variety of diseases and disorders. Therefore, I need more staff and students to help work on this very interesting research. I sincerely hope that young research fellows will join me in my work.



Clinical, clinico-pathologic, MRI, cerebrospinal fluid (CSF), and molecular characteristics of GM1 gangliosidosis in Shiba Inu dogs

Improving Athletic Performance in Horses

Dr. Misumi Kazuhiro, Professor

Multipotency of equine mesenchymal stem cells

Cartilage regeneration with cell therapy following arthroscopic surgery could be used in racehorses with intra-articular fractures (IAF) and osteochondritis dissecans (OCD). The aims of this study were to investigate the origin and multipotency of stromal cells in the synovial fluid (SF) and synovium (SM) of horses with intra-articular injury and synovitis, and to provide a new strategy for regeneration of lost articular cartilage. Mesenchymal stromal cells (MSC) were isolated from SF and SM of horses with IAF and OCD. The stem cells were positive for CD44, CD90 and major histocompatibility complex (MHC) class I, and differentiated into osteogenic, chondrogenic, adipogenic and tenogenic lineages. Chondrogenic induction in culture resulted in a change in cell shape to a 'stone-wall' appearance and the formation of a gelatinous sheet that was intensely stained with Alcian blue. SF may be a novel source of multipotent MSCs with the ability to regenerate chondrocytes. We have a plan to implant the stem cells into the osteochondral defects under the arthroscopy in racehorses.

Diagnostic colour doppler ultrasonography of equine superficial digital flexor tendon

Interest in colour doppler (CD) ultrasonography has recently spread to the determination of micro blood flow in the locomotive system. In horses with chronic tendinopathy, CD ultrasonography was useful as a diagnostic tool for intratendinous hyperaemia and short-term outcomes. We hypothesize that semi-quantitative determination of neovascularization by using CD images could be a helpful procedure to diagnose not only the time course of ruptured tendon bundles but also the cumulative micro-injuries prior to the macroscopic injuries. We reported the histopathology of chronic tendonitis that the vessels were increased in the tendon bundles. And we evaluated blood flows appearing in tendons of young Thoroughbreds with no tendon rupture before. Blood flows were in 6.4% of the whole CD images. The increased blood flows could be associated with the increase of the exercise intensity during a training period. Because no macroscopic injury was diagnosed by the following grey scale ultrasonography, the blood flows in the training period could not be predictive of future tendonitis once the animals had become racehorses.



An Interview with Dr. Miura Naoki, Associate Professor and Head of the International Exchange Committee

Is the globalisation of veterinary medicine necessary?

Very, whether it be for education or for research. Country borders mean nothing to diseases like influenza and foot-in-mouth. In veterinary medicine, infectious disease diagnosis, shared data, genome comparative analysis and many other areas of research require international cooperation.

What role does globalisation play in veterinary education?

MEXT has selected us as one of four veterinary schools in Japan to start preparing for international certification from the European Association of Establishments for Veterinary Education (EAEVE), which requires several years of educational reform.

What is international certification in education?

One of the biggest problems we face is contending with the problem of transboundary animal diseases. Presently, the EAEVE initiative ensures a guaranteed standard for veterinary education in European countries. It is important for Japan to follow a similar process so our veterinarians can participate at a global level.

What are some of the globalisation programmes within the faculty?

The joint faculty was only established three years ago; however we already have academic exchange

agreements with many universities around the world.

What is the aim of these academic exchange agreements?

Firstly, student exchange. I myself have spent roughly five years overseas on exchange in the United States and on other study trips around the world, so I know the joy of learning from other cultures, which I believe to be the most important part of globalisation. I believe students returning home from their studies in Japan will contribute greatly to the development of new teaching staff in their own countries. Furthermore, many of our young researchers are now involved in some very interesting and beneficial collaborative research projects.

What would you say to anyone thinking of studying in Kagoshima?

Kagoshima is full of many warm-hearted people that reflect the good old-fashioned values of Japan. The Joint Faculty of Veterinary Medicine may be the newest faculty within the university; however we are committed in our desire to make it a global department. From molecular biology to basic fieldwork, you can experience all of biology. We hope to see many more international students in the future.



Remil Linggatong Galay (Philippines)
PhD student

It was the great interest and high enthusiasm for parasitology that I have had since I was an undergraduate veterinary student that made me pursue it when I was blessed with the opportunity of PhD study in Japan. I really had no particular university in mind by the time I applied for the Japanese government scholarship, but I preferred that it should be located where the winter is not too long (coming from the tropical Philippines, I am not used to very cold temperatures), and in a city that is not that developed but also not too rural. As it happened, I found a laboratory at Kagoshima University that mainly works on ticks and tick-borne parasites. My research is related to tick iron metabolism employing genetic manipulation, with an end goal of controlling ticks through vaccination. Research work has not been easy, of course; it requires a lot of hard work, perseverance, determination and discipline.



When I feel too stressed, I find ways to relieve it by doing things that I enjoy like cooking, running and hanging out with friends. Aside from the struggles in research, as a foreign student I also had to cope with life in a different country. At first, I had to adjust to the difference in culture and way of living, but it did not take me that long. Kagoshima is really a nice city for me to be at home in – well, except for the ash! Of the many cities in Japan that I've been to during my almost five years, I still prefer living in Kagoshima.



student voice

Nguyen Thi Thanh Ha (Vietnam)
PhD student

I had dreamt of becoming a teacher since I was small. It was lucky that I got a chance to become a university teacher in my home country, Vietnam. However, to become an official teacher, I need a PhD degree. In addition, I also need to improve my knowledge to perform my job well. My seniors told me that it would be better if I accomplished my PhD course abroad, because it would help to improve not only my professional knowledge but also my personality. They told me that the experiences of living in a foreign land people help to become more independent, more sociable and also more international. In order to study abroad, it is much better if we have a scholarship, because without financial anxiety and spending time doing part-time jobs, we certainly can focus more on the studying.

I had known about the Japanese government scholarship from friends, and was lucky to have been selected. Therefore, I came to Japan as a graduate student. After finishing my master's in Okinawa, I wanted to do my PhD on a veterinary pharmacology subject, which is similar to my specialisation in Vietnam. I was interested in medicinal plants, so after finding out that the pharmacology department in Veterinary faculty here also performs this research



theme, I decided to move to Kagoshima to undertake my PhD.

Life in Kagoshima is similar to that in Okinawa: I can experience a typical countryside life-style. People here are nice and friendly. Due to studying, I have not spent much of time to discover the landscapes and the cultures of Kagoshima, so I am not able to talk much about that. I am now thinking that after graduation, before going back to my home country, I will spend at least several months to understand Kagoshima, the land that I can consider as my second home town, because I have experienced many beautiful things here. As I had expected, I have improved both my knowledge and my personality here. I think I have become stronger, more independent and more sociable. These are the bonuses I value besides the good education I have received.

student voice

Lai Yu-Chang (Taiwan)
PhD student

I am from Taiwan and graduated from the Department of Veterinary Medicine at National Chung Hsing University in 2011. We have a summer exchange student programme with various veterinary universities in Japan. I was the one of the exchange students to Kagoshima University in 2010. It was a nice experience to study and practice my clinical skills in the veterinary teaching hospital here. I was also impressed by the cutting-edge equipment, sympathetic working atmosphere and friendly Japanese students, veterinary technicians and professors. My one month exchange student life was pretty short but fulfilling, and these are the reasons why I decided to choose Kagoshima University as the starting point for more extensive research. I major in molecular biology, especially the relationship between the milk produced by mastitic (breast inflammation) cows and microRNA. I also focus on the study of dog liver cancer and microRNA. I would recommend foreign students to study at Kagoshima University. The university is located in Kagoshima City, which makes student life easier and



convenient. However, as opposed to the incredibly crowded and busy cities found elsewhere in Japan, the pace of life in Kagoshima can reduce your research/study stress. The *onsen* hot springs are also a good way to eliminate fatigue caused by study. There are a lot of *onsen* in Kagoshima, even some in walking distance of the university. This is a place not only for your short term study abroad but also for the creation of your lifelong memories.



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Equine Medical Centre

Southern Kyūshū has a long tradition of breeding both race and work horses, and with its warm climate it is also a well-known equine recuperation venue. However, the area lacked a specialised equine medical facility which could provide advanced medical care when needed. In order to rectify this problem the Equine Medical Centre was initially established by the Japan Bloodhorse Breeding Association as part of a Japan Racing Association development project with financial backing from the Japan Racing and Livestock Promotion Foundation. After construction of the centre finished in December 2008, the Bloodhorse Breeding Association donated the centre to Kagoshima University with medical services beginning from April of the following year. Veterinary professor, Misumi Kazuhiro, is the head of the centre and is one of only two equine specialised vets in all of Japan's veterinary universities. The first floor of the centre is equipped for equine medical treatment and operations. The theatre for carrying out orthopedic operations, such as

mending broken bones, is kept sterile through specialised air filters and the air flow and pressure is strictly monitored. There is also another operating theatre for open surgery and other invasive procedures.

The centre undertakes around 30 surgical procedures a year as well as over 100 other diagnoses and treatments, and this number is constantly rising. It has also carried out positive work on new treatment methods for the rehabilitation of movement in injured muscles, tendons, ligaments and bones. Also since the end of 2011, a specially-equipped vehicle has been commissioned allowing for examinations and treatments to be carried out away from the university.

The Equine Medical Centre is the only such university-based equine medical facility in all of Japan. It continues to be a place of learning and research for those young people wishing to become equine veterinarians and those who have already graduated and are working in the field.



Operating theatre with positive pressure ventilation



Anaesthetic induction room



The Equine Medical Centre building



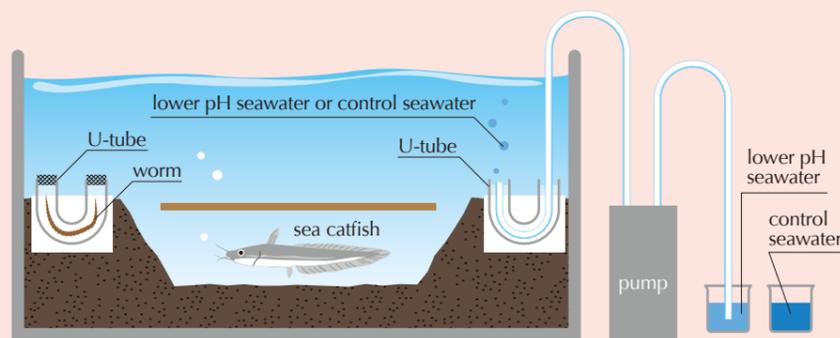
Discovery that Japanese Sea Catfish Locate Live Prey through pH Sensing

Dr. Kiyohara Sadao specialises in researching the taste systems of fish. In June 2014, after 30 years of continuous research into the taste mechanisms of the Japanese sea catfish, he discovered that they locate their prey through a highly sensitive pH sensing system.

Since 1984, Dr. Kiyohara Sadao (Executive Director for Education, former Dean of Faculty of Science) has conducted continuous research into the taste system/receptors of the Japanese sea catfish, *Plotosus japonicus*, which, like other catfish, are covered head to tail in taste receptors and are often called 'a swimming tongue'. Director Kiyohara stated, "When you dissect the brain of a sea catfish and see the large taste centre in the medulla, you come to understand just how highly developed its sense of taste is. So with support from the Japan Society for the Promotion of Science and the American National Science Foundation, I partnered with Dr. John Caprio from Louisiana State University, who was studying the taste receptors of fresh water catfish, and began my research". Professor Harada Shūitsu from the Graduate School of Medical and Dental Sciences also participated in this study. Dr. Kiyohara focused on the morphological analysis of the primary centre of taste, while Professors Caprio and Harada focused on the response of the countless nerve endings that are present on the facial whiskers. This was a study into the taste system of just one fish; however such a multifaceted comprehensive study had never before been performed.

Sea catfish locate live prey through pH sensing

During their research into the sea catfish's response to



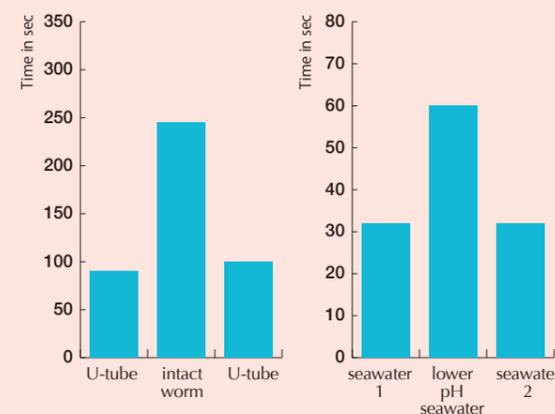
Experiment on sea catfish using lower pH seawater and polychaete worm

amino acids, Professors Caprio and Harada discovered that they were not only reacting to the amino acids but also had the ability to sense local pH-associated increases in H⁺/CO₂ equating to a decrease of ≤0.1 pH unit in ambient seawater. They also found that this sensitivity is maximal at the natural pH of seawater (pH 8.1 to 8.2) and decreases dramatically in seawater with a pH <8.0.

At that time, Dr. Kiyohara, along with Shimohara Mami, a 1st year postgraduate student, started a behavioral study using polychaete worms as bait. This was aimed at trying to prove the hypothesis that a function of the highly sensitive H⁺/CO₂ system of the catfish is to detect these prey items. The experiments saw four catfish being placed in separate aquariums. A glass U tube either empty or containing a live worm, was placed within each aquarium and covered with netting to prevent ingestion of the worm by the fish. The results indicated that the catfish spent significantly more time within the designated partition of the tank containing the U tube with the worm than in the part of the tank with the U tube that lacked the worm. A further experiment was conducted by replacing the worm with a pipe that fed in water with a lower pH and met with the same results. The fish were even seen to frequently bite the end of the U tube.

pH sensing system could be universal

Director Kiyohara stated "the results of these experiments made it clear that the sea catfish has the ability to sense local drops in pH level during its hunt for prey, where they use this pH sense at short range to pinpoint nearby prey through their breathing and at long range their amino acid sensitivity system. The verification of a fish species using this pH sense to hunt is a first". The team's results were published in the prominent American science journal, *Science*. It was also featured in scientific magazines, newspapers and



Difference in time spent by catfish in part of aquarium with/without worm, with/without lower pH seawater



Catfish biting the end of the U-tube containing a worm



Japanese sea catfish

T.V broadcasts all over the world and has had quite an impact. Presently more and more CO₂ is being released into the atmosphere, which then enters the oceans and leads to acidification. Dr. Kiyohara points out that if this continues, it will seriously impact fish that rely on pH sensitivity systems to find prey.

From now on, the team will continue their research and try to establish if these sense systems are present in other marine creatures, whether or not this is a universal feature. In particular, Dr. Kiyohara would like to find out whether the Manybar goatfish, *Parupeneus multifasciatus*, has this system or not. "Results only come from continuous research. I have conducted my studies at the university for 30 years and I plan to continue to uncover more about the taste systems of fish."



Dr. Kiyohara Sadao

Born in Aichi Prefecture in 1949. Received his doctorate from the Graduate School of Bioagricultural Sciences and School of Agricultural Sciences Nagoya University, specialising in animal husbandry in 1976. May 1976 – March 78, researcher at Florida State University. April 1978, entered Kagoshima as a lecturer in the general education department. Became professor in 1991. Moved to the Faculty of Science in 1997. Appointed dean of the Faculty of Science in 2007. Became Executive Director of Education in 2013. Specialises in sensory physiology, neuroanatomy, and fish physiology. Member of the Japanese Society of Fisheries Science, the Japanese Association for the Study of Taste and Smell, the Japanese Society for Comparative Physiology and Biochemistry, the Zoological Society of Japan and the Association for Chemoreception Science. Recipient of the Japanese Association for the Study of Taste and Smell Nakanishi Award at their 5th annual convention in 1989 and the Japanese Society of Fisheries Science Encouragement Award in 1990.



Shōgi Club

Yasunaga Tomoki, President,
BSc student, Faculty of Agriculture

Our *shōgi* club has existed at Kagoshima University for over 40 years and presently consists of a small number of very active members.

Firstly, what is *shōgi*? It is a traditional Japanese board game that is estimated to have over six million active players. *Shōgi* is thought to have originated from the ancient Indian strategy game *chaturanga*. It is believed that *chaturanga* was invented by a high priest of a war-loving Indian king as a way of satisfying the ruler's constant bloodlust. *Chaturanga* is also believed to be the common ancestor of many other board games including Western chess, Chinese *xianqi*, Korean *janggi* and Thai *makruk*. So in essence *shōgi* and chess are like brothers. However *shōgi* does have some distinguishing features. Firstly, the only difference between friendly and enemy pieces is the direction they face on the board, unlike these other games which use colour to differentiate sides. In *shōgi*, the pieces on both sides look the same, which leads to *shōgi*'s main distinguishing feature, the 'drop rule'. In other board games lost pieces can no longer be used; however in *shōgi* captured pieces can be reused by the player. This 'drop rule' is specific to *shōgi* and serves to deepen the games difficulty and challenge. *Shōgi* has a high branching factor meaning the number of possible game directions is 10226, a number that even powerful computers cannot handle perfectly. I believe the challenge of finding the best move amongst this huge amount of variables and information is *shōgi*'s greatest charm.

The Kagoshima University *shōgi* club meets every Wednesday and Friday in the *tatami* room on the third floor of the university hall. Our members play off against each other and study things such as standard

moves and the 'composed *shōgi* problem'. Through this we strive to improve our playing skills.

Additionally our members also compete in a tournament consisting of players from universities throughout Kyushu that is held four times a year. While *shōgi* is a one on one battle, at a university level there are two different styles, team competitions or personal matches. Team competitions have each university submitting 3 -7 players to play in concurrent matches with a final team score that decides the victorious side. This type of competition is good at a university level because it relies on solidarity and teamwork between club members. The most recent tournament in spring unfortunately saw us in fifth place, however all members are now working hard with our eyes set on a higher ranking at the next competition.

In the game of *shōgi*, we believe that abiding by proper etiquette is just as important as skill. Proper greetings before the match and a declaration of defeat are essential. *Shōgi* matches usually end with one side personally declaring they have lost. Having to admit one's own defeat is not something most people have to do in everyday life and that moment is very frustrating. However without experiencing this you cannot grow stronger. This is why we are always diligent in ensuring new members of the club properly admit their own defeat. They must take it one step at a time when overcoming adversity.

Society has image of *shōgi* being too complicated and hard, however once you learn the rules you will find this is not the case and it is in fact a game of great freedom. We invite all of you out there to come join us and try *shōgi* for yourself.



Personal Growth through Overseas Study

Each year students from Kagoshima University study at one of the many universities around the world that have exchange agreements with us. Seven students, who have just returned from these exchanges, describe their experiences and future ambitions.

Nagashima Kana (Education) – Gangneung-Wonju National University, Korea
Yamamoto Hayato (Law, Economics and Humanities) – Tamkang University, Taiwan
Komori Kenta (Agriculture) – Kasesart University, Thailand
Ushikai Yōsuke (Agriculture) – University of Georgia, USA
Maehara Miki (Law, Economics and Humanities) – Tamkang University, Taiwan
Iwamatsu Ayasa (Law, Economics and Humanities) – University of Munich, Germany
Yamashita Marika (Law, Economics and Humanities) – Linköping University, Sweden (from left to right)



1. Meeting New People & A Change of Values

Students who choose to travel abroad to study will find a new world of people, language, culture and a new way of life waiting for them. When asked about the best part about these experiences some of the students had this to say. Hayato answers, "It allowed me to form a strong tie between myself and Taiwan." Yōsuke replies "I was able to make many great friends." Ayasa says, "I was able to reconfirm my love for Kagoshima and country, but also learnt about international problems involving Japan." Marika seems to have a really positive point of view, "Whether it was a chance to try something new or some problem I had to deal with, I treated each experience as a chance to grow as a person."

2. Showing the World the Best Kagoshima has to Offer

Kagoshima is not known internationally, so when Kagoshima people are asked what they want the rest of the world to know about their home, they answer "volcanoes, hot springs, *shōchū*, the sea, fish and the people." Kenta told people in Thailand about the laid back nature of life in Kagoshima. Kana's Korean friend said that Kagoshima is a relaxing and easy to live in. Kagoshima people hold their hometown very close to their heart. Marika adds that Kagoshima is full of warm, kind-hearted people, many of whom choose to stay in the area when it comes time to find a job. One historical site that is a place of great pride for the Kagoshima people is *Sengan-en*, a villa with beautiful gardens built in 1658 and the adjacent *Shōkoshūseikan* complex that was designated as a World Heritage Site in July 2015. Ayasa believes Kagoshima is the best place in Japan, "but only as long as volcanic ash from the nearby volcano Sakurajima isn't falling on us!"

3. Showing International Students How Good Kagoshima Is

A distinct feature of Kagoshima University is the variety of student clubs it has to offer. Kenta believes that it would be a great idea for international students to also join these clubs, giving them a chance to interact with Japanese students and practice their Japanese language skills. Miki and others agree that there has always been

a real concern that there are not enough interactions between Japanese and international students.

To address this problem, Kenta has joined an international exchange club at the university that, together with similar clubs from other universities in the city, has begun to hold events involving foreign students and local students to expand international relations throughout Kagoshima. Yōsuke, after returning home, connected those American students who were interested in Kagoshima and its culture with students from Kagoshima University, so that they could both broaden their international horizons. International exchange at the university can continue in many forms, such as the plan to for international dormitories where foreign and Japanese students can live together and classes taught in English, which all serve as great paths toward improved study and international outlook.

4. Next Step: Improving Yourself & Introducing Kagoshima to the World

When asked about their next step in life: Marika would like to get to know many different people outside of her major studies, in order to expand her knowledge. Ayasa plans to carry on with German language studies, with the goal of becoming an interpreter. Miki has decided to study in China again and focus on studying Chinese and English. Kana hopes to contribute to the improvement of Japan-South Korea relations by showing the Japanese people the beauty of Korean culture. Hayato plans to continue Taiwanese and Chinese studies and would like to work in human relations. Yōsuke, starting with Georgia, wants to share Kagoshima with the world. Finally, Kenta plans to continue onto postgraduate studies and wishes to deepen ties between Japanese and international students, while working on ways to make Kagoshima known internationally.

All of them have returned home more mature and with a new outlook and it is exciting to see them all so passionate about international exchange and telling the world about Kagoshima. Students who have studied abroad will no doubt have a big part to play in the internationalisation of the university and the local area. Likewise, foreign students in Kagoshima will contribute to increased global activity and positive change.



Special Course in International Food and Resource Sciences

The Special Course in International Food and Resource Sciences was founded in April 2015 in cooperation between Faculty of Agriculture and Faculty of Fisheries. The inaugural class in the academic year of 2015 accepted twenty one students.



1. Objectives

This course is designed to provide students with the opportunity to gain knowledge about and contribute to the global community and industry, and to explore the field of sustainable agricultural and fishery production and rational utilisation of food resources. Currently, we are focusing on South-East Asia, the South Pacific and Africa.

2. Contents of education

- 1) Students will acquire professional knowledge on international food security issues and develop themselves through general education.
- 2) Students will obtain high proficiency in English and an understanding of different cultures, both of which are important for human resources involved in global food security issues.
- 3) Students will attain high level comprehension skills to contribute to the society and an enriched thinking ability, both of which are necessary for understanding and solving global food security problems.
- 4) Students of agriculture-based and fisheries-based sub-courses will study together and achieve comprehensive and multifaceted perspectives.

3. Features

- 1) We nurture the students in an international environment where Japanese and foreign students can interact with one another. This environment helps the students to acquire a universal way of thinking.
- 2) We provide various English subjects in order to develop an excellent English communication ability. In addition to classes conducted in Japan, we send students abroad for training programmes and give them opportunities to attend lectures together with the local students at the partner universities abroad. These are good opportunities for the students to further improve their English abilities.
- 3) We give opportunities to the students to do on-the-job training or conduct research overseas which will allow

them to improve their professional knowledge and cultivate an international perspective in their field.

- 4) We aid students in finding employment opportunities at relevant organizations or companies by providing internships or similar programmes at international organizations and global companies.

CAREER OPPORTUNITIES

International Public Service

- International civil servant
- International cooperation projects
- Japan Overseas Cooperation Volunteers (JOCV)
- Civil servant in the food sector

Global Business Companies

- Food trades
- General trades
- Global food processing
- Foreign-owned food processing
- Consultancy firms

4. Programme for foreign students

The Special Course in International Food and Resource Sciences will accept foreign students from coastal countries in Southeast Asia, where food security may become a larger problem in the future. The objective of the programme is to provide students with the necessary knowledge needed to stabilize food production and supply in the target region. This programme will be implemented through the cooperation between the Faculty of Agriculture and the Faculty of Fisheries, and seeks to educate students. Some major courses will be conducted in English for foreign students who lack Japanese language ability. It is expected that this programme will help Japanese students and foreign students alike improve their international awareness and English language ability. Such benefits will work in tandem to provide a very well-rounded experience.

Supporting developing countries that face hunger and primary

industry problems and improving global food security will lead to a stable food supply for our own country, Japan. Our target Southeast Asian countries are located in the tropics, one of the regions that are seriously affected by climate change. There are continuous devastating natural disasters in coastal areas, which seriously test the resilience of coastal systems. In fact, there is a high possibility that due to the effects of climate change these natural disasters will become increasingly dangerous. A catastrophic flood in Thailand in 2011, that submerged 300,000 hectares of farmlands and many factories, including those owned by Japanese companies, caused enormous economic damage.

These are extremely important and urgent issues, and the global community needs to work together to tackle these challenges. Thus it is necessary to develop professionals who can deal with these types of problems. Japan, as a member of the global community, is sharing these problems and is expected to develop human resources with advanced skills. The education of foreign students will contribute to the resolution of some of these food security problems and will also accelerate the international expansion of Japanese industries.

Kagoshima University is one of two universities in Japan that has both Agriculture and Fisheries Faculties, and this programme is established as a collaboration between the two. This allows the programme's students to learn about the issues related to food security from the perspective of both agricultural and fisheries sciences. This programme expects that foreign and Japanese graduates will eventually work together in order to solve global food security problems, making the best use of the knowledge that they have acquired and the experiences of their collaborative learning.

The students we seek in this programme are those who can contribute to international development. This corresponds to one of the educational goals of Kagoshima University: "Fostering a global perspective and developing the practical skills students need to contribute to the international community." The university has ties with many global companies throughout Kyushu (Southern Japan) giving opportunities for foreign students to work in Japan after graduation. Moreover, as Japanese companies expand throughout Southeast Asian countries, the graduates returning to their own countries may have the chance to become important executives in those companies, especially in those

related to agriculture and fisheries industries. We plan to provide students with many international experiences, such as major-related classes conducted by faculty members of different nationalities, overseas training programmes, internships, and graduation projects, in order to facilitate their career development in the international arena. Furthermore, by utilizing resources at our Tokyo Liaison Office of Kagoshima University, the North American Centre of Kagoshima University in California, USA, and the network with partner universities and Japan International Cooperation Agency (JICA), we will provide employment guidance and counselling for further career development.

This programme is also designed to promote graduate studies, possibly leading to future employment at universities as teaching staff or researchers, improving their educational quality and providing global awareness.

Total number of students for the Special Course: 22

Agriculture-based sub-course: 12
+
Fisheries-based sub course: 10

Acquire advanced expertise in sustainable food production and the knowledge to solve global food security problems through the regional cooperation and collaboration within the international community

- Elements of Agricultural Science
- Elements of Fisheries Science
- Agricultural Production Science
- Fisheries Production Science
- Overseas training
- Internship
- Participation in overseas joint research
- Foreign language training

Global human resources who can participate internationally in solving food and resource problems

Nobel Prize Winner Akasaki Isamu Receives an Honorary PhD from Kagoshima University

On 26th June, Kagoshima University conveyed an honorary PhD to last year's Nobel Prize in Physics recipient, longtime Meiji University professor and graduate of the precursor to Kagoshima University, Akasaki Isamu.

During the ceremony, president Maeda Yoshizane honoured Professor Akasaki for his research and academic achievements. After which, Professor Akasaki expressed his gratitude and then gave a very interesting speech about his drive to do something that no-one else had ever done which led to his Nobel Prize win, and the importance of universities and research.



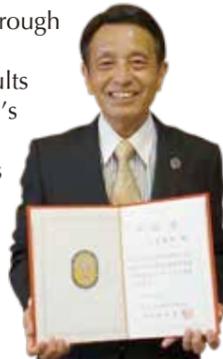
Professor Akasaki receiving his honorary PhD from President Maeda

Professor Komiya Setsurō Receives an Academic Achievement Award from the Japanese Orthopaedic Association

On 20th May at the 88th Annual Meeting of the Japanese Orthopaedic Association, Professor Komiya Setsurō was selected out of the association's 24,000 members to receive the Academic Achievement Award. This award is for those whose world-class research has contributed greatly to orthopaedic science and the professor is only the second recipient since the award's founding in 2010.

Professor Komiya's research has produced the following valuable results: osteosarcoma, development of new gene therapy for sufferers of cancerous bone tumours; the discovery of a new intracellular signalling substance and its application for cancer therapy and molecular medicine; a

breakthrough in the cause of rheumatoid arthritis, forming the basis of new treatments through biotechnological drugs; treatment for paraplegics using stem cells to regrow severed nerves; a breakthrough in the control of bone formation and growth; and a breakthrough in understanding why people's joints change with age. These research results were published in many of the world's foremost science publications including Nature. Professor Komiya's award not only reflects the excellent academic level of the Faculty of Medicine but also that of the university as a whole.



Professor Kosai Kenichirō Secures Large Research Grants for Independent Clinical Trials of Cancer Virotherapy.

On 25th May, Graduate School of Medical and Dental Sciences professor, Dr. Kosai Kenichirō (gene therapy & regenerative medicine) secured two large research grants from the Japan Agency for Medical Research and Development (AMED) to be used for research and trials for cancer virotherapy. Dr. Kosai has worked on producing a virus that only targets cancer cells and now plans to move onto group-based independent clinical trials. Molecularly-targeted drugs, which differ from traditional cancer medications in that they focus on

targeting the cellular mechanisms of the cancer, have so far shown great results. Dr. Kosai plans to build on this theory with the Survivin-dependent m-cra gene that his research group developed, in producing a virotherapy medication that safely and effectively destroys cancer cells without the use of gene modification. Using all the results they have gathered up till now, the research group plans to start their independent clinical trials on this progressive cancer treatment during this year.

Discovery of Slow-Moving Low-Frequency Tremors in the Sea of Hyūga

Faculty of Science assistant professor, Yakiwara Hiroshi, has led a joint research group which has discovered and processed new information on underwater earthquakes and shallow subduction interface. The results of which were published in the prestigious scientific journal, Science.

The group, consisting of project researcher Yamashita Yūsuke and Prof. Shimizu Hiroshi from the Institute of Seismology and Volcanology, Faculty of Sciences, Kyūshū University, assistant professor Yakiwara Hiroshi, technical officer Hirano Shūichirō and Prof. Miyamachi Hiroki from Kagoshima University, as well as researchers from Nagasaki University and the University of Tokyo, discovered slow-moving low-frequency tremors which occur at

the shallow subduction plate boundary in the Sea of Hyūga, off eastern Kyūshū. This indicates the possibility that the plate boundary in the vicinity of the Nankai Trough is slipping episodically and slowly (over days or weeks) without inducing a strong seismic wave. After the 2011 Great East Japan Earthquake, a fundamental review of shallow plate boundary interfaces has been required and these new findings provide important insight into slip behavior at the boundaries and will improve understanding and modelling of subduction megathrust earthquakes and tsunamis in the future. See Science (8th May 2015) <http://www.sciencemag.org/content/348/6235/676.full>

Presentation of Relief Funds for the Nepal Earthquake

A ceremony was held on Kagoshima University's Kōrimoto Campus on 28th May for the presentation of relief funds to those in need of help after the large earthquake in Nepal. Executive Vice President, Sumiyoshi Fumio, presented the donation money to Bibeck Ariaru, a Nepalese student studying in the Graduate School of Medical and Dental Sciences and his countryman, Mans Bohara.



Presentation of donations to the Nepalese students

Mini-Symposium on Fisheries Higher Education and International Linkages

In April, the Faculty of Fisheries, in cooperation with four South-East Asian fisheries universities, established a new international cooperation programme-based postgraduate course which provided the topic for a special presentation during the 2nd International Symposium on Aquaculture and Fisheries Education, held in Shanghai on 24th April 2015 entitled "Mini-Symposium on Fisheries Higher Education and International Linkages (Postgraduate Programme on Tropical Fisheries and International Linkages)". The symposium included representatives from a total of 14 institutions from

China, Taiwan, Indonesia, Cambodia, Malaysia, Philippines and Thailand, and Kagoshima University, Faculty of Fisheries' dean Matsuoka Tatsurō was a keynote speaker. The symposium included discussion on tropical fish industries, quality standards, the need for more flexibility in higher education systems, the quality of education required for the future global standard, and proper financial support for overseas students. The results of this symposium will now serve to improve and further develop the new postgraduate course.

Academic Exchange Agreements

- January 2015 — Agreement formed between Chung-Ang University Hospital, (Seoul, Korea) and Kagoshima University Hospital.
- February 2015 – Start of a student exchange memorandum with Mokpo National University, (Korea)
- March 2015 — Renewal of agreement with National Institute of Technology Karnataka, (Surathkal, India)