



The Defense Industry Takes Off

NSC's Science Park Makes Successful Recruiting Trip to US

A defense industry delegation organized by the NSC's Hsinchu Science Park recently completed a very successful investment recruiting trip to Washington D.C. As a result of this trip, such prominent firms as Lockheed Martin, General Dynamics, and ITT have promised to further assess establishing plants in Taiwan to take advantage of Taiwan's interest in military purchases. In addition, the NSC's Science Park Administration, the US-Taiwan Business Council, and the National Defense Industrial Association of Sino plan to establish a framework for US-Taiwan defense industry cooperation, promote technological cooperation between defense firms in the US and Taiwan, and encourage US defense firms to invest at Taiwan's Hsinchu Science Park.

The NSC's Science Park Administration stated that the recent defense industry recruiting delegation consisted of six persons and was led by NSC Deputy Minister Chi Gou-chung; the delegation spent May 2 ~ 8 in Washington D.C. publicizing Taiwan's plan to create a defense industry zone at the Tungluo Science Park and vigorously recruiting potential investors. The delegation also took part in a recruiting meeting held by the US-Taiwan Business Council. Over 100 persons participated in this event, including personnel from the US Congress, Department of Defense, academic research organizations, defense firms, and the media.

To boost US-Taiwan defense technology cooperation, the recruiting delegation met with a number of important Department of Defense officials, including upper management from DARPA, the Department of Defense

Research and Engineering (DDR&E) office, and the Foreign Comparative Testing Office. The delegation also visited major defense contractors, including Lockheed Martin, ITT, General Dynamics, and Booz Allen Hamilton. These contacts will strengthen future US-Taiwan defense industry technology cooperation and attract more US defense firms to invest in Taiwanese plants.

While America's leading defense manufacturers are extremely interested in capturing a share of Taiwan's defense purchases – worth approximately NT\$610.8 billion (roughly US\$20 billion) – Taiwan's Ministry of National Defense (MND) has instituted a new regulation specifying that all procurement cases exceeding NT\$50 million (roughly US\$1.6 million) must be awarded to domestic manufacturers as preference. This measure will encourage foreign manufacturers interested in MND procurement cases to establish their own plants in Taiwan. As an example of US interest, Lockheed Martin, which would like to sell its F-16 aircraft to the MND, repeatedly asked members of the delegation to find out more details concerning the MND's regulation.

The idea of sending a defense in-

dustry recruiting delegation to the US was inspired by the president of the US-Taiwan Business Council, Mr. Rupert Hammond-Chambers, who invited Deputy Minister Chi and Science Park Administration Director General James Lee to attend the US-Taiwan Business Council's recruiting meeting in the US. Personnel from the MND and major defense firms also joined the delegation.

Furthermore, the US Department of Defense's Foreign Comparative Testing (FCT) Office has completed an assessment report on Taiwan's high-tech military products following an FCT delegation visit to Taiwan on March 7 and April 25 of this year. In its search for high-tech products to participate in the Department of Defense's FCT program, the FCT selected seven products by six domestic manufacturers for comparative testing and pre-purchase certification. Four of the products selected are made by three companies in the Science Park. This shows that Taiwan's high-tech products have found favor with agencies of the US Department of Defense, and bodes well for further strengthening of US-Taiwan defense technology interchange and cooperative R&D.



The First Time in 28 Years

2005 Indo-Pacific Fish Conference Held in Taiwan for the First Time

Held once every four years, the five-day Indo-Pacific Fish Conference (IPFC) was held for the first time in Taiwan starting on May 16, 2005. According to Dr. Shao Kwang-tsao, Acting Director of the Research Center for Biodiversity, Academia Sinica (RCBAS), this year's IPFC was the largest yet in the 28 years that the event has been held. Participants included directors or chairmen of ichthyology associations in Europe, the Americas, and Japan, the directors of ichthyology departments at major museums, and many textbook authors and leading authorities on related subjects. The participants publicized many ichthyological discoveries and scientific progress made over the past four years.

The conference was jointly hosted by RCBAS and the Ichthyological Society of Taiwan; the NSC and National Museum of Marine Biology and Aquarium played supporting roles. Taiwanese researchers and scientists gave a summary report on the status of Taiwan's fish, and announced many world-class scientific findings. These included reports on highly endangered and confirmed extinct fish species, discoveries of new species, the smallest fish in the Greater China Area, and Taiwan's world-leading deep sea fish culture technology. After the conference, scientists Richard Pyle, Brian Greene, and John Earle conducted the first-ever survey of deep-sea coral reef fish in Taiwan.

Taiwan's ichthyologists used the conference to report their discovery of a number of unique species. For example, the alien-like species *Haliutopsis bathyresos* was discovered in Taiwan's waters. This new species – a member of the Ogcocephalidae – was found by the research vessel Ocean Researcher 1 southwest of Taiwan at a depth of 1,000 meters in 2004. According to graduate student Ho Hsuan-ching, the fish's discoverer and a stu-

dent of Dr. Shao, this species brings the number of members of the Ogcocephalidae to ten. And while it is thought that the Ogcocephalidae should live near the sandy or muddy bottom of the deep sea, their way of life is still a mystery. In addition, Dr. Chen I-shiung, an associate professor of the Institute of Marine Biology, National Taiwan Ocean University, announced the discovery of a *Pandaka* species only 1.1 cm in length. This new species is a member of the Gobiidae caught by Dr. Chen at the surface of the sea near the island of Hainan. After a long period of verification, it has recently been confirmed that this is the smallest fish in the Greater China Area.

After the conclusion of the conference on May 21, Dr. Shao accompanied Richard Pyle's team to Green Island to conduct their deep-sea coral reef fish survey. Dr. Shao later indicated at a press conference that this team consisted of specialists in coral reef fish classification and ecology, and had expert knowledge on the geological distribution of various fish. Equipped with SCUBA gear, the team dove to coral reefs at depths of 85 meters and sighted many rare fish unseen at shallow reefs, including the *Hoplolatilus cuniculus*, *H. marcosi*, and *H. purpureus* – three newly recorded species in Taiwan. The team also observed the newly recorded species *Pseudanthias englehardi*, and the previously recorded *P. bicolor*, *P. fasciatus*, and *P. cooperi*. Of the Pomacentridae, the team sighted two new species *Chromis* spp., and two newly recorded species *C. delta* and *C. leucura*. Other newly recorded species include the *Scarus tricolor*, *Plectranthias winniensis*, and the *Neosynchiropus ijimai*; new species include the *Cirrhitlabrus* sp., *Ptereleotris* sp., and *Xyricitys* sp. Even at depths below 50 meters, the team sighted fish rarely seen in



shallow waters, including the *Genicanthus watanabei*, *G. semifasciatus*, *Centropyge ferrugatus*, *Apolemichthys trimaculatus*, *Holacantus venustus*, and fish in the *Xanthichthys* genus.

While the island of Taiwan is not even 2.5 ten-thousandths of the world's total land area, fish surveys have recorded 2,775 species – or one-tenth of the world's total number of fish species. Taiwan's fish biodiversity is 400 times greater than the average value for other countries! Thanks to Taiwan's optimal geographical location, it possesses the following four ichthyological advantages: it is adjacent to the East Indian Archipelago, which boasts the world's richest marine ecology; it has complex marine topography; it possesses extremely diverse coastal substratum types and habitats; and it is close to the confluence of the Kuroshio Current, the China Coastal Current, and the South China Sea Current, which causes different north-south water temperature gradients at different seasons. These geographic attributes give Taiwan its enviable fish diversity. While the strong sea currents prevented Pyle and his teammates from reaching beyond depths of 85 meters on their deep-sea survey, the team was still able to collect over 20 different species from nine families of fish. This difficult feat attests to the richness of Taiwan's fish diversity.

Finally, Dr. Shao noted that although Taiwan possesses impressive fish biodiversity, the threats of overfishing,

habitat destruction, pollution, invasive species, and inappropriate ecotourism have caused the numbers of many species to plummet. Of Taiwan's 78 endemic fish species, six have disappeared during the past 30 years, and may already be extinct. Furthermore, another nine species – including Tai-

wan's national treasure Formosan Landlocked Salmon (*Oncorhynchus masou formosanus* (Jordan et Oshima)) – are on the brink of extinction and urgently require protection. After seeing the pristine waters around Green Island, Pyle and his teammates urged Taiwan to establish marine protected

areas (MPAs) and appealed against the practice of capturing coral reef fish for food. The team also suggested that if Taiwan created a coral reef protected area that allows the public to enjoy their beauty, the effort would help promote the establishment of MPAs in the future.

Happy Anniversary!

Commercial Operation of FORMOSAT-2 Satellite to Earn NT\$2 Billion over Five Years

Launched on May 20, 2004 US time, the FORMOSAT-2 has already passed its first anniversary in space. The National Space Organization (NSPO) of the National Applied Research Laboratories held a press conference on May 20 to celebrate the first full year of FORMOSAT-2 in space. According to Dr. Lance Wu, director general of the NSPO, images of the earth from the FORMOSAT-2 have been on sale since this May, and customers in Europe, the American, Asia, and the Middle East have expressed interest. While sales have just started, it is estimated that the images will generate NT\$80 million this year, up to NT\$200 million next year, and a total of NT\$2 billion over the next five years. This projection will far exceed the estimate of NT\$1.5 billion made at the time of launch.

The FORMOSAT-2, which has a resolution of two meters, possesses the feature of daily revisit to the same latitude and longitude, has made over 5,100 orbits of the earth, and has already imaged approximately 27 million square kilometers – equivalent to 750 times the area of Taiwan. The imaging work has made many contributions to academic study, humanitarian aid, technology diplomacy, and scientific discovery, according to Dr. Wu. Several major achievements of FORMOSAT-2 during the past year include assistance to the Southern Asia tsunami relief effort, the photography of red sprites on July 4, 2004, and the photography of blue jets on March 22

of this year. It is worth to mention that blue jets had only been previously photographed from the ground twice, the first photographs of blue jets from space by FORMOSAT-2 may give a substantial boost to efforts to crack the mystery of this rare form of high-altitude lightning.

The FORMOSAT-2, which cost NT\$4.6 billion to develop, underwent nine months of testing and adjustment after launch. The FORMOSAT-2 has begun commercial operation now after it passed the testing stage, and images are being sold internationally. Because the satellite was designed specifically to meet Taiwan's needs, images are sold to domestic units for prices that are much lower than those images sold on the international market. Domestic units pay only around NT\$20 for each square kilometer of the FORMOSAT-2's low level images, and this price is less than one-tenth of foreign retail prices. For better marketing, "Image distribution center" contracts have been signed with five domestic universities and one business unit thus far in order to form the domestic marketing network.

The NSPO only sells images to foreign customers with an average price of NT\$230 per square kilometer. This price is 40% ~ 60% lower than those of better-resolution US Quick Bird images, but 10% ~ 20% more expensive than those of the slightly-coarse resolution French SPOT 5 images. The FORMOSAT-2's images are thus highly competitive on the international market. SpotImage of France has signed



an exclusive contract as international distributor, and has established a receiving station in the arctic. The Kiruna receiving station in Sweden formally came on line on May 1. In the future, apart from downloading image data in Taiwan, the FORMOSAT-2 will also be able to download data to the Kiruna receiving station, greatly enhancing its global operating capability.

Taiwan's Second Phase Space Program began in 2004. Encouraged by the FORMOSAT-2's outstanding performance, the NSPO is in the midst of assembling and testing the six FORMOSAT-3 micro-satellites. This work is expected to be completed by the end of the year. After launch, the six micro-satellites will help the weather bureau track typhoons with better accuracy, allowing earlier warnings and bringing real benefit to the public. The NSPO has been inspired by the FORMOSAT-2's success and is currently formulating another forward-looking satellite program. The NSPO is aiming to become a top-notch R&D organization, making Taiwan one of the space technology leaders in Asia and a prominent member in the world space community.

Unraveling the Mystery of Drug Allergies

Discovery of Genetic Marker of Severe Allergic Reaction to Allopurinol

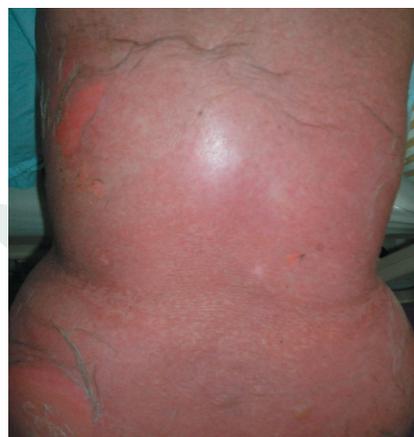
The anti-gout drug allopurinol is widely used by doctors. While it can effectively reduce blood uric acid concentration and lessen the occurrence of gout, it can also cause severe allergic reactions in some patients. These allergic reactions are characterized by skin rash, blisters, necrosis, and ulcers of the mucous membranes of the eyes and lips, and can even cause acute kidney or liver injury or failure in the worst cases. Common long-term consequences are deterioration of eyesight or even blindness. It is unfortunately not yet possible to predict which patients will suffer an allergic reaction to allopurinol.

Researchers at the Academia Sinica Institute of Biomedical Sciences, Chang Gung Hospital, and other major medical centers have been jointly using the pharmacogenomics concept to explore the pathogenic mechanism of severe drug allergies. This project, which has been funded by the NSC via the National Research Program for Genomic Medicine and by Academia Sinica Integrated Program for Genomics and Proteomics, has followed up on its 2004 success in finding a genetic marker for allergic reaction to Carbamazepine – which may induce an often-fatal allergic reaction (known as Stevens-Johnson syndrome or SJS) in Chinese – by discovering a genetic marker for severe allergic reaction to the anti-gout drug allopurinol this year.

According to Chen Yuan-tsong, head of the research team and director of the Academia Sinica Institute of Biomedical Sciences, the concept of phar-

macogenomics seeks to understand the relationship between genetics and how human beings react to drugs. If genomics research could predict which drugs an individual should take to get the best effect, or which drugs are likely to cause an adverse reaction, then doctors would be able to prescribe drugs with unprecedented precision and avoid the risk of drug allergies. While European and American research units and major pharmaceutical companies have been studying the genetic basis of drug allergies for many years, significant results have been slow in coming. The main problem is that drugs may induce many types of adverse reactions, and there is a vast number of genetic variations between individuals. As a result, finding correlated sequences among the three billion base pairs of the human genome to a specific adverse drug reaction takes exceptional coordinated efforts and insight.

The team led by Chen Yuan-tsong has used genomics techniques to study 51 patients who had previously experienced severe allergic reactions to allopurinol. This study also had a control group consisting of 135 patients who had taken allopurinol without any adverse effects. The participants in the study donated a small number of blood specimens, which were used to determine the patients' genotypes and gene frequencies. It was discovered that while the 51 patients who had suffered severe reactions to allopurinol all had human leukocyte antigen genotype HLA-B*5801, only around



The anti-gout drug allopurinol induced the toxic epidermal necrolysis, causing skin rash, blisters, and peeling all over the patient's body. The symptoms of this condition resemble those of a large-area burn, and the death rate can be as high as 30 ~ 50%.

15% those who experienced no reaction had this genotype.

HLA is a polymorphic gene located on the sixth chromosome and producing human leukocyte antigen. Its main physiological function is to recognize antigens in conjunction with immune cells to fight for infection. Over 500 different HLA-B genetic sequences have been found globally, and more than 40 genotypes are common in Taiwan. The research team discovered that the presence of the HLA-B*5801 genotype increases the risk of a severe allergic reaction to allopurinol 500-fold. If genotype testing can be performed before prescribing allopurinol, and persons found to possess the HLA-B*5801 genotype avoid taking allopurinol, then cases adverse reaction to allopurinol can be dramatically reduced.

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