

NTU



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President Lee visits HK, Macau

NTU Computer Scientists becomes IEEE Fellows

Int'l Recognition of NTU Scientific Contribution

NTU Promotes E-Learning

Special Report
Fast Growing Academic Exchange



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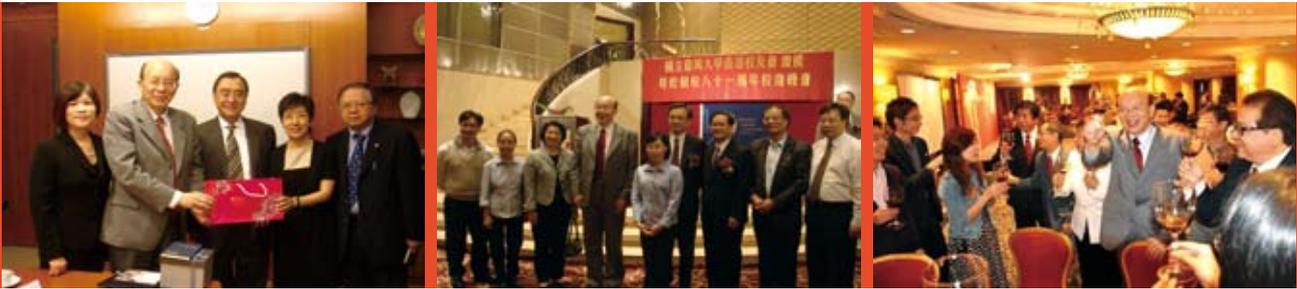
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NTU President Lee Visits Partner Universities in Hong Kong and Macau to Promote Cooperation



1. Group photo at the University of Hong Kong: (from left to right) NTU Dean of International Affairs Tung Shen, NTU President Si-chen Lee, HKU Acting President Richard Yue Chim Wong, HKU Office of International Student Exchange Programme Director Katherine Wan 2. President Si-chen Lee attends a gathering of the NTU Alumni Association (Hong Kong). 3. President Si-chen Lee raises his glass to members of the NTU Alumni Association (Macau).

In late 2009, NTU President Si-chen Lee led a delegation of NTU officials to Hong Kong and Macau with the aim of strengthening bilateral cooperation in higher education between Taiwan and these special administrative regions of China. Dean of Research and Development Ji-wang Chern and Dean of International Affairs Tung Shen accompanied President Lee in visits to the University of Hong Kong (HKU), Chinese University of Hong Kong (CUHK) and the University of Macau (UM).

NTU signed a cooperation agreement with HKU in March 1995, making it NTU's earliest partner university in these two regions. NTU next signed a student exchange agreement with CUHK in July 1995. NTU, CUHK and Peking University host in rotation a triennial sports competition. In meetings with officials from HKU and CUHK, President Lee exchanged views and held substantive discussions on directions for further cooperation.

At HKU, all classes are taught in English, while CUHK offers courses in Chinese and English. At both universities, a large majority of the faculty members are foreign scholars, so these institutions are highly internationalized.

President Lee was deeply impressed by CUHK's unique college system, which fosters closer communication and exchanges between students and faculty and stresses care for the students. Stressing life education and whole-person education, this system encourages the students to be thoughtful and well-rounded. President Lee wishes to implement this sort of system for new students at NTU.

HKU and CUHK emphasize cutting-edge research, as well. CUHK's former President Charles K. Kao was

awarded the Nobel Prize in Physics in 2009, an honor of intense pride to the university. Both universities strive to recruit world renowned international scholars to their faculties. They eagerly wish to expand the scope of their research cooperation with NTU. Areas of future collaboration may include medicine, biodiversity, agriculture and Chinese studies.

NTU and the University of Macau signed their first cooperation agreement in 2009. As Macau is the only part of the Greater China region not to have a university ranked among the world's top 100, UM Rector Wei Zhao expressed his university's intent to follow NTU's example and cooperate closely with NTU. Rector Zhao asked numerous probing questions during his discussions with President Lee. Specifically, he asked how NTU has succeeded in achieving so many outstanding research results and entering the ranks of the world's top 100 universities when faced with the challenge of only being able to offer lower salaries than elsewhere. Rector Zhao said NTU's success filled him with hope when he thought of UM's prospects.

President Si-chen Lee and University of Macau Rector Wei Zhao pose for a photo during their meeting.





Five NTU College of Electrical Engineering and Computer Science Professors Named IEEE Fellows in 2010

(from top to bottom) Prof. Powen Hsu, Prof. Ruey-beei Wu, Prof. Ching-fuh Lin, Prof. Shen-luan Liu and Prof. Wanjiun Liao



NTU proudly announces that five professors from the College of Electrical Engineering and Computer Science were named fellows of the Institute of Electrical and Electronics Engineers in November 2010. This is the highest number of NTU faculty awarded IEEE fellowships in a single year. A total of 12 Taiwan scholars became IEEE fellows in 2010. The College of Electrical Engineering and Computer Science now boasts 29 IEEE fellows, the highest number of any university in Taiwan.

Prof. Powen Hsu works in the Department of Electrical Engineering, Graduate Institute of Communication Engineering and Graduate Institute of Photonics and Optoelectronics. His research mainly concerns developing slot antennas. Prof. Hsu's latest research innovation on slot antennas is crucial in the design of handheld wireless telecommunication devices. He was elevated to IEEE fellow "for leadership in electrical engineering education."

Prof. Ruey-beei Wu is a professor in the Department of Electrical Engineering and Graduate Institute of Communication Engineering. He has made numerous outstanding research breakthroughs in computational electromagnetics, transmission line and waveguide discontinuities, microwave and millimeter wave planar circuits, and interconnection modeling for computer packaging. Prof. Wu was awarded his IEEE fellowship "for contributions to coplanar waveguide passive components." He was the first researcher to develop a complete analysis model for transforming coplanar waveguide structures into equivalent electrical circuits.

Prof. Ching-fuh Lin teaches and conducts research in the Graduate Institute of Photonics and

Optoelectronics, Graduate Institute of Electronics Engineering and Department of Electrical Engineering. He has made outstanding contributions in optoelectronics, and he leads research teams in several fields including ultrafast phenomena and carrier dynamics in semiconductor lasers/amplifiers, broadband semiconductor lasers/amplifiers for optical communication, silicon-based light-emitting devices and nano-structures for optoelectronics. IEEE awarded him a fellowship "for contributions to broadband semiconductor optical devices."

Prof. Shen-luan Liu is a professor in the Department of Electrical Engineering and Graduate Institute of Electronics Engineering. His research interests are analog and digital integrated circuits and systems. Prof. Liu heads research groups who have made technological breakthroughs in phase-locked and delay-locked loop circuits. He is regarded as a world-leading scholar for breakthroughs in 96 GHz CMOS (complementary metal-oxide-semiconductor) phase-locked loop circuits, 140 GHz CMOS frequency dividers and 40GHz CMOS delay-locked loop circuits. Prof. Liu won his IEEE fellowship "for contributions to high-speed phase-locked and delay-locked loop circuit design."

Prof. Wanjiun Liao of the Department of Electrical Engineering, Graduate Institute of Communication Engineering and Graduate Institute of Networking and Multimedia undertakes innovative research in multimedia networking, mobile multimedia computing, wireless Internet and streaming video protocols. She was named an IEEE fellow "for contributions to communication protocols in multimedia networking."



NTU's Contribution to Taiwan Academic Institutional Repository Ranks 23rd Globally for Data Volume

University library procurements of academic journals have declined in recent years due to the rising prices of these publications; at the same time, the increased versatility of the Internet has catalyzed the concept and realization of open access.

Addressing these challenges and grasping these opportunities, the ROC Ministry of Education commissioned the NTU Library to establish the Taiwan Academic Institutional Repository as an Internet portal to provide access to documents related to scholarly achievements in Taiwan. The guiding principle is to share construction responsibilities and integrate search and browsing applications in constructing the portal. Under this principle, each academic institution establishes its own institutional repository system, while the Taiwan Academic Institutional Repository serves as an integrated national archive system for accumulating, displaying, sharing and using metadata related to all scholarly achievements in Taiwan. The repository permits users to enter the archive system of each institution and access its full-text data by clicking the link for each metadata item.

Following the Taiwan Academic Institutional Repository's system of sharing compilation responsibilities, the NTU Library is compiling scholarly materials, such as research reports, academic journal articles, conference papers, on-line PDF documents and on-campus publications produced by the university's faculty and students. Thus far, the NTU library has amassed over 138,000 individual documents from NTU, among which more than 44,000 are complete documents. This hefty data bank ranks 23rd among institutional repositories at universities in the world and first in Taiwan.

Regarding integration efforts, as of December 2009 the Taiwan Academic Institutional Repository has arranged the participation of nearly 100 universities and

academic institutions around Taiwan. These institutions have supplied the repository with over 500,000 documents, of which almost 150,000 are complete documents. This is an amazing accomplishment-- a treasure trove of research resources for Taiwan's academic community.

Looking to the future, the repository is working to lay the foundation for the long-term operation of the archival system. Moreover, the participation and support



President Si-chen Lee and University of Macau Rector Wei Zhao pose for a photo during their meeting.

of more local institutions will be encouraged in order to extend the scope and impact of the system.

As the Taiwan Academic Institutional Repository is still under development, some of its applications are not yet ready. Furthermore, the quality of the archive's metadata varies according to the partner institution. Consequently, the repository has not yet allowed public search engines to access and index the information archived on the portal.

The repository's development team is working to enhance lateral communication among team members and partner institutions. It will also provide system manuals to assist each institution in improving the quality and accessibility of its metadata.



College of Management Wins Eduniversal Five Palmes Award for 2009



The NTU College of Management earned a ranking on a par with the 100 best schools in the Eduniversal ranking of the world's 1,000 leading business schools for 2009. The college claimed the highest Eduniversal award, the Five Palmes Award, which acknowledges institutions "with major international influence."

Highly regarded in Europe, the organization follows a rigorous selection system that renders an institution's "recommendation rate"

based on a survey of the deans of the schools targeted in the ranking. The NTU College of Management garnered an 186% recommendation rate in the 2009 survey, placing it at the top in Taiwan and on a par the 100 best worldwide.

Also in 2009, the college placed 40th in the Financial Times' global ranking of Executive Master of Business Administration programs.

The College of Management is a member of the Association of

Asia Pacific Business Schools, in which it participates actively as part of its effort to foster constructive cooperation relationships with other schools in the Asia Pacific region.

The college presently carries out academic exchanges with and receives exchange students from 66 institutions in 19 countries. Over 150 of its students study at partner universities every year. The college also offers up to 119 courses taught in English each semester.

Animal Cancer Center and Animal Cancer Treatment Center Open on January 14

NTU on January 14 marked a major step in the improvement of animal cancer care and the research of animal oncology, fields that might provide insight into human cancers. On that day, the university inaugurated the Animal Cancer Center, while the NTU Veterinary Hospital opened its new Animal Cancer Treatment Center, which is equipped with a 16-slice CT scanner.

The first of its kind in Taiwan and Asia, the Animal Cancer Center is an integrated research center that



NTU Veterinary Hospital officials open the Animal Cancer Treatment Center with an unveiling ceremony.

brings together resources related to clinical veterinary medicine and basic veterinary medicine research related to cancer from throughout the NTU system.

The genetic makeups of dogs

and cats show an even higher degree of similarity to the genetic makeup of humans than does that of mice. Moreover, dogs and cats are exposed to nearly the same environmental conditions and dangers as humans are. Consequently, there are some similarities between carcinogenesis in these popular pets and in humans, so models based on these animals might be of value for research into human oncology.

The Animal Cancer Center will undertake wide-ranging research on the disease mechanisms of animal cancers, while at the same time engaging in international cooperation and the promotion of education and practice in these areas in Taiwan.



Student Team's Energy-Saving System Wins Top Excellence Award at Cross-Strait Entrepreneurship Competition in December

An NTU student team won the top Excellence Award at the 2009 Cross-Strait Student Entrepreneurship Invitation Competition at Shanghai Jiao Tong University

A new NTU student invention took the top Excellence Award at the 2009 Cross-Strait Student Entrepreneurship Invitation Competition at Shanghai Jiao Tong University on December 9.



in China on December 9. Aware of the startling growth of the green energy industry, the team won with a product called the I-Sensor Intelligent Power Saving System. The team, consisting of eight students from the robotics research lab of the Graduate Institute of Electrical Engineering, designed its project under the guidance of Prof. Ren-chyuan Luo of the Department of Electrical Engineering and Prof. Ming-huang Chiang of the Department of Business Administration.

The team's system applies the concept of sensor fusion to detect the volume of human presence in a room in order to adjust air-conditioning and lighting systems and thus reduce the electrical output in commercial buildings. Compared to expensive Internet remote control systems on the market today, this energy conservation system is fully automatic and low cost. The team estimates that I-Sensor could cut air-conditioning and lighting costs for enterprises by around 20%, allowing them to recoup the initial cost of the system in about one year. The team has submitted patent applications for this technology in the United States, Taiwan and China.

Six teams from Taiwan were invited to the competition after winning major student entrepreneurship competitions hosted by Tic 100 and Global Tic. NTU's I-Sensor team received its invitation after winning the Excellence in Innovation Award at the 2009 Tic 100 Innovation Competition. Six teams from Shanghai Jiao Tong University reached the finals of the competition.

NTU Student Wan-jung Cheng Wins Taiwan's First Swimming Gold in East Asian Games in December



Miss Wan-jung Cheng, a junior in the Department of Bio-Industry Communication and Development, won the gold medal in the 400-meter individual medley finals at the East Asian Games in Hong Kong on December 10. Posting a stunning time of 4 minutes and 40.21 seconds, she outpaced the other swimmers to break a record that had held firm in the East Asian Games for 16 years as well as a Taiwanese national team record. This gold medal bears particular significance for Taiwan's sporting fans since it marks the first time Taiwan has grabbed a gold medal in swimming at the East Asian Games.

Miss Cheng has won many honors in swimming since she enrolled at NTU. She has won seven gold medals and four silver medals for NTU and broken ten of the General Assembly's records in the two years she has participated in the National Collegiate Sports Meet. Competing in the Asian Swimming Championship Games in Guangzhou, China, recently, she won the gold medal in the 200-meter individual medley, giving Taiwan its first gold medal ever in that event. Through her sterling performances in swimming, Miss Cheng is bearing out the NTU spirit of the pursuit of excellence and proving that scholars can excel in sports as well as academics.

With the support of NTU President Si-chen Lee, the NTU swimming team was upgraded to a prioritized sports team at NTU in 2008. The team's long-term goals are to train athletes to compete in international tournaments, such as the Asian Games and the Olympics, and rewrite Taiwan's national records in swimming.



College of Bioresources and Agriculture Associate Dean Chen Presented with Award by Asian Soil Science Federation



The East and Southeast Asia Federation of Soil Science Societies presented NTU Prof. Zueng-sang Chen with its ESAFS Award at the 9th ESAFS International Conference in Seoul, South Korea, on October 27. Prof. Chen is an associate dean of the College of Bioresources and Agriculture as well as a distinguished professor of the Department of Agricultural Chemistry.

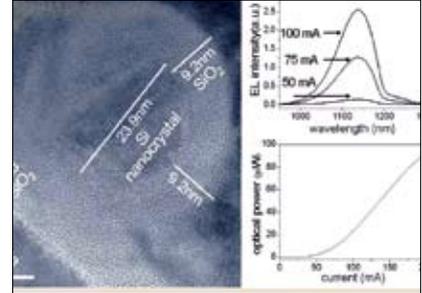
The ESAFS Award is the federation's highest honor. It recognizes those researchers who have made outstanding achievements in the field of soil science and major contributions to the promotion of soil science research and academic exchanges in East and Southeast Asia.

Prof. Chen earned his PhD from the Department of Agricultural Chemistry here at NTU in 1984. His research interests include soil science, soil classification and surveying, soil morphology and genesis, soil pollution remediation and restoration, and soil quality assessment.

NTU Paper on Efficient Silicon LED Breakthrough Published in *Nanotechnology* Journal

An article on the breakthrough creation of efficient silicon heterostructure light-emitting diodes by a research team headed by Prof. Miin-jiang Chen and Prof. Jer-ren Yang of the Department of Materials Science and Engineering appeared in the internationally renowned journal *Nanotechnology* on October 5 (see <http://www.iop.org/EJ/abstract/0957-4484/20/44/445202/>). Moreover, the website nanotechweb.org reported on the NTU paper in its *Journal Highlights* section on December 10 (see <http://nanotechweb.org/cws/article/lab/41209>).

Silicon is an indirect bandgap semiconductor, and therefore has very low luminous efficiency. The research team's breakthrough was based on utilizing silicon nanocrystals to enhance the light



emission efficiency of silicon. The efficient silicon LEDs were created by embedding silicon nanocrystals in a SiO₂ matrix and combining it with an n-type Al-doped ZnO (n-ZnO) layer to improve the external quantum efficiency of silicon in the n-ZnO/SiO₂-silicon nanocrystals-SiO₂/p-silicon LEDs. This technology may be used in developing efficient silicon LEDs for optical interconnections in integrated circuits in the near future.

NTU Spintronics Physicist Ching-ray Chang Named American Physical Society Fellow in 2009

Prof. Ching-ray Chang of the Department of Physics was named a fellow of the American Physical Society in 2009. The society recognized Prof. Chang "for contributions to the theory of magnetism and the development of computational approaches in spin transport, and for leadership in fostering international research and education in Asia." Currently, only around ten Taiwanese physicists have been bestowed with the honor of ASP Fellowships.

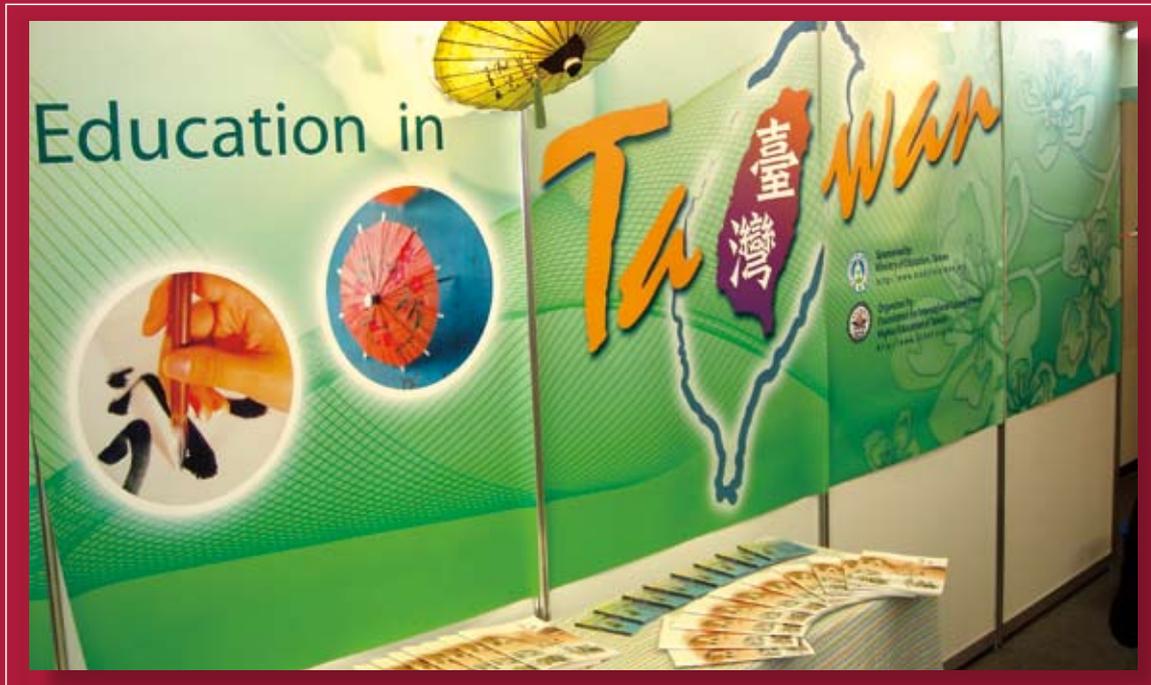
Following his return from graduate school at the University of California, San Diego, in 1988, Prof.

Chang developed an interest in the new field of spintronics. At the time, mainstream high-temperature superconductor research attracted few researchers. However, owing to Prof. Chang's determination, Taiwan is emerging rapidly as an important center for the study of spintronics.

Prof. Chang's current research interests include quantum tunneling of macroscopic magnetization, dynamic reversal of mesoscopic magnets, the mechanism of tunneling magnetoresistance, the mechanism of exchange bias in spin-valves and magnetic recording theory.



NTU Wins Bid to Host 2011 Asia-Pacific Association for International Education Annual Conference



Following two years of preparation, and having formally submitted its bid to host the annual conference of the Asia-Pacific Association for International Education earlier in 2009, NTU succeeded in winning the honor of welcoming the association's 2011 annual conference in December 2009. The event is expected to draw over 1,500 representatives of higher education to Taiwan and the NTU campus.

APAIE stands as the collective symbol for institutions of higher education in Asia and Oceania. Established in 2004, this association works in the spirit of the NAFSA: Association of International Educators in the United States and the European Association for International Education. Its goal is to advance the development of and cooperation between institutions of higher learning in the Asia-Pacific region. Participants in APAIE are international affairs officials and higher education scholars from universities in Asia, Europe and the Americas.

APAIE originated at Korea University under the guidance of that university's Prof. Doo-hee Lee. The other universities that took part in the association's creation were mostly Korea University's partner universities. These included prestigious universities from 13 regions, including Japan, the United States, Australia and China. Taiwan's National Sun Yat-sen University also participated in the establishment of APAIE.

NTU first informed the president of APAIE of its willingness to host the association's annual conference in 2007, and the association followed up with a visit to the NTU campus to gain an understanding of its facilities. In 2009, NTU formally submitted its application to host the conference. Ultimately, NTU stood out from the other applicants during the APAIE board of directors meeting on December 9, 2009, and was named host of the 2011 annual conference.

The 2011 APAIE Annual Conference is scheduled to take place in the spring of 2011. At that time, over 1,500 representatives of institutions of higher learning are expected to be on our campus to attend the conference. This massive influx of international education professionals will boost NTU's international visibility as well as increase the opportunities of Taiwan's institutions of higher education to cooperate and conduct exchanges with international organizations. Moreover, the NTU Office of International Affairs will hold an overseas education fair during the conference to provide students in Taiwan with firsthand information on studying abroad.

The 2011 APAIE Annual Conference will be hosted by Griffith University on the Gold Coast in Queensland, Australia, from April 14-16. Last year's annual conference was held at Renmin University in Beijing, China, in April 2009.



Festive Events Help International and Local Students Share Christmas Spirit in December



Scenes from NTU's 2009 Christmas celebrations for international students

The Christmas season at NTU was a lively one in 2009, ensuring that NTU's international students and their local classmates didn't miss out on the festivities. Brightened with festive decorations, a cozy atmosphere and Christmas carols wafting from the speakers, NTU's Global Lounge was the first place the Christmas spirit could be felt. Cookies and coffee were on offer from December 21-26, making this international space feel like a home away from home for the season.

A more formal celebration was held on the afternoon of December 23. Students from the Global Lounge team, 2nd Student Activity Center and the Office of International Affairs hosted an early Christmas event with about 40 students joining in on the festivities.

Continuing an established tradition, international students in the NTU Foreign Students' Association

celebrated Christmas with a Christmas and New Year's Party. More than 140 international and exchange students participated in the event on December 26, enjoying exchanges of gifts as well as talent show performances including singing, salsa and ballroom dancing. Santa Claus even put in a personal appearance.

These events would not have been possible without help from International Youth Club, International Students Information Service and OIA, but most importantly it was the continued hard work of the university's international student community that made Christmas at NTU such a festive affair. Only through creating traditions and students experiencing and sharing culture with their peers will the university be enriched and a vibrant international community sustained. Thanks to everyone for making this Christmas season special.

NTU Sees Big Rise in Number of Visiting Exchange Students for 2010/2011 Academic Year

NTU's aggressive effort to establish cooperative relationships with universities around the world in recent years has boosted opportunities for both local and overseas students to take part in exchanges. During the 2009/2010 academic year, the university has increased the number of overseas universities with which it enjoys visiting student programs to 16.

In 2010, NTU has added Sweden, Portugal, the Czech Republic and





OIA Using Education Fairs to Boost International Degree-seeking Student Applications in 2010

NTU's Office of International Affairs has received consistently positive feedback of its International Student Enrollment Fair over the years. In order to make it convenient for international students in other parts of Taiwan to gain information about attending NTU, the office took the show on the road and held its first such fair in southern Taiwan at the National Science and Technology Museum in Kaohsiung in late 2009.

The OIA also held an information meeting to explain the application process for international students who wish to enroll in NTU as degree-seeking students at the NTU Global Lounge in December. The office arranged for representatives from each of the university's eleven colleges to set up information booths to introduce their programs and answer questions. Some colleges invited current international students in their programs to speak about their experiences as NTU students at the meeting in order to provide vivid, personalized information and views to those interested in enrolling at NTU.

This year, NTU is using education fairs and information meetings to raise the number of enrollment applications it receives from international students. Depending on their success, the university will continue to hold similar events for the foreseeable future. Specifically, the focus will be on international



students already studying at Chinese language centers in Taiwan.

NTU will accept applications for the fall semester of 2010 until March 15. An online application system has been created for the convenience of applicants. For more information, please visit www.oia.ntu.edu.tw.

Latvia to the list of countries with universities with which it has partnerships. Also this year, NTU has inked cooperation agreements with an additional 30 universities, including the University of Wisconsin–Madison, University of Edinburgh, Osaka University and Xi'an Jiaotong University. NTU now has partnerships with universities in 51 countries. These relationships add to the growing number of channels available to NTU students for entering study abroad programs.

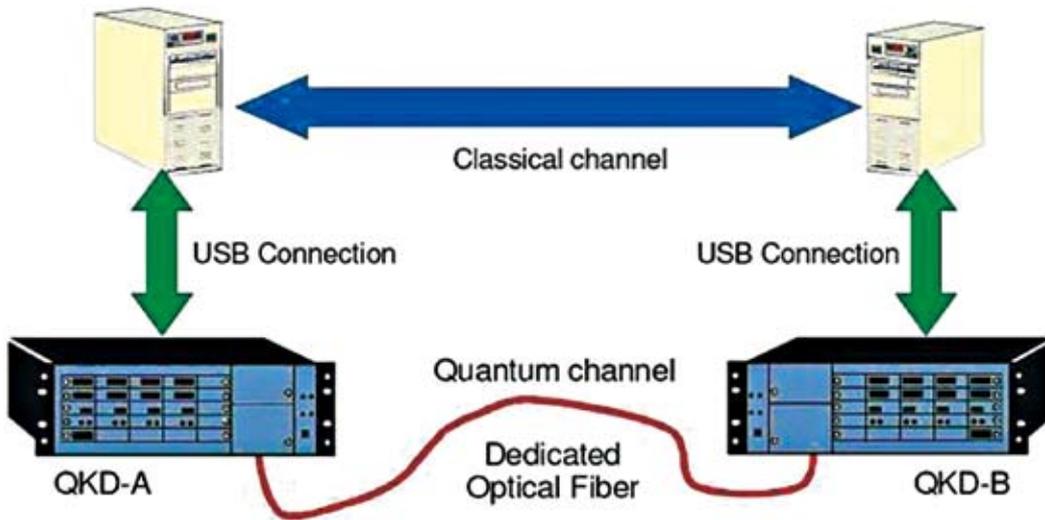
The NTU Office of International Affairs conducted an evaluation of its university-level international exchange student program for the 2010/2011 academic year at the end of 2009. The purpose of this program is to inform and enrich the global views of students as well as to promote international academic and cultural exchanges. Moreover, it is intended to create opportunities for NTU students to interact and study with students from around the world. Thus, NTU

has established relationships with universities throughout Europe, those in Germany and France in particular, where it has partnerships with 27 universities.

As the number of NTU partner universities around the world continues to rise, our contacts with international scholars and students will also increase. These exchanges will stimulate the thinking and broaden the world views of NTU's students and faculty alike.



Center for Quantum Science and Engineering Pursues Secure Quantum Communication and Computation Research



Ⓐ Experiment based on the Clavis QKD system

Communications is an important technology function. With the advent of quantum communication, the properties of quantum mechanics can be utilized to carry out many tasks that would be impossible with classical communication technology.

Quantum cryptography was the first quantum information task to reach the level of mature technology. It is often called Quantum Key Distribution (QKD) because it is used only to produce and distribute a key, not to transmit the encrypted messages. QKD enables two parties to generate a shared random bit string, i.e., a key, known only to them. The key can then be used with any chosen encryption algorithm to encrypt and decrypt a message. If the one-time pad is used as the encryption algorithm, then the overall communication system can be made unconditionally secure. In contrast to traditional

public key cryptography which relies on random mathematical functions, quantum cryptography relies on the foundations of quantum mechanics. It also detects eavesdropping and guarantees key security, making it preferable to traditional cryptography.

Basically, it requires two communication channels. The sender and receiver are connected by a quantum communication channel that allows quantum states to be transmitted, and they communicate via a public classical channel. The center project will conduct QKD experiments to determine the problems involved in deploying a practical and reliable QKD network.

The first task will be to write a program to control the QKD device, which is the Clavis system made by id Quantique, Inc.. While most QKD experiments use photon polarization, the Clavis QKD system

relies on the phase of a photon to store quantum information. The program used must control the laser diode, which is the light source of the system. Then, the avalanche photodiodes must be tested, as sensitive photon detectors, to make sure the noise in the system is low enough. Excessive noise would reduce the key generating rate and increase susceptibility to eavesdropping. To establish an effective and secure QKD link, it is necessary to measure the line length between the sender and receiver. Presently, the center is researching this problem. In the end, the QKD protocol, BB84 or SARG, will run on the QKD system. The next stage research target will be to build up a reliable QKD network.

In contrast to QKD, a quantum direct communication (QDC) protocol is used to transmit a secret message directly without generating a secret encryption



key between the communicating parties in advance. Recently, the center proposed a new protocol that is capable of securing QDC with authentication. Our protocol introduces a mutual authentication procedure, uses quantum Bell states and applies unitary transformations in the authentication process. Then, it exploits and utilizes entanglement swapping and local unitary operations in the communication processes. Thus, after the authentication process, the client users would be left alone to communicate with each other, and the authenticator would have no channel to tap into the secret message. In addition, our protocol does not require a direct quantum link between any two users. This may also be an appealing advantage in the

implementation of a practical quantum communication network.

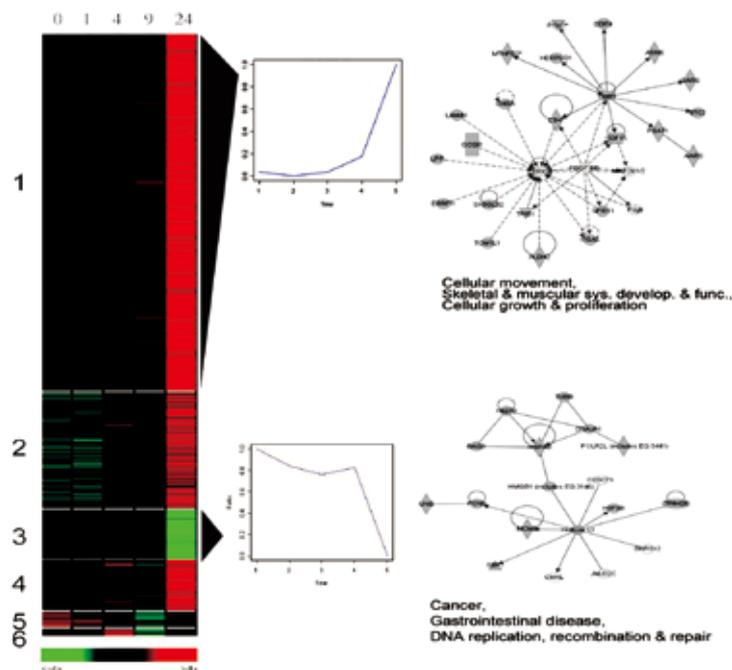
Advances in practical quantum algorithms and quantum error correction codes have prompted a search for a practical quantum computer. One of the important criteria for the implementation of a practical quantum computer is to have a universal set of quantum gates with operation times much faster than the relevant decoherence time of the quantum computer. In addition, the high-fidelity quantum gates needed to meet the error threshold of about 10^{-4} are also desired for fault-tolerant quantum computation. Recently, the center applied the gradient ascent pulse engineering optimization approach to find a control parameter sequence in a

near time-optimal way for a high-fidelity controlled-NOT (CNOT) gate in silicon-based donor spin quantum computer architectures. This high-fidelity CNOT gate has an error of about 10^{-6} , below the error threshold required for fault-tolerant quantum computation, and its operation time of 100ns is about 3 times faster than the 297ns of the proposed global control scheme. The high-fidelity and near time-optimal CNOT control sequence we found is also robust against control voltage fluctuations, dipole-dipole interaction and electron spin decoherence. This study may provide essential input into the understanding of the implementation and manipulation of functional devices using practical silicon-based donor spin quantum computers.

Bioinformatics and Biostatistics Core Lab Developing Novel Microarray Analysis Algorithms and Database Tools

The Bioinformatics and Biostatistics Core Laboratory is one of the eight core labs set up under the College of Medicine's Center for Genomic Medicine. Led by Dr. Eric Y. Chuang, this facility provides services for research study design, performs statistical analysis and develops methodologies for data mining and data analysis algorithms for microarray and proteomic core laboratories. (see next page→)

Data mining, database searching and analysis tools can integrate information, such as hierarchical clustering, gene-gene interaction networks, signal transduction pathways and literature, and help the user perform data mining to extract knowledge from information.





(← see previous page)

Advances in biomedical science technologies have generated much basic and clinical data. DNA microarray, methylation chips, array comparative genomic hybridization arrays, microRNA arrays and SNP (Single Nucleotide Polymorphism) arrays have provided new platforms for studying genomic medicine. In the post-genomic era, the rapidly increasing number of nucleotide and amino acid sequence data is now a major source of information for biomedical researchers. Therefore, knowing how to use appropriate software tools on powerful computers is a necessity for biologists aiming to identify new genes or targets.

Information about the genetic abnormalities associated with a target disease in the human genome can be easily derived and

analyzed using biostatistics and high-performance computers, and the Bioinformatics and Biostatistics Core Lab was established to support genomic and clinical research with such services.

This core lab is devoted to the methodological research of bioinformatics and provides necessary training courses to researchers and students. It is involved in the development, maintenance and management of the center's website and file sharing servers, and is devoted to research and development related to biostatistics and bioinformatics.

The specific aims of the lab are:

1. Microarray data analysis and data mining, including gene chips, methylation chips, aCGH chips, miRNA chips and SNP chips

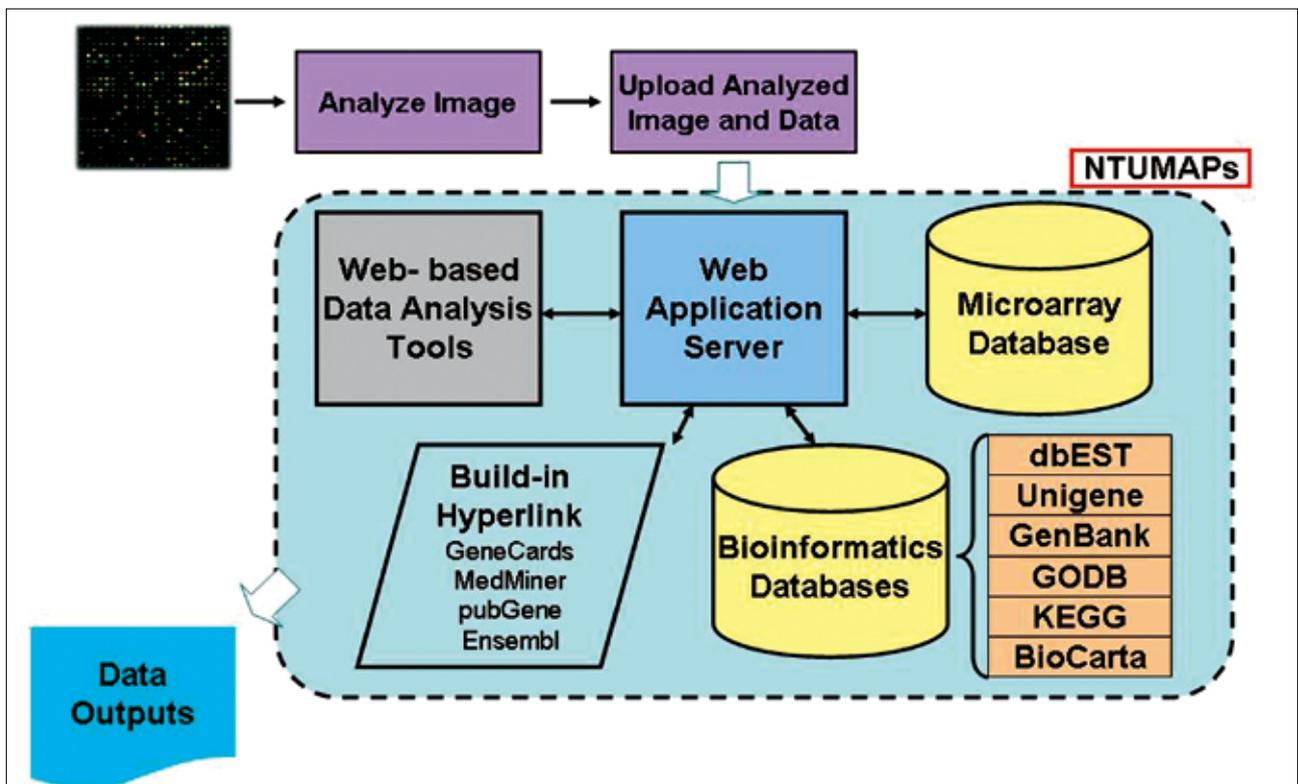
2. Development of microarray-related biostatistical and bio-informatic algorithms

3. Development of biomedical databases

4. Association studies between disease and genome

5. Development of analytical systems and tools for genomic research. An example of this is the establishment of the NTU Microarray Analysis Platform and system (NTUMAPs), an online analytical system with powerful database management functions. The first web-based system for DNA microarray analysis in Taiwan, this system permits users to perform gene analysis, gene matching and information searches.

The structure and schema of NTUMAPs: After uploading chip data, users are able to use various algorithms and databases to conduct analyses.





Center for Teaching and Learning Development Continues Series of Popular e-Learning and Learning Skills Workshops

The Center for Teaching and Learning Development continues to receive enthusiastic responses to two series of workshops run by two of its divisions since 2007: the Division of Multimedia and e-Learning's e-Learning Workshop series, and the Division of Learning Support's series of learning skills workshops.

For the e-Learning Workshop series, the Division of Multimedia and e-Learning invites professors from NTU and other universities, together with photographers, multimedia designers and

effective learning techniques and strategies for college-level study. The workshops were initially presented in the form of speeches, but were redesigned as small group classes in 2008. Workshop topics focus on practical academic skills, such as academic reading and writing, note taking, oral presentation and time management. The workshops were originally designed for up to 40 participants, but, as a sign of their popularity, have attracted almost three times that number on average. Students consistently speak

positively of the usefulness of the workshops. To bring the workshops to a broader audience, videos are posted on the NTU Speech website, while manuscripts are made available on the center's Learning Gate website (<http://ctld.ntu.edu.tw/ls/strategy/>).



experienced teaching assistants, to share their knowledge and experience in the use of digital tools to enhance their teaching and learning. Topics have included intellectual property and the copyrighting of teaching materials, the development of computer-assisted teaching materials, photography, video recording and editing techniques, the use of NTU's CEIBA course management platform and the application of learning technologies in large-enrollment classes. Workshop participant feedback continues to stress the usefulness of these workshops. The division makes these workshops available on the NTU Speech website (<http://speech.ntu.edu.tw/user/index.php>).

The Division of Learning Support's learning skills workshops are aimed to help students develop





College of Medicine's Transgenic Mouse Lab Looks Forward to Move to New Facilities in March

NTU College of Medicine's Laboratory Animal Center established the Transgenic Mouse Core Laboratory in 2000 in response to NTU's genomic medicine and biotechnology research needs. In 2002, this core laboratory became a sub-project of the college's Center for Genomic Medicine, providing such technical services as pronuclei microinjection, embryo cryopreservation and pathogen-free rederivation.

The Transgenic Mouse Core Laboratory is located within the barrier room of the Laboratory Animal Center. This decreases the chances of infection and allows transgenic mice to be transferred directly and safely to other facilities within the barrier. Once a new transgenic mouse strain is produced and the Laboratory Animal Center approves it as a special strain for breeding, the strain is transferred to breeding technicians for backcross breeding to produce a congenic strain and for the breeding of

sufficient numbers of transgenic mice for use in experiments.

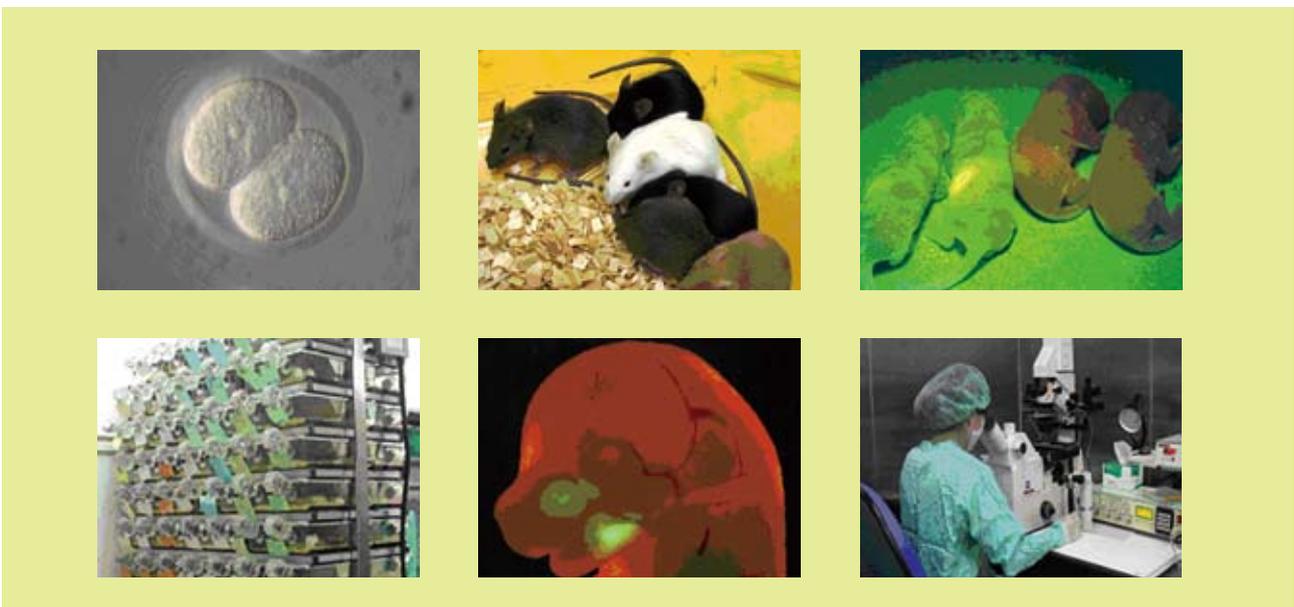
Embryo cryopreservation is provided for those strains not needed in the near future, in order to reduce the expense of long-term breeding and decrease the chance of mutation accumulation and the loss of genetic traits resulting from long-term breeding. In the future, various types of assisted reproduction, including embryo transplants and artificial insemination, will be used to facilitate the breeding of transgenic mice that have difficulty reproducing. Moreover, to avoid the spread of pathogens between animal facilities worldwide, shipments of frozen embryos will gradually replace shipments of live animals for the exchange of experimental animals.

By the end of 2009, the core laboratory had completed approximately 38 transgenic mouse projects. It has produced more than 300 transgenic mice for use by researchers and succeeded

in cryopreserving 82 strains. Rederivation testing has been conducted on all strains, which comprise a bank of around 50,000 embryos. Due to variations among the mice strains, rederivation success rates have ranged from 10% to 68%. With an average success rate of 38%, this laboratory is the largest and most successful mouse cryopreservation bank among universities in Taiwan.

Inspection of the second-stage of renovation and improvement work at the College of Medicine's new Laboratory Animal Center was completed at the end of 2009. Once the environmental sterilization work is complete, the Transgenic Mouse Core Laboratory is scheduled to begin moving from its original location at the NTU Hospital to the tenth floor of the NTU International Conference Center in mid-March. At the same time, the Center for Genomic Medicine's Gene Knockout Mouse Core Laboratory will move to the tenth floor, creating a complete transgenic mouse research facility.

Some of the exciting research achievements of the College of Medicine's Transgenic Mouse Lab





Digital Library and Museum of Buddhist Studies Supports Worldwide Buddhist Research

The NTU Center for Buddhist Studies was established in 1995 by Venerable Master Heng-ching Shih of the NTU Department of Philosophy. Among the center's first projects was the creation of the Buddhist Studies Internet Database, which was designed as a repository for Buddhism research materials that could be accessed by scholars and researchers around the world. In 1999, the center, with the support of the university, teamed up with Dharma Drum Mountain to expand the content and functions of the site and renamed it the Digital Library and Museum of Buddhist Studies.



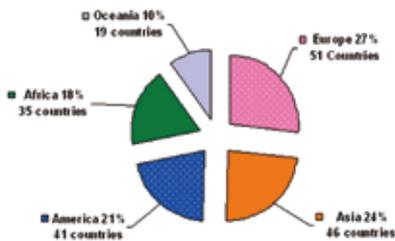
Presently sponsored by the NTU College of Liberal Arts, the DLMBS serves Buddhism research communities worldwide. The site has grown to contain 200,000 bibliographical records of books and research papers in 45 languages and 14 forms of media, 13,000 full-text research papers and books, 53 on-line research tools, a listing of 144 international institutes

of Buddhist studies and 335 related links. The DLMBS has also acquired a number of digital Buddhist scriptures, including the Tripikata, Taisho Tripitaka, Xuzangjing, Chien-Lung Tripitaka, Yongle Tripitaka, Tibetan Tripitaka and Pali Tipitaka. These features make the site one of the most comprehensive resources for Buddhist studies on the Internet.

Over the years, the DLMBS has received visitors from 192 countries. It currently draws an average of 120,000 visitors who access an average of 670,000 pages each month. This high degree of international visibility makes the DLMBS one of the most heavily used Buddhist studies websites in the world.

The English version of the DLMBS is located at <http://buddhism.lib.ntu.edu.tw/BDLM/en/>.

1995-2009 High International Visibility, with user from over 192 countries in the world over the years.



Media type of DLMBS	bibliography	full-text
□Journal Article	107,927	10,321
□Book	65,555	436
□Thesis and Dissertation	5,735	231
□Book Review	3,655	673
□Proceeding Article	1,631	420
□Serial	1,615	37
Sound Recording	851	2
Internet Resource	550	358
Collected Papers	446	128
Reference Book	412	4
Audiovisual	406	0
Others	395	193
E-Book	33	21
Microfilm	2	0
total (till Oct., 2009)	189,213	12,824
Number of words in full-text files		65,245,452



Department of Chinese Literature Signs Agreements to Develop International Ties

The NTU Department of Chinese Literature long has been a bastion of international Chinese research, and it continues to develop its international ties. In 2009, the department inked several student and scholar exchange agreements and international academic cooperation memoranda, promoted international dual-degree and joint-degree programs, and strengthened its recruitment of international students.

The department signed student exchange agreements with the Department of Chinese, Translation and Linguistics at City University of Hong Kong and the Department of Chinese Language and Literature at Fudan University in late 2009. Signed at NTU on November 17, the agreement with CUHK calls for the two departments to exchange up to two undergraduates each semester and allow credits to be transferred. Under the agreement with Fudan University, which was signed on December 12, the departments will exchange undergraduate and graduate students. Although Taiwan's Ministry of Education does not recognize university credits from China, the NTU Department of Chinese Literature still encourages

its students to take advantage of this program to broaden their experience.

The department also forged closer ties with two prestigious American universities in October. It signed a memorandum of understanding on academic cooperation with the UCLA Center for Chinese Studies. The memorandum states that the two academic programs are linked by common academic interests and calls for the development of cooperation and exchanges in areas of shared interest and expertise. Specifically, the two programs agree to organize joint conferences, arrange exchanges of faculty and scholars, and exchange academic information and material. And, with the Department of East Asian Languages and Cultures at Columbia University, the department signed an international scholar exchange agreement under which the two departments agree to hold two lecture series at both universities each year to promote closer working relationships between the universities' sinology scholars.

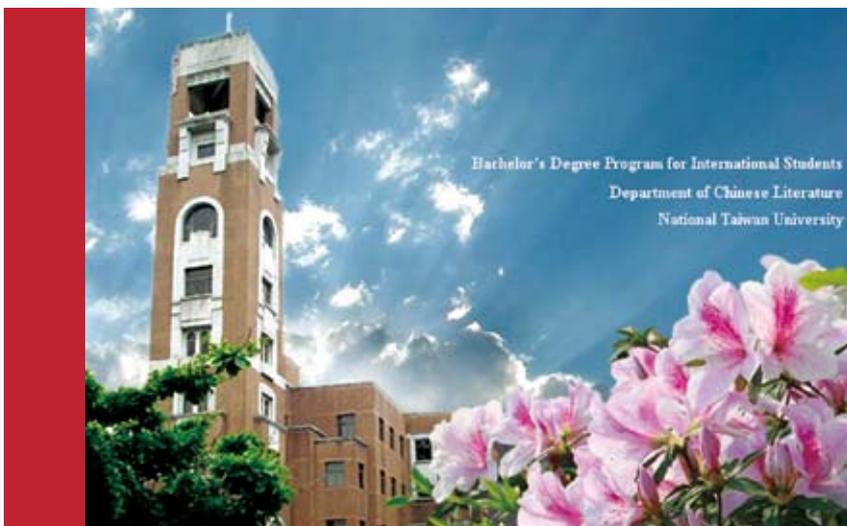
The Department of Chinese Literature and the Department



The NTU Department of Chinese Literature's Prof. Yu-yu Cheng and Prof. Jonathon Webster of City University of Hong Kong sign an exchange student program agreement in November.

of Chinese Studies at Hanyang University in South Korea have spent many months working on the establishment of a dual bachelor's degree program. The two parties have already hammered out the framework of the agreement and are working on a few remaining details. Also, following the signing of an academic cooperation MoU between NTU and Belgium's Ghent University, NTU's Department of Chinese Literature, Department of History, Department of Philosophy and College of Liberal Arts have been leading the way in promoting student and scholar exchanges and joint PhD programs between the College of Liberal Arts and the Faculty of Arts and Philosophy at Ghent University.

Finally, NTU's "Bachelor's Degree Program in Chinese Literature for International Students" is currently recruiting freshmen for the 2010/2011 academic year. Since 2008, this program has grown in popularity and drawn an increasing number of applicants from a growing number of countries. As the program has grown, the department's professors have gained greater experience and skill in instructing international students. The help of teaching assistants and local Taiwanese students has also proved greatly beneficial in helping the program's students complete their course work.





NTU Center for the Arts Holds Painted Ceramics Exhibition in December

The NTU Center for the Arts rounded out an exciting year of exhibitions and performances with an exhibition of painted ceramics by NTU alumna Tseng Li-fen in December. Organized in cooperation with the NTU Library as part of the 2009 NTU Odeum Art Exhibition, "Adulterated Bliss—Tseng Li-Fen's Ceramic Paintings" was put on display in the Multifunction Room on the first floor of the NTU Library from December 8-30.

A graduate of the Department of Chinese Literature, Tseng has been working in ceramics for nearly 30 years. Having developed an exquisite artistic talent in producing beautiful ceramics, she has in recent years turned her focus to painted ceramics.

Reflecting her feelings for NTU, Tseng displayed a series of creations featuring scenic spots on the NTU campus. Such pieces included, "NTU Main Gate," "Drunken Moon Lake," "Administration Building," "Hsitou University Lake" and "Poet (Azalea)." The artist also presented a piece titled "Clouds Floating Past the Odeum" to the NTU Center for the Arts. Another series of works on display included natural scenic areas around Taiwan.

Additionally, a series of five workshops on making hand-kneaded pottery and painted ceramics were held during the exhibition period to interject an interactive, hands-on side to the event.



NTU Global MBA Program Fosters Diversity and Charity

The NTU College of Management's English-instructed Global MBA program has attracted students from over 33 countries, achieving an enrollment ratio of 56% Taiwanese students and 44% international students. This diversity creates a stimulating learning environment and provides students with global networking opportunities and other crucial advantages that are essential in today's global market.

Entrepreneurship, innovation and real-world practice are the themes of the Global MBA program. The Leadership Practice course offered by GMBA Director Prof. Seng-Cho Timothy Chou stresses real-world practice with outside-the-box thinking. One of the topics in this class is charity. This gives students a chance to put their organization and execution skills into practice to help the local community.

Last semester, Prof. Chou's students organized a Halloween Charity Event to benefit aboriginal communities in southern Taiwan that were devastated by Typhoon Morakot in August. Held at a bar in Taipei, the party raised around NT\$80,000, which was donated to World Vision Taiwan.



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