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NATIONAL TSING HUA UNIVERSITY NEWSLETTER

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Professor J.W. Yeh speaking at the ICHEM 2016.

A NEW ERA IN HIGH-ENTROPY MATERIALS LAUNCHED AT NTHU

The first "International Conference on High-entropy Materials (ICHEM 2016)" was held at NTHU on November 6–9. In his address, Prof. Jien-Wei Yeh of NTHU's Department of Materials Science and Engineering reflected on his development of high-entropy alloys—now regarded as a major breakthrough in the field of metallurgy—as "seeing the light at the end of the tunnel." Widely hailed as "the father of high-entropy alloys," Yeh predicted

that with the joint efforts of the participating researchers, the field of high-entropy materials is about to enter a new era. Over the past few thousand years, man-made alloys mainly consisted of a major metal element such as iron or aluminum and a small amount of some other elements, resulting in improved strength and toughness. It was believed that if other metal elements were to be added in a large amount, the resulting alloy would tend to be brittle. This myth was overturned by Yeh. He first conceived of high-entropy alloys in 1995, and in 2004 he published his research demonstrating the superior qualities of high-entropy alloys consisting of a



The ICHEM 2016 included participants from around the world.

mixture of five or more different metal elements. His discovery opens a new chapter in the history of metallurgy.

In his opening address, NTHU President Hong Hocheng pointed out that it was highly significant to hold the first "International Conference on High-entropy Materials" at NTHU, because it was the birthplace of high-entropy alloys some 21 years ago. He also noted that NTHU was honored to host such a gathering of top scientists from around the world. Also in attendance was Prof. Lih J. Chen, the former president of NTHU, who commended Prof. Yeh for his creative and innovative approach to overcoming all sorts of difficulties while exploring uncharted territory. He also pointed out some of the challenges currently being met in the research and development of high-entropy materials, including selecting the optimal combinations from amongst a vast number of possibilities, and the need to develop more effective ways to determine the optimal combinations.

Prof. Peter K. Liaw of University of Tennessee said that high-entropy materials is presently one of the most popular areas of research, and that last year alone more than 250 related papers were published, and have already been cited more than 5,000 times, and that this year those figures are likely to be exceeded. He expects that in the next 10 to 15 years the field of high-entropy materials will produce a Nobel Prize winner.

A special report titled "Mixed-up metals make for stronger, tougher, stretchier alloys" published in the May 19 issue of Nature recognizes Prof. Yeh as the first person to create the field of high-entropy alloys. The article also mentions that at about the same time, Prof. Brian Cantor, the Vice-Chancellor at the University of Bradford in the UK, was also conducting similar research. Prof. Cantor came to Taiwan to attend the conference and recalled that at that time lots of people regarded the idea of combining a large amount of metals as

quite ludicrous, and that it was difficult to find sponsorship for related research. Thus he was very impressed when Prof. Yeh's research began to attract academic attention. Prof. Cantor also stated that Yeh's work is a fine example of coming up with a good idea and then following up on it. The conference was attended by more than 200 scholars from around the world, 170 of whom presented their recent research in the areas of high-entropy alloys, ceramics, and composites.

Summing up some of the highlights of the conference, Prof. Yeh said that while the superalloy turbocharger blades currently used in cars can withstand temperatures of up to 800 degrees Celsius, it's now expected to be possible to make them out of a high-entropy alloy so that they can withstand higher pressure and temperatures of up to 1,000 degrees Celsius, thereby increasing engine efficiency. He then expressed his appreciation for an oil company representative who traveled a great distance to present a 20-minute report on his company's development of bearings used in oil well pumps. Prof. Yeh also mentioned a report on a theoretical model of high-entropy alloys and a report on a corrosion-resistant alloy which also resists irradiation superior to 304 stainless steel.



Dr. Yu-Chen Chan, assistant professor at the Institute of Learning Sciences, National Tsing Hua University.

UNRAVELING THE MYSTERY OF HUMORLESSNESS: THE NEURAL CORRELATES OF GELOTOPHOBICS

Some people are known as "conversation killers" among friends. When others are exchanging banter, they may feel rather uncomfortable, or even worry about being laughed at. People who have an excessive fear of being laughed at are referred to as 'gelotophobics.' Whereas most of us experience mirth upon hearing a good joke, gelotophobics are often unable to appreciate the humor. In Taiwan, such people are referred to as *jiehai*, "those who ruin the high spirits both in themselves and others easily and immediately."

Research conducted by Yu-Chen Chan, an assistant professor at the Institute of Learning Sciences, NTHU, has found that the dorsal pathways in the brain, which are associated with cognitive control, are more active for gelotophobics (those who are afraid of being laughed at) than for non-gelotophobics. She also found that the ventral pathways, which are related to emotions, are less active in gelotophobics. When comprehending jokes, they tend to exert more cognitive control and emotional repression, making it difficult to experience amusement. Thus, gelotophobics may be regarded as lacking a sense of humor or even as "party poopers." Fortunately, according to Chan, training can help most gelotophobics learn to comprehend and enjoy humor. Based on cognitive neuroscience, the study was the first in the

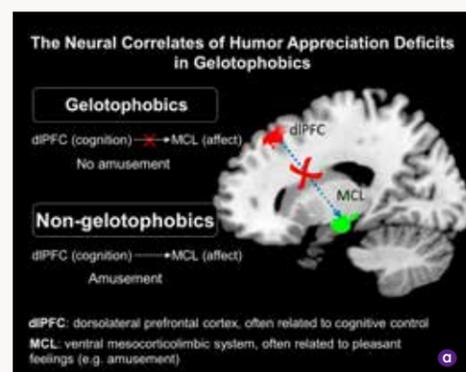


Figure 1. For gelotophobics, the dorsal pathways (e.g., dIPFC) in their brain, which are associated with cognitive control, are more active in comparison with non-gelotophobics, and their ventral pathways (e.g., MCL), which are related to emotions, are less active. When comprehending jokes, gelotophobics may tend towards cognitive control and emotional repression, making it difficult to experience amusement.

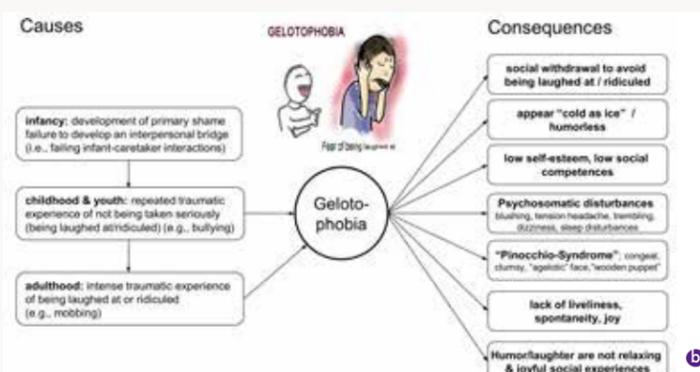


Figure 2. The putative causes and consequences of gelotophobia (Ruch, 2009).

world to use functional magnetic resonance imaging (fMRI) to identify the neural correlates of responses to hostile and non-hostile jokes in gelotophobics and non-gelotophobics. The results were recently published in *Scientific Reports*, an international journal of the Nature Publishing Group. In her research, Chan found that when gelotophobics read hostile jokes, the dorsal corticostriatal system of the brain was more active than when non-gelotophobics read the same jokes. Such increased neural activity appears to reflect the brain's efforts to determine whether the individual is being laughed at by others. At the same time, such people exhibit decreased ventral mesocorticolimbic system (MCL) activation than non-gelotophobics do, reflecting that they are less able to experience amusement from appreciating jokes (Figure 1). Studies conducted worldwide have found that mild gelotophobics constitute between 2% to 15% of the total population in each country (Proyer et al., 2009), and that the ratio is relatively higher in the UK and Asia (cf. Platt, BBC news). "Since my childhood, I have always lacked a sense of humor, was unable to comprehend jokes, and was excessively serious," Chan admitted, adding that she began studying the phenomenon five years ago in an attempt to find out how the brain processes humor and to further understand herself. Gelotophobia is often caused by environmental factors, mostly stemming from difficult relationships with parents during childhood and bullying during teenage years or at work (Ruch, 2009; Ruch et al., 2014) (Figure 2). She added that these causes can result in impairment of the neural connections related to cognition and emotion in gelotophobics. The good news, however, is that, as long as the underlying cause is not congenital, gelotophobics can rewire these neural connections through such training techniques involving listening to more jokes, learning to understand them, and finally gaining the ability to enjoy them.

Chan has also found that students who lack a sense of humor at school often experience lots of difficulties in social interaction, including being ridiculed or bullied; some such students unfortunately go on to inflict bullying on others. Thus, she encourages schools to identify gelotophobics and help them to interpret and develop a flexible and positive appreciation of humor. She also points out the need to educate students about the benefits of non-sarcastic humor to help gelotophobics better enjoy the amusement in jokes.

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Prof. Chou and the BNCT members took a photo at the 17th International Conference on Neutron Capture Therapy (at the University of Missouri, October 1, 2016)

HITTING THE MARK IN THE TREATMENT OF LIVER CANCER

It is now possible to eliminate liver tumors without using chemotherapy or surgery! A research team headed by NTHU Professor Fong-in Chou has developed a new treatment for liver cancer using boron neutron capture therapy (BNCT). Following good results in animal experiments, it's expected that next year it will be possible to commence human

clinical trials.

According to Professor Chou, BNCT is a type of targeted internal radiotherapy. The first step is to inject the patient with a boron drug, boric acid (BA), which selectively accumulates in the tumor. Then, NTHU's nuclear reactor is used to perform neutron irradiation for around 30 minutes. The high-energy particles that are produced by the boron neutron capture reaction can effectively kill the tumor cells. The tumors in liver can be successfully eliminated in two fractions of BNCT

without affecting the normal liver cell function. In other words, boric acid is used to draw a target on the liver tumor cells, and then a neutron beam is used to track them down and kill them off, wherever they may be hiding. The research results have been published in international journals, and patented in Taiwan and the United States. The relevant technology has been transferred to the Taiwan Biotech company.

Chou's radiation research goes back many years. In 2010 NTHU signed a trilateral cooperation agreement with Kyoto University and the Taipei Veterans General Hospital to conduct BNCT research on cancer patients. In 2014, the research team administered

a two-fraction BNCT treatment to 17 patients suffering from recalcitrant head and neck cancers, and succeeded in improving the patient's condition and quality of life. Most surprising of all was that in six patients the tumors completely disappeared.

The research team is also working on developing a boron drug for BNCT of liver cancer, consistently one of the top three causes of cancer deaths in Taiwan. Chou says that in liver cancer the tumor usually multiple. However, since in the early phase there are no obvious symptoms, by the time a clinical diagnosis is made, the condition is usually far advanced. Thus the mortality rate is 95%.

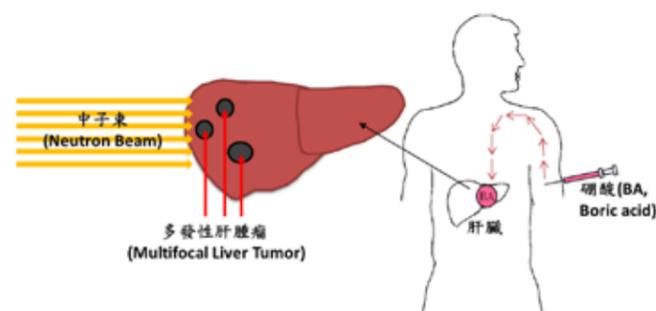
Chou explains that the boron drug for treating patients with head and neck cancer uses BPA (boronophenylalanine). But when used for treating liver cancer, BPA doesn't accumulate very clearly, and may even accumulate in the adjacent pancreas. Hence, BPA is deemed unsuitable for the treatment of liver cancer. In the search for a solution to this problem, boric acid (BA) was discovered to selectively accumulate in liver tumors.

Conducting experiments on rats and New Zealand rabbits, the research team confirmed that BA selectively accumulates in the tissues of liver tumors and in the affected veins. In the animal experiments, the first fraction of BA-BNCT treatment reduced the volume of most of the tumors. Twenty days later a second fraction of BA-BNCT was given, resulting in overall improvement in physiological condition, as well as additional shrinkage or even disappearance of the tumor.

Of these, 93.75% of the tumors completely disappeared after two fractions of BA-BNCT. Moreover, histopathological examinations showed that there were no residual tumor cells in the liver and no detectable damage in normal liver cells. These results confirm that BA-BNCT can completely cure multiple liver cancers without harming normal liver cells.

In addition, BNCT is a targeted internal radiotherapy treatment; it is not only more accurate than proton therapy or heavy particle therapy, but is also less expensive. At present, the BA-BNCT treatment for liver cancer has been applied for counseling by Taiwan's Center for Drug Evaluation (CDE); after which an application will be submitted to Taiwan's Food and Drug Administration (TFDA) to conduct clinical trials (IND). If all goes well, clinical trials will begin. Since Professor Chou's research team discovered that BA selectively accumulates in cancerous liver regions, they have been refining the treatment procedure and hope to be ready to begin the clinical trial soon, and now they are nearly ready to begin conducting the human experiments that untold numbers of people suffering from liver cancer have been waiting for. Although Professor Chou has already retired, and the treatment technology has already been transferred to the manufacturers, she continues to take every opportunity to promote the experimental process so that this new procedure can be used to treat cancer patients as soon as possible.

以硼酸為含硼藥物對肝腫瘤之硼中子捕獲治療
(Boric Acid-Mediated Boron Neutron Capture Therapy for Liver Tumor)



Boric acid-mediated boron neutron capture therapy for a liver tumor.
Boron capture neutron therapy, BNCT

Remarks: The ideal cancer treatment is effective in destroying tumor cells without harming normal cells. In BNCT the patient is injected with a boron-containing drug which is selectively absorbed by the tumor. Then the tumor is irradiated in vitro with thermal neutrons or hyperthermal neutrons, resulting in tumor cells being killed off by the high-energy particles released by the boron-neutron capture reaction (Cardoso et al., 2009).



NTHU ALUMNUS JORDAN HU MAKES A NAME FOR HIMSELF ON WALL STREET

On July 14 RiskVal Financial Solutions, LLC, founded by Jordan Hu, a 1984 graduate of NTHU's Department of Mathematics, won two categories in the 2016 Waters Rankings: *Best Market Risk Solution Provider* and *Best Portfolio Management System Provider*. Hu, who has spent many years working in New York's banking sector, said that the excellent education he received at NTHU has been an essential element of his successful career. It was also during his time at NTHU that he chose the first name Jordan for himself, after the French mathematician Camille Jordan, who

he read about in his textbook on linear algebra. Hu fondly recalls that at that time NTHU was the only university in Taiwan that required all her students to live on campus, as a result of which he developed close relationships with lots of his classmates and teachers. While studying linear algebra with Prof. Jer-shyong Lin he discovered that mathematics can be used to solve a large number of complex and abstruse problems. After that, he took a course in numerical analysis and found that even though mathematics may seem like a highly abstract field of knowledge, it can actually be used to solve real problems. That's why he chose to specialize in the field of numerical analysis during graduate school.

According to Hu, numerical analysis provides estimates and optimizations which are very useful for solving complex problems. Moreover, statistics and probability are essential in large data research and quantification studies; and partial differential equations (PDE) and stochastic calculus are foundational elements in the evaluation of financial models. Although he graduated more than 30 years ago, he still uses these same methods on a daily basis, so he strongly recommends that all NTHU students should have

RiskVal Financial Solutions, founded by Jordan Hu, won two categories in the 2016 Waters Rankings: *Best Market Risk Solution Provider* and *Best Portfolio Management System Provider*.

a good understanding of these basic mathematical tools. In 2001, he founded RiskVal on Wall Street. Today RiskVal is a well-known financial engineering company with its clientele consisting of investment banks and hedge funds in the United States, Britain, Canada, Europe and Japan, such as Citigroup, Goldman Sachs, Morgan Stanley, Deutsche Bank, and Swiss Bank.

The RiskVal Financial System is highly rated by Wall Street elites in the areas of interest arbitrage, risk management, project portfolio management, and real-time transactions. Shortly after the global financial crisis in 2008, RiskVal launched a unique application service to calculate the probability that a given company might fail at some point in time, allowing investors to control risks during a crisis. As a result the company's 2008 revenue reached a record high, increasing by 30% in comparison with 2007.

Under Hu's able leadership, RiskVal has been awarded numerous awards, including Custody Risk's "*Risk Technology Vendor of the Year*" award in 2015. Hu himself won the SmartCEO's Future 50 Award in both 2015 and 2016. The Waters Rankings mentioned above is conducted by Waters Technology, a leading financial information technology journal in the United States, in which its readers vote to determine which financial services companies are the most reliable. The competition is fierce, and this year a record-breaking number of well-known companies from all over the world participated in the competition.

According to Hu, RiskVal's market risk management system is a real-time, pre-trade, relative value analysis system that can improve profitability and achieve hedging effects, which involves obtaining reliable intraday market data sources, as well as timely and fully integrated investment positions of customers. RiskVal's portfolio management system provides a multi-level portfolio structure that efficiently analyzes risk

and profit and loss, and also provides a full set of risk reports. The company has an excellent reputation for providing outstanding customer service, accurate financial engineering, and innovative solutions. Hu said he is thrilled to be successfully competing with all the big players on Wall Street.

Although he has been living in the United States for a long time, this year he returned to Taiwan to attend NTHU's sixtieth anniversary celebration, during which he shared his educational and work experience with members of NTHU community at the NTHU Hall of Fame. Hu has long been a generous supporter of NTHU, and over the years has helped to establish a merit-based scholarship for disadvantaged undergraduates. He has also made significant contributions to NTHU's endowment fund, as well as a fund which helps new teachers participate in international academic conferences and short-term visits.

President Hong Hocheng congratulated Hu for his many achievements, adding that he is the epitome of the "gentleman" in traditional Chinese culture, as well as the embodiment of the NTHU motto, "Self-discipline and social commitment."





IS IT REAL THAT CUTTLEFISH CAN COUNT?

The jury may still be out on whether or not Paul the Octopus was able to accurately predict the outcome of football games, but it has already been scientifically proven that cuttlefish can perform math. Professor Chuan-chin Chiao of NTHU's Department of Life Sciences and his research assistant Tsang-yi Yang have demonstrated that cuttlefish know that two is greater than one and that five is greater than four. They also found that cuttlefish require more time to calculate larger numbers.

Their research has recently been published in the prestigious British journal *Proceedings of the Royal Society B*, and

has also been reported as research highlights in this month's edition of *Nature*. Prof. Chiao pointed out that their findings on the mathematical and risk-assessment abilities of cuttlefish reveal that cognitive functions of many animals are far more advanced than we imagined. He also said that studying the factors affecting what cuttlefish choose to eat not only increases our understanding of the cuttlefish's ecosystem, but also sheds light on the human decision-making strategies and consumer behavior. Cuttlefish are cephalopods; amongst all invertebrates, they have the most developed nervous system. In addition to their remarkable camouflage behavior, cuttlefish are considered to be fairly intelligent animals. And although a number of past experiments have confirmed that cuttlefish have higher cognitive functions, no research has attempted to determine whether they have mathematical abilities.

Chiao's research studied the cuttlefish's natural feeding behavior when presented with differing quantities of shrimp, and found that they have a definite preference for larger quantities, e.g., five shrimp as opposed to four.

How cuttlefish do math?

Chiao said that in order to verify that cuttlefish have a real sense of numbers, rather than simply a preference for whichever group of shrimp has a higher density, in the experiment he presented the cuttlefish with two groups of shrimp with the same density but different quantities, in which case they regularly chose the group with the larger number of shrimp.

c Professor Chiao holding a press conference.



b Professor Chuan-chin Chiao and his research assistant Tsang-yi Yang.

In general, humans have two ways of counting. One is "sensory counting," in which small quantities (usually less than five) are automatically recognized on first sight, without having to actually count them; the other way is to actually count out each item. In order to determine which of these counting methods is used by cuttlefish, the experiment also measured how much time the cuttlefish spent making their choice. It was found that the cuttlefish spent more time when faced with a relatively more complex choice (4 to 5 shrimp) than they did when faced with a relatively simple choice (1 to 2 shrimp), indicating that they were actually counting out the number of shrimp.

Can cuttlefish perform risk assessment?

In the experiment it was also found that when cuttlefish are faced with a choice between one large shrimp and two small ones, if they are hungry they prefer the one large shrimp, but when they are not very hungry they prefer the two small shrimp. Chiao concludes that this is a kind of risk-assessment strategy, since choosing the larger shrimp is riskier than choosing two small ones; i.e., they are more likely to choose the high-risk, high-reward option, which is the same with humans. Chiao has also done a lot of research on how cuttlefish use visual information when engaging in camouflage behavior, as well as the related neural control mechanisms. He says that he was pleasantly surprised by all the attention his research on the mathematical ability of cuttlefish has received from foreign media, including *Nature* and *Discover*.

The benefits of cuttlefish research

Yang, who is currently a research assistant at the Institute of Systems Neuroscience, laughs when she recalls how she decided to come to NTHU after learning about Chiao's research on cuttlefish, adding that, "Although the experiments can sometimes be rather tedious or disappointing, I found that simply watching the cuttlefish swimming back and forth

was actually very therapeutic; it's actually a good way of dealing with frustration." The study used a type of cuttlefish known as the "pharaoh cuttlefish," which, along with the shrimp, were raised by Yang in pure sea water. After discovering that each cuttlefish had a unique personality, she gave each one a matching name, such as "Sleepy" and "Timid." However, when one died she became rather dejected, so Chiao had her drop the names in favor of serial numbers.



Tsang-yi Yang giving her cuttlefish a math quiz.

When cuttlefish get angry they spit out a kind of ink. When that happened the whole tank of water would darken, and pretty much all of lab assistants have a few souvenir T-shirts marked with indelible ink spots. Yang was also sporting a smile when she said that the next step was to figure out if cuttlefish have a concept of "zero."



TAIWAN'S INDIGENOUS SCIENCE EDUCATIONAL ANIMATION IN THE INTERNATIONAL SPOTLIGHT

Go Go Giwas, an Indigenous science education animation film produced in Taiwan, has recently been screened at the Chicago International Children's Film Festival (CICFF) and the Bucheon International Animation Festival (BIAF) in Korea. Produced by a team led by Professor Li-Yu Fu of National Tsing Hua University, the film was sponsored by the Ministry of Science and Technology. It has also been awarded the Best Animation Prize of the 51st Golden Bell Awards this year.



The CICFF is the world's most influential children's film event and the largest of its kind in North America. It is also the only international children's film festival recognized by the Academy Awards. Every year thousands of children's films from dozens of countries are submitted for consideration. The news that *Go Go Giwas* was accepted for inclusion in this prestigious event generated much excitement throughout the NTHU community.

The BIAF is the first animation film festival initiated in Asia, and this was its 18th festival. This year a total of 1,221 films were submitted from 70 countries, only 135 of which were accepted as finalists. *Go Go Giwas* was selected as one of the finalists in the "TV & Commissioned Film" category.

Prof. Fu said that Taiwan's animation industry is widely recognized as top-notch, but this is the first time a Taiwanese educational animation has received so much acclaim. The main character in the film is Giwas, an 8-year-old girl of the Atayal tribe. Giwas is a very popular name among the Atayal females. In this 130-minute film, Giwas and her companions acquire both traditional wisdom and scientific knowledge thru daily life and various adventures. In one scene, from the traditional way of binding a torch they learn about flash points, combustion, and interface reactions. In other scenes they learn about geology, structural mechanics, the lotus effect, pigmentation, and light refraction.

Prof. Fu originally specialized in the history and philosophy of science. In February 1997, Chuan-Guo Yang, the principal of the Taian Junior High School in Miaoli County, invited her to

a b Stills from Go Go Giwas
c Professor Li-Yu F u.

give a lecture on "Indigenous Science Education." She spent half a year preparing for this speech, during which time she became deeply immersed in the world of Taiwan's indigenous peoples and became an active advocate in the promotion of Indigenous cultures and Indigenous science education.

In 2005, the National Science Council (NSC) was planning to initiate a popular science educational channel in Taiwan like the Discovery Channel. For pilot runs, NSC commissioned Prof. Fu to produce an educational film based on Indigenous cultures and daily life. At that time Fu had no experience with animation, so she began to familiarize herself with the field by studying the work of Disney and the famous Japanese animator Hayao Miyazaki.

Prof. Fu's first production was *The Flying Squirrel Tribe*, which was followed up with *The Flying Squirrel Tribe Revisited*. *The Flying Squirrel Tribe Revisited* won the 48th Golden Bell Award in the year of 2013.

Prof. Fu extended a hearty thanks to all the members of her animation team, especially the well-known animation director Shi-Wei Wang; the excellent cultural consulting group formed by the tribal elders of the villages of Jian-Shi and Wu-Feng in Hsinchu County; and Professor Chung-Yu Mou, Professor Kuo-Chu Hwang, and Professor Shin-Rung Yeh, all of NTHU, for their scientific guidance.

Prof. Fu believes that the key to the success of *Go Go Giwas* lies in its compelling story. She also proudly points out that she has already received inquiries from African, German, and Danish scholars about producing films for them.



d Stills from Go Go Giwas
e The Go Go Giwas production team had a field trip to experience Giwas life world at the village of Smangus.
f The screening of Go Go Giwas at "little Tsing Hua" a charter program for Indigenous high school students.



NTHU'S ONLINE COURSE IN FINANCIAL MANAGEMENT IS A BIG HIT IN MAINLAND CHINA

Nowadays lots of university students in mainland China are keen to start their own businesses, resulting in the surging popularity of online financial management courses. When Prof. Che-chun Lin, Chair of NTHU's Department of Quantitative Finance, launched a MOOC (Massive Open Online Course) on Financial Management last February, it attracts more than 100,000 people in just six months. Private enterprise and investment have become widespread in China over the past few decades. Add to this the practical approach of Lin's Financial Management course and his inclusion of the "Taiwan experience"; it comes as no surprise that it has been highly praised by so many mainland students. This online course starts with the basics of financial statements and ratio analysis, and then moves into investment decisions and the internal management of a company, thereby helping students learn the most practical financial knowledge. Many mainland students indicated that the traditional Chinese characters and unfamiliar technical terms used in Taiwan are not a problem in learning Lin's lectures,

and that because Taiwan's accounting standards are more rigorous than those in the mainland, they are eager to continue to take such courses. Lin said that through his accumulated experience in teaching middle and high-ranking managers studying in NTHU's EMBA and MBA programs, he realized that it is necessary to use simple language and lots of examples when explaining difficult theories. This also helps to make the topic more interesting and digestible for the students. This is another reason why his MOOC has been so well received. Lin's online curriculum also cites lots of Taiwanese news and current events, such as the financial reforms implemented by the Taiwan High Speed Rail Corporation when it was on the brink of bankruptcy a few years ago. Another example cited by Lin is the Taipei Regent's capital reduction measures. In each case he discusses, Lin encourages students to think about the meaning behind the measures taken by an enterprise, and

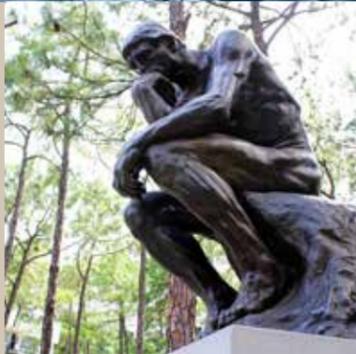
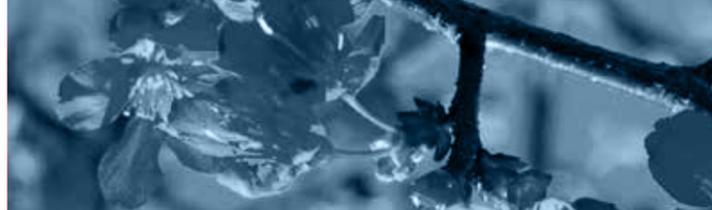


Professor Che-chun Lin.

then try to propose their own alternative solutions. In addition to being an inspiring teacher, Lin also has a lot of hands-on experience, making his classes highly popular. In light of Lin's financial management expertise, he has been appointed as the investment manager of the NTHU Endowment Fund, which has grown 8% since November 2014. As Lin sees it, studying investment and financial management doesn't require a highly specialized background, so his MOOC is open to all who are interested in the subject. He says that even high school students can get something out of it.



Professor Che-chun Lin's online course Financial Management is highly popular amongst budding entrepreneurs in mainland China.



SIX NTHU FACULTY MEMBERS RECEIVE THE 2016 WU TA-YOU MEMORIAL AWARD

Amongst the winners of the 2016 Wu Ta-you Memorial Award are six Associate Professor at NTHU: Yun-wei Chiang of the Department of Chemistry; Yeong-luh Ueng of the Department of Electrical Engineering; Hui-chun Yang of the Department of English; Chung-Shou Liao of the Department of Industrial Engineering and Engineering Management; Tzu-chien Wei of the Department of Chemical



Associate Professor Yun-wei Chiang of the Department of Chemistry.

Engineering; and Kean-fung Guan of the Department of Chinese Literature.

Yun-wei Chiang: At the cutting edge of electron spin resonance and apoptosis

Associate Professor Chiang received his Ph.D. from Cornell University in 2006 and began teaching at NTHU's Department of Chemistry the following year. His research areas include physical chemistry and biophysical chemistry, focusing on the development of magnetic resonance spectroscopy, especially the use of unpaired electrons as probes to analyze the behavior of bio-macromolecules.

Mainly engaged in spectroscopy and biomedical experiments, Chiang's laboratory has developed a number of unique electronic spin resonance (ESR) technologies for analyzing the behavior of molecules during the apoptosis process, so as to understand how the mechanism of programmed cell death is, in some cases, shut down in cancer cells. His research has been mentioned in the well-known journal *Structure*. In recent years, in addition to numerous invitations to present papers at large international conferences, Chiang has received a number of academic accolades, including NTHU's New Faculty Research Award, the Shuimu Foundation's Outstanding Young Scholars Award, the Biophysical Society of the ROC's Outstanding Young Scholars Award, and the Young Chemists Award of the Chemical Society Located in Taipei.

In accepting the 2016 Wu Ta-you Memorial Award, Chiang thanked all his colleagues for their support, as well as his family for their love and encouragement. He also thanked the students in his research team for helping to create a congenial and positive atmosphere in the lab, adding that lively discussions with his students has been an important driving force behind his continuous breakthroughs.

Yeong-luh Ueng: At the vanguard of channel coding research

Associate Professor Ueng earned his Ph.D. from the Department of Electrical Engineering at National Taiwan University in 2001. After working in the industrial sector for four years, he began teaching at NTHU's Department of Electrical Engineering and Institute of Communications Engineering. Ueng's research interests are channel coding, digital communications, and communication integrated circuit design. The lab he heads has made a number of significant contributions in the areas of error-correction codes, communication and storage system applications, and hardware design. He is the holder of seven patents in the United States and seven patents in Taiwan, and during the past five years he has published 18 research papers in world-class journals. Last year he received the Distinguished Young Scholars Award of the Taiwan IC Design Society. In addition to its academic value, Ueng's research has been adapted to a wide array of industrial applications. His laboratory has successfully developed error correction coding

technologies for such applications as Wi-Fi, 10Gbps Ethernet, SRAM, and flash memory. In addition, in cooperating with the Industrial Technology Research Institute, Ueng has made 18 technical proposals relating to IEEE 802.16 standards. A number of these technologies have been developed and successfully transferred to leading domestic manufacturers.



Associate Professor Yeong-luh Ueng of the Department of Electrical Engineering.

Upon receiving the 2016 Wu Ta-you Memorial Award, Ueng thanked his dissertation advisor, Mao-chao Lin, for his expert guidance and for helping him develop professionally. He also expressed his appreciation for the excellent research environment and resources provided by the Department of Electrical Engineering and



Institute of Communications Engineering; for the support and assistance of his senior colleagues, and for the financial support provided by the Ministry of Science and Technology. He further acknowledged that his achievements would not have been possible without the help of his colleagues and graduate students. Ueng also thanked his family for their unstinting support, which has allowed him to fully concentrate on his work.

Hui-chun Yang: Charting new territory in language assessment

After earning her Ph.D. in Foreign



Associate Professor Hui-chun Yang of the Department of English Instruction.

Language Education from the University of Texas at Austin in 2009, Associate Professor Yang first taught at Chung Shan Medical University and later at National Hsinchu University of Education in 2012. Her interest in language assessment research began during her doctoral studies when she participated in designing the local and international language assessment at Educational Testing Service (ETS) in the United States. This experience advances her knowledge of various aspects of language assessment, and she thus recognizes how the construction and use of assessment tools may dominate the planning and implementing of language curriculums.

Yang's research focuses on the theoretical frameworks, standards, and the development of assessment tools of high-stakes standardized English tests and classroom assessments. Her research areas include construct validity, authenticity, and fairness of various types of academic English writing assessments. She also investigates the impact of test types on the discourse-pragmatic features of the production of learners of different proficiency levels. She further expands to combine the information technology area to develop learning-oriented adaptive language assessment systems in order to elevate the effectiveness of differentiated learning and instruction. She aims to apply fundamental assessment research findings to the practice of English teaching in the hope to improve teaching mechanism.

Yang said that receiving this award is a great encouragement and affirmation. She is very grateful for the funding and research resources provided by the Ministry of Science and Technology, as well as the supportive research environment and academic freedom provided by the Department of English Instruction. A special thanks must go to her research

associates for their selfless cooperation, and her family for their love and support. Nothing would have been possible without them. In the future, she will keep her end goals in mind while striving to research what is meaningful and practical.

Chung-Shou Liao: From theory to application in combinatorial optimization

Associate Professor Chung-Shou Liao joined NTHU in 2010. His research focuses on the design and analysis of combinatorial optimization algorithms that can be used to solve difficult optimization problems, especially in interdisciplinary applications, including: global alignment of multiple biological networks, real-time algorithms for large-scale route planning, dynamic scheduling, and smart grids. In all the areas he has applied the theoretical analysis of combinatorial optimization to making significant improvements and breakthroughs.

With the graduate students working in his lab, Liao emphasizes the importance of theoretical research and analysis, and that a solid mathematical basis is essential for a variety of research applications. As a result, many of his lab students have gone on to receive considerable international recognition. He said, "These students are the cornerstone of my lab's achievements; they are the driving force behind my motivation to explore the wonderful world of research." In recent years, Liao's research has been published in top-tier journals such as *Bioinformatics* and *Transportation Research Part B: Methodological*. He has also received a number of prestigious awards, including the CIIE Outstanding Young Industrial Engineer Award; the K.T. Li Young Researcher Award of the IICM; and the Sayling Wen Award for Outstanding

Young Researchers in Service Science. Professor Liao has a great passion for teaching, and has twice received the College of Engineering's Outstanding Teaching Award. Upon receiving the Wu Ta-you Memorial Award Liao thanked the Department of Industrial Engineering and Engineering Management for providing an excellent research environment, as well as his colleagues for all their support and encouragement. He also thanked his family, especially his wife for all her understanding and sacrifices while raising their two daughters.



Associate Professor Chung-Shou Liao of the Department of Industrial Engineering and Engineering Management.



Tzu-chien Wei: Opening new territory in electrochemical engineering

After receiving his Ph.D. degree in Chemical Engineering from NTHU in 2007, Associate Professor Tzu-chien Wei worked in the industrial sector, and in 2012 he returned to teach at NTHU. His research interests include dye sensitized solar cells and perovskite solar cells, nanoparticle synthesis and application, and electrochemical metallization processes. In his teaching Wei emphasizes both engineering applications and research, and gives particular importance to imparting basic implementation skills, presentation

skills, time management, and work attitude—all essential for success in the workplace. His future plans include applying his research results to the industrial sectors.

In accepting this award, Wei expressed his thanks to all his students, both past and present. He also thanked his family for their steadfast support, as well as Professors Wan Chi-chao and Wang Yung-yun for their guidance during his student days.

Kean-fung Guan: Exploring the landscape of late Qing literature

After earning his Ph.D. in Chinese Literature at National Chengchi University, Associate Professor Guan Kean-fung began teaching at NTHU's Department of Chinese Literature. Guan specializes in modern Chinese literature, especially late Qing novels, investigating such questions as: How did late Qing

novelists use their writing as a way of reflecting on their own position within the turbulent society of 19th-century China? How did the highly conservative and traditional Chinese literary tradition begin to engage in a dialogue with the new intellectual trends appearing on the scene during the late Qing? And, what was the nature of the paradigm shift in literature brought about by these intellectual trends?

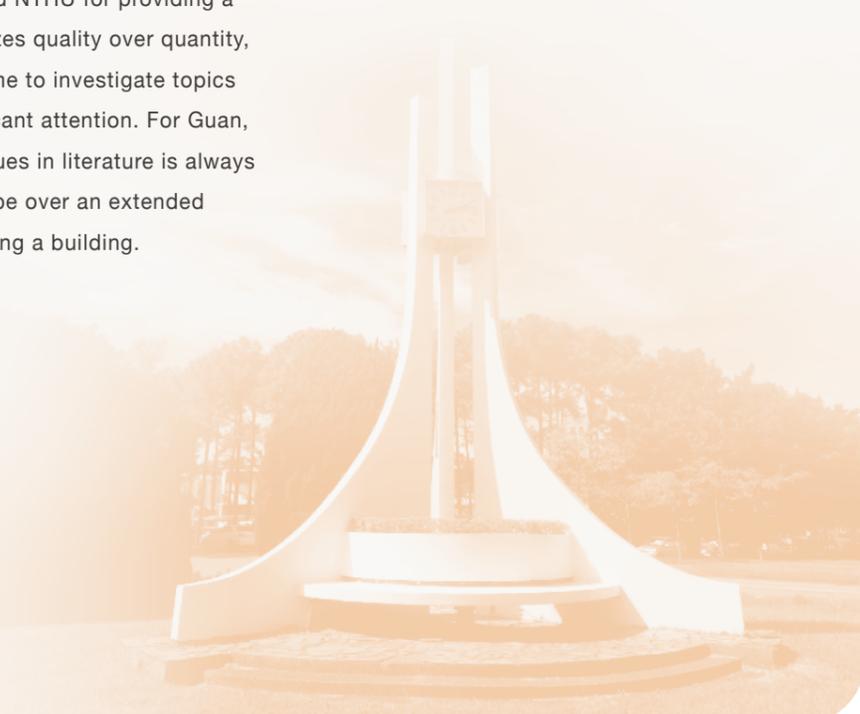
His numerous works include *"From the Body to the World: A Map of the New Concepts Found in Late Qing Novels"* and *Revolution, Awakening, and Expression: Research in Modern Chinese Literature and Culture*. His papers have been published in leading journals, and this year he has also received the Academia Sinica Junior Scholars Award.

An avid traveler, Guan's investigations of such themes in late Qing novels as utopia, the world, adventure, and Africa have led him to conclude that they are a kind of response to the deep-seated urge to travel. During his own travels he has stayed at innumerable backpacker hostels, where the creaky beds has provided him with abundant creative inspiration. He teaches a course titled Travel and Literature, which brings together literature, research, and his own travel experience.

In accepting this award, Guan thanked NTHU for providing a research environment which emphasizes quality over quantity, and allowing him to have sufficient time to investigate topics which have previously received but scant attention. For Guan, in-depth research on fundamental issues in literature is always an exacting procedure that takes shape over an extended period of time, rather like a constructing a building.



a Associate Professor Tzu-chien Wei of the Department of Chemical Engineering.
b Associate Professor Kean-fung Guan of the Department of Chinese Literature.





SUCCESS IN THE HIGH-TECH INDUSTRY AND THE MARATHON OF LIFE

"Life is like a lifetime marathon; it's fine to start at a slow pace, as long as you keep running."

This is the philosophy of Mr. Po-wen Yen, CEO of United Microelectronics Corporation (UMC) and the winner of the 2016 SEMI Sustainable Manufacturing Leadership Award.

The 2016 SEMI Sustainable Manufacturing Leadership Award was conferred by President Tsai Ing-wen at SEMI's annual



Mr. Po-wen Yen, CEO of UMC

Leadership Gala Dinner, which was recently held in Taipei. "Yen exemplifies outstanding leadership and commitment to sustainable manufacturing issues. He approaches environmental protection in a holistic way, thinking broadly and then setting up the infrastructure to institutionalize the change while staying involved each step of the way," said Denny McGuirk, president and CEO of SEMI. In this age of global warming and a looming energy crisis, this award represents a major affirmation of not only an individual, but also the entire industry. Mr. Yen earned his bachelor's degree from NTHU's Department of Chemical Engineering in 1980, and his master's degree from National Taiwan University's Department of Chemical Engineering in 1982. In 1986 he began working at UMC, and has been there ever since. During these 30 years he has made sustainable development as one of the core values at UMC, thereby helping the company to become a global leader in the semiconductor industry.

Yen says that it was in 2009 that he made his first trip to a recycling center. He was rather shocked by the sight of so many unfinished drink containers, which makes the recycling process more labor intensive and expensive. As a result, he started to advocate proper recycling as often as possible, both at home and at work.

Comparing recycling to one of today's highly popular games, Yen says, "those treasures you find in Pokémon Go aren't genuine; the real treasures are recycled resources."

Without his knowledge, one of his colleagues nominated Yen

for the SEMI Sustainable Manufacturing Leadership Award. He attributes winning the honor to a concerted team effort. Mr. Yen believes that in the technology industry small changes in methodology can have a major positive impact on the environment.

More than a decade ago, when Yen was a fab director, he began to advocate for reducing fluoride (PFC) emissions. For him, even if employees don't have strong views on environmental issues, it is still essential for management to do as much as possible to reduce the production of toxic waste. "Of course, these measures can be costly and have to be verified through repeated trials," points out Yen, "but, the company has to understand that the results are very important."

Recalling his university days, Yen describes himself as being "muddled and slow," and says that he had his share of problems in school. However, with the help of good friends, he matured and learned valuable lessons. He has many fond memories about his exemplary teachers at NTHU, especially Dr. Chun-shan Shen, who later became university president. Mr. Yen highly admired Dr. Shen not only for his academic abilities, but also for his active involvement in social and campus activities including athletics, Go and Bridge tournaments.

Yen readily admits his share of mistakes along the way, but adds that these same mistakes have taught him much, such as how to recover from setbacks. For Mr. Yen, "life is like a lifetime marathon; it's fine to start at a slow pace, as long as you remember to keep running." He encourages students who are still unclear about their direction in life by saying, "don't be afraid of making mistakes—just remember to learn from them!"