ISSN: 2077-2491

Autumn/Winter 2012

umagazine 澳大新語

issue: 07 第七期

大師對談

劉炯朗 x 姚期智 x 儲楓: 教育應讓人才發揮最大潛力

Conversations between Masters

Chung-Laung Liu x Chi-Chih Yao x Frances Yao: Education Should help People Reach Maximum Potential

新方向、新起點

澳大學生事務專題報導

New Direction, New Start

Feature on Student Affairs at UM

「數學是我看世界的方式」

專訪錢濤教授

Maths Is My Way of Looking at the World

Interview with Professor Qian Tao

附刊 Supplimentary Issue

2011/12

澳門大學年度簡報

University of Macau Annual Report

Autumn/Winter 2012 umagazine

EDITOR’S WORDS 編者的話 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

各位讀者不難發現，本期澳大新語的焦點聚於「人」：今年澳大向阿登·李·貝蒙特教授、星雲大師、蘇樹輝博士及姚期智教授四位傑出人士頒授榮譽博士學位，表彰他們在研究、文化與教育方面的重大貢獻。我們把握機會邀請來三位大師級科學家——姚期智教授伉儷和劉炯朗教授進行一場難得的對談，分享他們在人生和學術探索路上的睿智經驗；另一方面，今年首屆澳門科學技術獎上摘取唯一一項「自然科學獎」一等獎的我校數學系錢濤教授，也和我們分享他的激盪人生故事，令我們對如何做學問和做人，多了一份深刻而具體的感受⋯⋯

從這些大師的寶貴人生經歷中，我們不難體會到，大學教育的核心價值，除了知識的教授和技術的承傳，更在於涵養人格、開拓胸襟，學生們應在大學階段建立自己的人生格局、鍛鍊駕馭人生的能力。那麼，澳大將如何在學生事務層面——尤其是在明年遷入新校區後——達成這些目標呢？我們透過專訪學生事務副校長程海東教授、學生事務長余小明博士，以及曾參與澳門學生事務高級研修班的學員，從不同角度剖析澳大將如何透過落實「四位一體」教育模式，全方位打造學生的軟硬實力，創建具特色、高水準的世界一流大學。

作為澳門規模最大的國際化、綜合性公立大學，澳大除了培養人才，更責無旁貸地肩負起社會責任，本期策劃的專題文章，將有助於大家深入了解澳大與社區的互動及聯繫。此外，從今期開始推出的「學院專欄」，廣邀校內不同學院的老師執筆，分享他(她)們的精闢觀點和深入看法，相信必會令各位讀者有所得益。

This issue of *umagazine* focuses on people. This year the University of Macau (UM) conferred honorary doctorates upon four distinguished individuals, Prof. Arden Lee Bement, Jr., The Most Venerable Master Hsing Yun, Dr. Ambrose So Shu Fai and Prof. Andrew Chi-Chih Yao, in recognition of their outstanding contributions in research, culture and education. A close encounter at UM with these eminent individuals was an interview opportunity too good to miss. So we invited Prof. Andrew Yao, his wife Prof. Frances Yao, and his former teacher Prof. David Chung-Laung Liu for an interview to share their life experiences and some insightful views on higher education and success. Another person that shares his inspiring life story in this issue is Prof. Qian Tao from the Department of Mathematics, who received the sole first prize of the Macao Science and Technology Award in the Natural Science Award category. Hopefully their stories can help readers gain some new understanding about how to be a better traveller in the journey of life and the never-ending journey of scholarship.

If there is anything in common that we could easily learn from their stories, it’s that the core value of higher education should not be limited to the acquisition of knowledge and skills — higher education should also promote character development, opens one’s eyes and mind, broadens horizons, and helps draw a blueprint for life. How can UM achieve these objectives through its student affairs professionals — especially after relocation to the new campus next year? We interviewed Vice Rector (Student Affairs) Prof. Haydn Chen, Dean of Students Dr. Peter Yu, as well as some participants of an earlier advanced training course in student affairs offered by the Macau Student Affairs Institute. They discussed how UM plans to help students acquire and improve soft skills and become a world-class university with characteristics, through the implementation of the “4-in-1” education model.

As the largest comprehensive public university in Macao, UM takes it upon itself to fulfill its social responsibility in addition to producing outstanding graduates. This issue’s feature will give readers a better understanding of the interactions and ties between UM and the community. Also worth reading are articles in the newly-launched “Faculty Column”, in which faculty members share their insightful views on a diverse range of issues.

張惠琴
Katrina Cheong

Autumn/Winter 2012 <<Issue 7 第七期 >>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>>

電話 Tel: (853) 2883 1662
傳真 Fax: (853) 2883 5467
通訊 Mail: 中國澳門氹仔徐日昇寅公馬路
澳門大學傳訊部
Communications Office
University of Macau
Av. Padre Tomas Pereira, Taipa,
Macau, China
電郵 Email: umagazine@umac.mo
網址 Website: http://www.umac.mo/umagazine

主編 Editor-in-chief
Katrina Cheong

編輯 Editor
Joe Tang

執行編輯 Executive Editor
Kris Chi

編輯助理 Editorial Assistant
Veronica Tang
Zara Ho

撰稿 Writers
Albee Lei
Ella Cheong
Joe Tang
Tak-Wing Ngo
Rose Lai

翻譯 Translator
Ruby Chen

顧問 Advisors
Prof. Tim Simpson
Prof. Wu Mei

出版 Publisher
University of Macau

ISBN：2077-2491

澳大新語是澳門大學的刊物，每年出版兩期，旨在報道教學、科研及大學發展的最新動向。
umagazine is a biannual publication of the University of Macau. It aims to provide information on the latest developments of the university in teaching, research and other areas.

CONTENTS

Autumn/Winter 2012 << Issue 7 第七期 >>

大師對談：
劉炯朗 x 姚期智 x 儲楓
教育應讓人才發揮最大潛力

Conversations between Masters:
David Chung-Laung Liu x Andrew Chi-Chih Yao x Frances Yao
Education Should Help People Reach Maximum Potential

策劃｜編輯部
Planned by the editorial board

訪談及整理｜鄧曉炯
Interviewed & Edited by Joe Tang

筆錄｜高紅（澳大校園記者）
Transcribed by Elisa Gao (UM Reporter)

攝影｜李思、何杰平
Photos by Manual Reis, Jack Ho

2012年11月16日，澳門大學（澳大）在文化中心舉行2012年榮譽學位及高等學位頒授典禮，在澳門特別行政區行政長官兼澳大校監崔世安博士主持下，澳大向阿登•李•貝蒙特教授(Arden Lee Bement, Jr.)、蘇樹輝博士及姚期智教授頒授榮譽博士學位，以表彰他們在科學研究、文化與教育等方面的重大貢獻。代表榮譽博士在典禮上致辭的姚期智教授表示，「歷經三十餘載的發展，澳大不僅在教學、研究領域成績斐然，在社會服務方面更取得了卓越成就，正朝著世界一流大學邁進。」姚教授對澳大的高度評價，實令澳大人倍感鼓舞。

追溯起來，姚期智教授和澳門的緣份，始於其澳門人導師、國際知名計算機科學家劉炯朗。幸運的是，在頒授典禮當日，姚、劉兩師徒均同在座，而更巧的是，姚教授的太太儲楓亦在場。算起來，當年專業本屬物理學的姚期智，就是在儲楓建議下轉向新興的計算機領域，而本身亦成就卓越的儲楓，目前在北京清華大學擔任講席教授，與先生比翼齊飛。澳大新語當然不會放過這個難得良機，力邀三位大師對談分享感受。姚氏夫婦加上姚教授的恩師劉炯朗，訪談室內頓時滿溢一片溫馨氣氛。而我們的話題，就從姚、劉二人差不多40年前的那段師生緣份開始……

On 16 November 2012, the University of Macau (UM) conferred honorary doctorates upon Prof. Arden Lee Bement, Jr., Dr. Ambrose So Shu Fai and Prof. Andrew Chi-Chih Yao, in recognition of their outstanding contributions in research, culture and education. The ceremony was presided by Dr Chui Sai On, Chief Executive of Macao SAR and chancellor of UM. In his speech on behalf of the other honorary degree recipients, Prof. Andrew Chi-Chih Yao said, “Through over thirty years of development, UM has attained impressive achievements in teaching, research and community service, and is now working towards the goal of becoming a world-class university.”

Of the four recipients, Prof. Yao deserves special mention because his ties with Macao dated back nearly forty years when he studied under Prof. David Chung-Laung Liu, a world-renowned computer scientist who received his early education in Macao and who watched with pride as his former student received the honorary degree. A close encounter at UM with two eminent computer scientists was an interview opportunity too good to be missed. So the editorial team of *umagazine* invited the two masters for an interview, to which they generously agreed. To our pleasant surprise, Prof. Yao’s wife Frances Yao, who was also at the ceremony, joined our interview. An accomplished scholar in her own right, Frances is a chair professor at Tsinghua University, Beijing. It was Frances who suggested to Prof. Yao forty years ago that he should switch from physics to computer science, a relatively new field at the time. And our interview began with Prof. Yao recalling how that suggestion led him to become a student of Prof. Liu, who would later have a profound influence on his life.

在澳門特別行政區行政長官兼澳大校監崔世安博士（右二）主持下，澳大向姚期智教授（左二）頒授榮譽博士學位。
UM confers an honorary doctorate upon Prof. Andrew Chi-Chih Yao (2nd from left) at a ceremony presided by Dr. Chui Sai On (2nd from right), chief executive of Macao SAR and chancellor of UM.

劉：劉炯朗　姚：姚期智　儲：儲楓
記：記者

劉炯朗：「姚班」就像當年的「錢班」一樣重要

姚：　我1973到75年在伊利諾大學的時候在劉教授門下。劉教授除了學問好，還懂得怎樣造就人才。我對他印象很深，是我早年就看到一個好老師的典範。劉教授最重要的就是因材施教，他的學生不見得全部數學都特別好，但每個人都有長處，可能有些人沒有什麼觀念性的想法，但基本功不錯，也很用功，那劉教授就給他一些能用數學表達出來的問題去做；而對於自己有想法的學生，劉教授就會給他們很多自由，鼓勵他們獨立思考。所以他的學生取得了各式各樣不同的成功，這對我影響很大，尤其是我最近幾年在清華教學生。劉教授當年的風範，對我有非常大的影響。

L: David Chung-Laung Liu　Y: Andrew Chi-Chih Yao
F: Frances Yao　J: Journalist

Liu: “The ‘Yao Class’ is as important as the ‘Qian Class’ ”

Y:　I studied under Prof. Liu from 1973 to 1975 at the University of Illinois. I was very fortunate to have such a good role model as Prof. Liu at a young age. He is a well-versed scholar and he knows how to educate students according to their strengths. For example, for students who didn’t have a lot of systematic ideas but were diligent and had a solid grasp of the fundamentals and theories, he would assign some tasks that suited their strengths; for those who had original ideas, he would give them a lot of freedom and would encourage them to think independently. That’s why his students have achieved success in different ways. He saw the strengths in every student and helped them achieve maximum potential. This has had a huge influence on me, especially for my teaching at Tsinghua University in recent years.

劉炯朗教授
Prof. David Chung-Laung Liu

劉： 姚教授在哈佛大學拿到（物理）博士學位，他的老師是諾貝爾獎得主Sheldon Lee Glashow。姚教授這兩天（在澳大）做的演講「量子計算：一門偉大科學的誕生」與今年諾貝爾獎也有很密切的關係，使很多平時不可能的事情都變成可能。所以我和姚教授是學無先後，達者為先。姚教授最讓我佩服的，是他八年前決定回國，到北京清華大學。其實這也是我們很多人的願望，但姚教授他是全身心投入。再講一點我覺得姚教授很了不起的，他剛去（清華）打算開研究所的課，後來發現得從頭教起，所以本科基礎課都是姚教授一手教的，在清華這幾年，他的學生已經出人頭地，在國際上最重要的會議上發表很多文章，現在只要是姚教授的學生，像美國MIT（麻省理工學院）、Stanford（史丹福大學）、Carnegie Mellon（卡內基梅隆大學）這些學校都歡迎。現在全世界最傑出的研究生願意到清華去，留下來為姚教授工作，所以這個「姚班」跟當年的「錢班」是一樣重要的。*（編按：「錢」指錢學森）*

姚： 這裡我可以談一談在清華的情況，剛開始我希望很快地組成一支研究隊伍，專注在我本行（計算機科學）的理論方面。因為中國計算機科學理論方面不太行，但這方面國際上很重視，比如說有20%的圖靈獎都是和理論有關，但在中國基本都沒有。*（記：您覺得這個跟中國的教育制度有關嗎？）*跟中國的科學研究重點有關係。中國在很長一段時間都是比較注重實用，需要一個東西馬上能看到有用之處。國內的計算機科學比較注重工程方面，不太注重科學基礎。所以我在清華就很想讓（理論）這方面生根，但我感覺要從本科開始，於是我們在清華二次招生，本科生報到的那個禮拜，我們就透過考試選拔了30個學生進來（姚班），這有點類似澳大的榮譽學院。現在大概已有四個班畢業了。我們應該很快能看到成效，我對此非常非常樂觀。像劉教授跟我從事的，尤其是對中國學生的培養，對提升中國計算機科學有很大幫助。

L: Prof. Yao received his PhD degree in physics from Harvard University, under the supervision of Sheldon Lee Glashow, a Nobel Prize laureate. Over the past two days Prof. Yao gave a lecture on quantum computing, which was related to this year's Nobel Prize in Physics, and which has the potential to make possible what's otherwise impossible. I may have started a little bit earlier than Prof. Yao, but in the journey of scholarship we are not so much teacher and student as travel companions who learn from each other and cheer each other on. What I find most admirable about Prof. Yao is his decision to return to China to teach at Tsinghua University eight years ago. This is a common wish of many people, but what sets Prof. Yao apart is the fact that he devotes himself to it with all his heart. Prof. Yao joined Tsinghua University with the intention of launching postgraduate programmes, but he soon realised he had to start with undergraduate courses, and so he did. Students he taught at Tsinghua University over the years have established themselves, with many papers published at major international conferences. Now Prof. Yao's students are welcomed by top universities like MIT Massachusetts Institute of Technology, Stanford, Carnegie Mellon, etc. His students are sought-after by top universities and the world's best postgraduates are willing to go to Beijing to work for him—I think that's quite something! That's why I think the "Yao Class" is as important as the "Qian Class". *(editor's note: "Qian" refers to Qian Xuesen.)*

Y: I'd like to talk a little bit about my early days at Tsinghua University. At first I was hoping to quickly set up a research team to focus on the theoretical aspect of computer science, because it is internationally recognised to be important—for example, 20 per cent of the Turing Award-winning projects are related to theory; but it is an area China has long neglected. *(J: do you think this has to do with China's education system?)* I think it has to do with China's priority in scientific research. For a long time China has focused on practicality; in other words, it wants to see immediate results. Computer science in China tends to focus on the engineering aspect, with little attention to scientific foundation. So I was really hoping it the awareness of the importance of the theory could take root at Tsinghua, but I also felt this should start with undergraduate education. So we conducted a second undergraduate recruitment. During the freshmen check-in week, we selected thirty students through exams for the Yao Class, which is similar to the Honours College at UM. We have since graduated four classes. I am very positive that we should see results pretty soon. I believe what Prof. Liu and I are doing, especially educating Chinese students, goes a long way towards raising computer science in China to a higher level.

剛到清華的時候，我們還做了一件事情，就是特別舉辦了很多會議，讓學生出去交流，我們在這方面花了很多資源，除了讓學生增長見識，也是為打造品牌。因為一旦有了這個品牌，就能讓別人感覺到我們的學生是非常非常優秀的，以後就會非常願意接受我們的學生。所以經過六、七年努力，現在這個品牌已經打出來，所有美國計算機科學(專業)方面的優秀大學都知道我們這個(姚)班。所以我覺得，當初做這件事是對的。

姚期智：大學教育要讓年輕人能回答兩個問題

記： 你們覺得教育的本質是什麼？一個好的教育制度又應是怎樣的呢？

姚： 大學教育，尤其是本科教育，最重要的，就是要讓年輕人能在大學教育裡回答兩個問題：第一，他們發現什麼是自己最感興趣的事情；第二，他們發現自己做什麼最拿手、最有能力？我覺得，整個大學最重要的，就是讓學生能發現這些事情，當然最好還有地方能讓他們發揮最大的潛力。為什麼我覺得這事情重要呢？因為我覺得一個社會或國家能比別的社會或國家更有優勢，就是因為能把人才發揮到最優化的程度。這聽起來容易，但做起來非常困難，這也是辦一所好大學最困難的地方，而不能說美國怎麼做，我們就怎麼做，因為大家的條件都不一樣。比如說美國最好的大學有很多頂尖的學者教授，他們不需要特別去教育學生，老師們只要做好本來應該做的事情，學生們有充分的自由，接觸不同的課，他們就有機會透過這些好老師，找

Another thing I did when I first joined Tsinghua was to organise many conferences to give students opportunities for international exchange. We devoted a lot of resources, and our purpose was two-fold: broadening students' horizons and building a brand internationally. Because once we have built a brand and make people realise our students are truly outstanding, they would be happy to accept our students for further studies after their graduation. Now it's been about seven years since we launched the project, and I'm glad to say that we have successfully built a brand—universities in the US that excel in computer science now all know our (Yao) Class. So I know we did the right thing.

Yao: "University education should help young people answer two questions."

J: What do you think is the intrinsic mission of education? What's your idea of a good education system?

Y: I think the most important mission of university education, especially undergraduate education, is to help young people answer two questions. The first is, "What am I really interested in?" The second is, "What do I excel at?" Of course it would be even better to provide a

姚期智教授
Prof. Andrew Chi-Chih Yao

到自己的興趣。但像這種方法，在亞洲比如中國就沒辦法，因為我們沒有那麼多的、足夠的人才，即使整個亞洲加起來也不可能有哈佛那樣(多的頂尖學者和教授)。所以我們就必須要花心思，讓我們的學生達到這樣的境界。我覺得，教育對我來講，它的基本使命，就是這件事情。

儲： 我過去幾年在香港教書，但要吸引學生學科技是比較大的挑戰。受(香港)社會環境影響，學生對法律、經濟、商業這些科目的興趣比較高。所以我們就要循循善誘，介紹科學的趣味以及裡面的思路，它(科學)和文學藝術一樣，你一旦瞭解之後，會非常非常吸引你，但要花很大功夫才能體會到當中的奧妙，不是件容易做到的事情。

劉： 我從一個不同角度來談談吧。有人問我：你在世界頂尖的學校，學到什麼東西？我說，第一、我知道天高地厚，因為看到那麼多老師同學都是世界上最傑出的人才，但我也知道天有多高、地有多厚，換句話說，跟他們在一起，我會很努力，大家不會相差太遠。所以一方面要知道天高地厚，另一方面也要知道天有多高、地有多厚。中國過去沒有這樣的機會，讓我們的學生一方面很謙卑，一方面也能建立信心。姚教授在清華大學，一方面讓學生們眼界大開，你看姚教授本人，還有他請來的朋友都是計算機科學裡最頂尖的；而同時姚教授也帶給他們信心，他的學生已在最好的國際會議上發表文章，我覺得這個就是教育的目的。

還有就是怎樣鼓舞學生下功夫做學問。成為世界級的學者，一定要有個大師在那邊給他做榜樣。我覺得姚教授做的很重要的一件事情，就是讓學生看到：啊，假如我努力的話，也許有一天，我也可以到達這個(水平)。像姚教授、楊振寧教授、丘成桐教授，他們建立了這種大師級的榜樣給學生，不光是教他們東西，還鼓舞他們，這是非常非常重要的。

platform for students to achieve their maximum potential. But basically I think helping young people find answers to the two questions is the most important thing any university could do, because whether a country can have an advantage over other countries depends on whether its people can achieve their maximum potential. As with many other things, this is easier said than done, and it is the greatest challenge for any university that aims for excellence. We can't just mechanically copy the practices of US universities because the circumstances are different. The best universities in the US have many top professors and scholars. These professors don't have to go out of their way to educate the students; they just need to do their job. Even so their students still stand a better chance of discovering their interests than their Chinese counterparts because they have sufficient freedom to access different courses and interact with all these excellent teachers. But this approach simply wouldn't work in China or other parts of Asia, because we just can't hold a candle to Harvard in terms of faculty strength, not even with all professors from Asia combined. So we have to be creative and design ways that suit us to help our students achieve a similar outcome. For me, that's the intrinsic mission of education.

F: I've taught in Hong Kong for a couple of years, and from my personal experience, I feel that it's difficult to make Hong Kong students interested in science and technology; they are more interested in subjects like law, economics and business administration, probably because those are what society is interested in. So we have to draw them in patiently, by introducing them to the fun side of science and the logic behind it. Like art and literature, science is something that will fascinate you once you understand it better; but appreciating the beauty of science is not easy, it takes a lot of work to get there.

L: I'm going to answer this question from a different angle. I was once asked: "What did you learn from the best university in the world?" I answered: "I was at once humbled and hopeful, humbled because I was surrounded by so many extremely talented people, hopeful because I was with them every day, and I knew that if I worked really hard, I would not be lagging behind too much. " I think it's very important to keep our students both humbled and hopeful, in other words, to instil in them both humility and confidence. Prof. Yao does exactly that! He opens students' eyes because he himself and the people he invites to give lectures are all top computer scientists. He boosts students' confidence through various ways, including helping them to publish papers at top international conferences. I think that instilling in students both humility and confidence is an important mission of education.

儲楓教授
Prof. Frances Yao

我覺得，現在教育制度受社會大環境影響，目前的教育制度難以培養學生讀書的興趣，沒有讓他們學會讀書的方法，而如果他有興趣有方法了，把他吸進去，他再也出不來。而姚教授就像一塊磁鐵，把學生們吸引過來，他們自然就會往下走。說實在話，姚教授帶起了一股風氣，有很多年輕教授跟著他。你像美國麻省理工學院裡有一百多個教授、幾百個非常傑出的學生，這樣的環境就會讓你覺得鼓舞，這非常重要，「姚班」就有這個好處，30個人都在相互鼓舞。

I think another mission of education is to motivate students to devote themselves to scholarship by the teacher's own example. In order to become a world-class scholar, you must have a master to serve as your role model. I think a very important thing Prof. Yao has done for his students is to make them realise that as long as they work hard, they might one day attain the same level. It's very important for teachers to not just teach but also motivate, which is exactly what masters like Prof. Yao, Prof. Franklin Chen-Ning Yang and Prof. Shing-Tung Yau have done. In today's society, with the current education system, it's very difficult to make students interested in learning, much less to teach them the correct method to learn, which is a shame. Because with interest and correct method, a teacher could draw students like a magnet, like Prof. Yao does. There are over one hundred professors and several hundred outstanding students at MIT, and this creates an environment that keeps you motivated, which is very important. And this is what happens in the "Yao Class"—thirty people are motivating each other.

儲楓：要對國家、社會、人類做更大貢獻

記：　從科研到教育，不管從哪個角度、用哪種標準來看，三位已經取得令人矚目的成功。那麼，你們對「成功」又如何定義？

姚：　我覺得，成功就是你自己想想，對自己一生的經過是不是覺得相當滿意？是不是盡了自己最大的力量，能對世界產生一些影響？如果一個人覺得說我盡了最大的力量來做事情，我覺得就是一個成功的人。

劉：　我同意姚教授所講。我是1952年離開澳門的，算起來已經60年了，但我覺得，就跟60年前一樣，我會盡力做到最好，自己在做事、讀書還有做人等方面，一直都盡力做到最好。比如我當年在（澳門）蔡高中學讀書的時候，國內正值動亂時期，進大學是從來沒想過的，那時澳門沒有大學，只有去香港讀大學，但自己做夢也沒想過，我沒錢，什麼都沒有，我當學生的時候，連飯都沒得吃，學費都交不出來，看不見前途。但我還是非常努力讀書。到現在，像我最近七、八年來，每個禮拜都做一個電台節目，那是件小得不能再小的事情，但是就像剛剛姚教授講的，我還是盡力去做好。做人做事，一定要盡你的力才行。

儲：　劉校長從美國回台灣做校長，在台灣清華大學發展了多方面的經驗、智慧和才能，在學術界發揮了更大的作用，我覺得這是個非常有意義的選擇，而且他也帶了很多學生，這間接也對姚教授、我以及其他教授回到亞洲來，有種帶頭的作用。所以我覺得，所謂成功，就是在你施展所長的方面，選擇對國家、對社會、對人類能做更大貢獻的機會和方向，這能令個人事業的成功更有意義。

Frances: “Choose the path where you can contribute the most to the world.”

J:　You three have achieved remarkable success in research and education. What is your definition of “success”?

Y:　I think success is when you look back on your life and ask yourself if you are pleased with the journey and if you have tried your best and have had some impact on the world, you can say yes.

L:　I couldn’t agree more. “Always try your best” has been my motto since a young age. When I was in middle school, China was in a state of turbulence, and going to university was something I never dared to think about even in my wildest dreams—for one thing, Macao didn’t have any university, only Hong Kong did; for another, I had no money, I couldn’t even afford tuition fees and I constantly worried about where my next meal would come from. To put it simply, I couldn’t see a future, but still I studied very hard, because of my belief in that motto. It’s been sixty years since I left Macao in 1952, but this attitude hasn’t changed one bit. I’ve been hosting a radio programme for seven or eight years now, and even for a little thing like that, I always do my best.

F:　Prof. Liu returned to Taiwan from the US to be the president of Tsing Hua University, where in addition to teaching, he used his experience, wisdom and talents to develop Tsing Hua in various areas and played a greater role in the academic circle. More importantly, I think his return has had a motivational impact on me, Prof. Yao and other professors who have chosen or might one day choose to return to Asia. So I think to achieve meaningful success, you should choose a path where you can use your strengths to make the greatest contribution to your country and the world.

(The English is a translation of the interview conducted in Chinese)

後記 Postscript

科學創見，起於精思妙想，成於探索實踐，盛於人才培養。不管是姚氏夫婦、還是劉教授，他(她)們熱心教學，以身作則，始終把培養人才、服務社會作為崇高的使命目標，為之傾注精力心血，其成就不但有目共睹，更對澳大日後構建全天候、多方位的教育模式，以及創建具特色的世界一流大學帶來了深刻的啟發。

Scientific inventions begin with original ideas, develop with explorations and practice, and prosper with talent nurturing. What Prof. Yao, Frances and Prof. Liu have in common is their dedication to education and to serving society. Their achievements speak for themselves, and are deeply inspirational for UM in its efforts to implement a multi-faceted education model and to become a world-class university.

姚期智教授 Prof. Andrew Chi-Chih Yao

知名計算機科學家、澳大榮譽博士，國際計算機理論方面最頂尖的學者之一。2000年，姚教授獲全球首要計算機協會（ACM）授予圖靈獎，成為該獎創立以來首位獲獎的亞裔學者，也是迄今為止唯一獲此殊榮的華裔計算機科學家。姚教授曾於麻省理工學院、普林斯頓大學、史丹福大學、加州大學伯克利分校等多所美國知名高等學府任教。2004年出任北京清華大學計算機科學專業教授，先後創辦計算機科學實驗班、理論計算機科學研究中心、交叉資訊研究院和量子資訊中心。姚教授亦受聘於香港中文大學為博文講座教授。

Prof. Andrew Chi-Chih Yao is a well-known computer scientist and recipient of an honorary doctorate from UM. He is recognised as one of the world's leading scholars in the theory of computation. He received the Turing Award in 2000 from the world's leading Association for Computing Machinery, becoming the first and the only overseas Chinese computer scientist to date to have won this award since its founding. Prof. Yao has taught at numerous renowned universities in the US, including MIT, Princeton University, Stanford University, and the University of California, Berkeley. In 2004 he became a professor of computer science at Tsinghua University, Beijing, where he successively founded a computer science pilot class (more commonly known as the "Yao Class"), the Institute for Theoretical Computer Science, the Institute for Interdisciplinary Information Sciences, and the Center for Quantum Information. He is also a Distinguished Professor-at-Large at the Chinese University of Hong Kong.

劉炯朗教授 Prof. David Chung-Laung Liu

國際知名計算機科學家、澳大榮譽博士及台灣清華大學蒙民偉榮譽講座教授。先後於麻省理工學院、伊利諾大學、台灣清華大學等高校任教，曾任伊利諾大學（香檳校區）助理副校長及台灣清華大學校長。迄今發表180餘篇學術論文，出版了八部學術專著、七部中文散文集。2005年至今於新竹IC975廣播電台每週主持一期的人文科技節目。

Prof. David Chung-Laung Liu is a world-renowned computer scientist, recipient of an honorary doctorate from UM, and William Mong Honorary Chair Professor of Computer Science at Tsing Hua University, Taiwan. He has taught at MIT, the University of Illinois and Tsing Hua University, Taiwan. He was associate provost at the University of Illinois at Urbana Champaign and president of Tsing Hua University, Taiwan. He has published over 180 technical papers, eight technical books and seven Chinese essay collections. He has been hosting a weekly radio programme on technology and humanities for the radio station IC975 in Hsinchu, Taiwan, since 2005.

儲楓教授 Prof. Frances Yao

北京清華大學交叉信息院講席教授。1973年獲麻省理工學院計算機博士學位，先後在美國伊利諾大學、布朗大學及史丹福大學任教。2003年加入香港城市大學電腦科學系並任系主任。研究跨越理論計算機科學各方向，專長於計算幾何與組合演算法。其論文"Speed-up in Dynamic Programming"和"A Scheduling Model for Reduced CPU Energy"被視為演算法研究重要新分支的源頭。

Prof. Frances Yao is a chair professor at the Institute for Interdisciplinary Information Sciences, Tsinghua University, Beijing. She received her PhD degree in mathematics from MIT in 1973. She has taught at the University of Illinois, Brown University and Stanford University. She joined the City University of Hong Kong in 2003 and served as the head of the Department of Computer Science. Her research interests cover various areas in theoretical computer science, specialising in computational geometry and combinatorial algorithms. Her papers "Speed-up in Dynamic Programming" and "A Scheduling Model for Reduced CPU Energy" ushered in an important new branch in the studies of algorithms.


UNIVERSIDADE DE MACAU

三位榮譽博士（左三：姚期智教授，左四：阿登•李•貝蒙特教授、左六：蘇樹輝博士）與行政長官崔世安博士及澳大領導層合影。

Three honorary degree recipients (left to right, Prof. Andrew Chi-Chih Yao (3rd), Prof. Arden Lee Bement (4th), Dr. Ambrose So Shu Fai (6th) with Macao SAR Chief Executive Dr. Chui Sai On and UM's top management

澳門大學今年向阿登•李•貝蒙特教授、星雲大師、蘇樹輝博士及姚期智教授四位傑出人士頒授榮譽博士學位，以表彰他們在研究、文化與教育等方面的重大貢獻。頒授典禮於2012年11月16日舉行，澳門特別行政區行政長官兼澳大校監崔世安博士親臨主持。

UM this year conferred honorary doctorates upon four distinguished individuals, namely Prof. Arden Lee Bement, Jr., the Most Venerable Master Hsing Yun, Dr. Ambrose So Shu Fai and Prof. Andrew Chi-Chih Yao, in recognition of their outstanding contributions in research, culture and education. The conferment ceremony was held on 16 November 2012. Dr. Chui Sai On, chief executive of Macao SAR and chancellor of UM, presided over the ceremony.

知名材料科學家阿登 • 李 • 貝蒙特教授
Prof. Arden Lee Bement, Jr., renowned materials scientist

獲頒榮譽理學博士學位的知名材料科學家阿登•李•貝蒙特教授，在業界、學術界及政府機構中作出了重大貢獻並出任許多重要領導職務，曾主管多間國際機構於科技方面的重要事務，現為美國國家工程院院士。貝蒙特教授致力於材料研究，尤其是支持先進的工程轉化技術，曾先後擔任美國麻省理工學院核材料學教授、美國－蘇聯雙邊磁流體動力學交流計劃成員、麻省理工學院聚變技術研究計劃主管、美國國防部研究與工程副部長、國家標準技術研究所主任等。此外，在他出任美國國家科學基金會主席期間，領導國家科學基金會在中國北京設立辦事處，促進中美科技合作。

Prof. Arden Lee Bement, Jr., recipient of the Degree of Doctor of Science *honoris causa*, has made outstanding contributions in his many important leadership roles in industry, academia, and government agencies. He was in charge of science and technology affairs at numerous international organisations. He is currently a member of the United States National Academy of Engineering. Prof. Bement conducts materials research in support of advanced engineering conversion technologies. He successively served as professor of nuclear materials at the Massachusetts Institute of Technology (MIT), member of the US-USSR Bilateral Exchange Program in MHD, head of the MIT Fusion Technology Program, deputy undersecretary of defense for research and engineering, and director of the National Institute of Standards and Technology. He was the director of the US National Science Foundation (NSF). Under his directorship, NSF opened its office in Beijing, China, which played an important role in enhancing Sino-US collaboration in science and technology.

佛光山開山宗長星雲大師
The Most Venerable Master Hsing Yun, founder of the Fo Guang Shan Buddhist Order

佛光山開山宗長星雲大師名貫寰宇獲頒榮譽人文學博士學位，他曾先後創建200餘所道場，樹立佛教制度新風，信眾遍及天下，在全球均具極高知名度與影響力。星雲大師畢生精研宗教哲學，博聞強識，著作等身，學術造詣精深，人文修為甚高，此外，他更熱心公益，致力弘揚教育、文化和慈善事業，利濟眾生，於國內外創辦多所教育機構，包括：九所美術館、26所圖書館及出版社、12所書局、50餘所中華學校、16所佛教學院等。大師一生得獎無數，舉其熒熒大者，如1978年榮膺首獲美國東方大學榮譽博士的比丘，1992年被公推為世界佛教徒友誼會永久榮譽會長，1995年榮獲全印度佛教大會頒贈「佛寶獎」。

The Most Venerable Master Hsing Yun, recipient of the Degree of Doctor of Humanities *honoris causa*, is the founder of the Fo Guang Shan Buddhist Order. He has established himself as an influential world religious and philanthropic figure, with a large following worldwide. He has built more than two hundred temples all over the world. He has dedicated his whole life to the study of the philosophy of religion. He is well-read, a prolific author, and is committed to the advancement of philanthropic, educational and cultural causes. He has founded a large number of educational institutions both at home and abroad, including nine art galleries, twenty-six libraries and publishers, twelve bookstores, over fifty Chinese schools, and sixteen Tsung Lin Buddhist colleges. Master Hsing Yun has received numerous honours. In 1978, he became the first Buddhist monk to receive an honorary doctorate from the Eastern University in the US. In 1992, he was elected honorary president of the World Fellowship of Buddhists. In 1995, he received the Buddha Ratna Award from the All India Buddhist Conference.

著名商界翹楚蘇樹輝博士
Dr. Ambrose So Shu Fai, distinguished figure in the business world

獲頒榮譽社會科學博士學位的著名商界翹楚蘇樹輝博士，為澳門博彩控股有限公司行政總裁、澳門博彩股份有限公司董事。為全國政協委員、葡萄牙共和國駐香港特別行政區名譽領事、澳門特別行政區政府經濟發展委員會成員、澳門特別行政區政府文化諮詢委員會成員，以及澳門陸軍俱樂部理事會主席等，對推動澳門、香港、中國及葡萄牙的經濟和文化交流合作，特別是促進澳門在中國與葡語系國家之間的平台作用，貢獻良多。同時，他在服務澳門博彩旅遊業逾35年間，促進了澳門博彩業的專業化、規範化和多元化。蘇博士為書法家，並舉辦多次個人書法作品展。2009年，蘇博士獲澳門特別行政區政府頒授文化功績勳章。

Dr. Ambrose So Shu Fai, recipient of the Degree of Doctor of Social Sciences honoris causa, has made significant contributions to the economic and cultural exchange and collaboration between Macao, Hong Kong, China and Portugal, especially in fostering Macao's role as a platform between China and Portuguese-speaking countries. He is presently CEO of SJM Holdings Limited, Director of Sociedade de Jogos de Macau, S.A., member of the National Committee of the Chinese People's Political Consultative Conference, Honorary Consul of the Republic of Portugal in Hong Kong SAR, member of the Economic Development Council and of the Cultural Consultative Council of the Macao SAR government, and President of the Board of Directors of the Macau Military Club. Dr. So has served in Macao's gaming and tourism industry for more than 35 years, during which time he has made relentless efforts to the professionalism, regulation and diversification of the gaming industry. Dr. So is a devoted calligrapher and has held numerous solo exhibitions. In 2009 he was awarded the Medal of Cultural Merit by the Macao SAR government.

新方向、新起點
—澳大「學生事務」專題報導

New Direction, New Start
Feature on Student Affairs at UM

撰文｜張愛華
Text by Ella Cheong

攝影｜何杰平、張愛華、黎詩琪
Photos by Jack Ho, Ella Cheong, Kay Lai

環視全球大學教育的發展趨勢，大多數高校已意識到課堂內外的學習具有互補性，而培養新時代的大學生，專業知識（硬實力）與博雅教育（軟實力）兩方面均不可或缺，新型的大學教育模式需要兩者的完美結合。

Many higher education institutions around the world have come to realize that classroom education and education outside the classroom should complement each other, that both professional expertise (hard skills) and liberal arts general education (soft skills) are indispensable in nurturing university students in this new era, and that a new mode of education requires the perfect balance.

因此，全球的知名大學均極重視學生事務，其教育功能也在不斷擴大。澳門大學（澳大）一直重視學生的課堂外的學習，2008年趙偉校長上任後，更推出「四位一體」新教育模式，提倡透過融合專業教育、通識教育、研習教育和社群教育，推動和實踐全人教育的理念，這一方面加強了學生的學術與研究硬實力，另一方面通過社群教育（主要以住宿式書院制度）培養學生專業以外的軟實力，包括樂觀積極、團隊合作精神、溝通技巧、責任感、同理心、是非道德判斷、終身學習等所有關乎個人修養與價值觀的能力。

That's why renowned universities attach great importance to student affairs via living and learning experiences. The educational function of student affairs is continuously expanding as the University of Macau (UM) attaches great importance to education outside the classroom. In 2008 after Prof. Wei Zhao took office as the rector, UM launched a new "4-in-1" education model, which aims to implement whole person education through the combination of discipline-specific education, general education, research and internship education, and community and peer education. Such an education model not only strengthens students' hard skills, but also helps students to develop – through community and peer education anchored in a residential college (RC) system – soft skills such as optimism, team spirit, effective communication, sense of responsibility, empathy, ability to exercise sound moral judgment, and lifelong learning, etc..

隨著澳大不斷發展，對學生事務工作亦提出了更高要求，橫琴新校區啟用後將全面引入住宿式書院，屆時需要大量優秀的學生事務人員來拓展學生事務。故此，澳大特別新增兩個專門負責學生事務的高層職位 —— 學生事務副校長和學生事務長，前者由擁有豐富高校管理經驗的程海東教授出任，後者由從事了20多年學生事務管理工作的余小明博士出任。此外，澳大今年5月亦舉辦了亞洲前所未有的澳門學生事務高級研修班，請來全球頂尖的學生事務專家、教育專家，全面提升高校學生事務發展人員的質素。因此，我們特別邀請程海東教授、余小明博士，從不同角度剖析澳大將如何打造學生的軟實力，全面加強學生管理方面的工作。同時，我們也專門走訪曾參與澳門學生事務高級研修班的學員，暢談完成修讀課程之後，對學生事務工作的新領悟、新啟發。

The rapid development of UM is placing higher demands on student affairs work. After the new campus on Hengqin Island is put into use, an RC system will be fully implemented. This inevitably requires the training of a large number of outstanding student affairs professionals. Therefore, UM recently created two senior positions responsible for student affairs: Vice Rector for Student Affairs, and Dean of Students. The former is held by Prof. Haydn Chen, who has rich experience in higher education management, and the latter is held by Dr. Peter Yu, who has over twenty years of experience in student affairs. Additionally, in May 2012 UM established Asia's first-ever Macau Student Affairs Institute, and invited top-notch student affairs and education experts from across the globe to provide an advanced training course. In this issue of umagazine, we invited Prof. Haydn Chen and Dr. Peter Yu to discuss from different perspectives how UM plans to help students acquire and improve soft skills, as well as how UM will enhance student management. We also interviewed some participants of the training course to learn what new understanding of student affairs they have gained from the course.

程海東：人的品格更重要

傳統的系與所開授的課堂學習，重點在於教授學生專業知識，由於專業知識培養學生特殊能力，因此更容易受重視，而課堂外亦即學生事務領域則恰恰相反。課堂外的學習是開放式的，時間長、空間大，內容豐富多樣，方法也千變萬化。它不一定有現成課本，難以量化，似乎缺乏一定的衡量標準。但微妙之處卻在於，社會卻對之極為重視，比如很多著名跨國機構聘請見習生，非常重視申請人的語文溝通、分析與解決問題、人際關係、團隊合作、國際視野、自我學習與激勵、情緒管理以及領導潛能等多方面的軟硬實力。

明年澳大新校區啟用後，將設立8至12所亞洲最大規模的住宿式書院，屆時學生可享受更多校園生活。書院與學院制度相輔相成，每所書院由約500人組成，不同學科、不同年級、不同族群的學生一起學習、生活和娛樂，互相學習，互相激勵，共同成長。在書院裡，師生將同宿共膳經常交流，形成一個跨學科的學習共同體。那麼，對於澳大學生軟實力的培養，以及推行在即的書院制度，澳大首任專責學生事務的副校長程海東教授又有何看法和規劃呢？

程：程海東教授
記：記者

記：　您認為21世紀最需要的是甚麼人才？澳大又如何配合社會發展的需要？

程、　21世紀的人才應具備以下能力、一、學習能力；二、服務熱忱；三、國際視野；四、實踐能力；五、多元智慧；六、人文素養；七、正向的人生觀。現在我們經常聽到說大學生態度不好，熱情不夠，行動力不足，合作性不強，抗壓力不大等責備之聲，其實這些與專業無關，屬於人格特質，而博雅教育的目的正是培養這些特質。20世紀的大學教育偏重於專業知識，科技重於人文，專業重於通才，但博雅教育注重培養學生成為知識的自由人而非知識的奴隸，因為若學生具備知識卻不懂獨立分析，那不過是個機械人而已。20世紀末的大學教育開始意識到，教育應以學生的學習成效為目的，於是開始關注人文與科技

Haydn Chen: Character Is More Important

Conventional classroom education, which focuses on imparting specialty knowledge, tends to be valued more readily, partly because knowledge is quantifiable and is aimed at educating students in specific skills. Education outside the classroom in the domain of general or whole person education, however, is a totally different matter, in that it is open-ended, requires more time and space, deals with a diverse range of issues, and has no fixed teaching methods or textbooks. The lack of a textbook and examinations makes it difficult to quantify and measure the outcome of this kind of education. But the tricky thing is that skills which normally can only be acquired through such education are greatly valued by society. For instance, many multinational companies hiring interns look for communication skills, analytical and problem-solving ability, interpersonal effectiveness, team spirit, a global mindset, self-education and motivation, mood management, and leadership potential.

After the new campus is put into use next year, between eight and twelve RCs will be established, forming the largest RC system in Asia. When that happens, students will be able to enjoy a richer campus life. The RC system will be a perfect complement to the faculty system. Each RC will be inhabited by approximately five hundred people. Students of different majors, years of study and ethnicity will live and learn together and from one another. Living and dining together in the same RCs will give staff and students ample opportunities to interact and make each RC into a multi-disciplinary learning community. What's Prof. Haydn Chen's opinion on soft skills acquisition and the RC system to be implemented on the new UM campus in the near future? And what plans does he have in these two areas?

C: Prof. Haydn Chen
J: Journalist

J:　What kinds of people are most needed in the twenty-first century? How can UM meet the needs of the developing society?

C:　People most needed by the twenty-first century should possess the following skills and traits: (1) excellent learning ability, (2) passion for service, (3) a global mindset, (4) practical ability, (5) multifaceted intelligence, (6) internalised liberal arts knowledge and caring about humanity, and (7) a positive outlook on life. Nowadays we often hear complaints about university students' poor attitude as well as their lack of passion, action, cooperativeness and stress-handling skills. These actually have little to do with which major subject they chose to study at college. These are personality traits, and the development of these traits is exactly the purpose of liberal arts education. In the last century, universities tended to focus on imparting professional expertise, with greater emphasis on science subjects than on the humanities, with priority on training specialists instead of generalists. But liberal arts education aims to help every student become an independent agent of

程教授鼓勵學生利用課堂外時間發展不同才能
Prof. Chen encourages students to use time outside the classroom to develop various talents

平衡的跨領域學習，這是21世紀培育人才的基本核心，澳大推行的「四位一體」教育模式，就是先培育學生成為一個具有良好品格的人，有行動力，有良好價值觀和道德關懷心，能在團體中發揮力量，這樣的人最後才能成為對社會有貢獻的人才。

記： 拓展學生事務對培養學生軟實力有何重要作用？

程： 現代大學教育觀念強調整合式跨領域學習，除了專業教育，還有博雅教育或軟實力教育，而在這方面，學生事務部可

free will rather than a slave to his knowledge, because a person full of knowledge in his head without independent analysis of the knowledge is nothing more than a robot. Towards the end of the twentieth century, universities came to realise that education should be learning-outcome-based, and so they began to attach more importance to multi-disciplinary education that stresses a balance between science subjects and the humanities. This is at the core of education in the twenty-first century. The "4-in-1" education model implemented at UM aims, first and foremost, to help students become people of action, people with good character traits and values and compassion, and people who can contribute to a team. Only then can they truly make valuable contributions to society.

J: What role does student affairs work play in helping students develop soft skills?

以發揮很重要的作用，這部門應超越其服務性的功能，成為教學單位，甚至是培養學生軟實力的平台。所有在學生事務部工作的人員，都肩負教育學生的責任。目前澳大學生事務部已制定了培養學生軟實力的教育目標，在此目標下我們將設計核心能力指標，然後通過各種課程、演講、工作坊、文藝、體育等多項活動，讓學生達到這些能力指標。

記：　品格教育對學生來説為何重要？

程：　學生若只有專業知識卻沒有良好品格，可能會造成很大的問題，比如知法犯法的法律學家、沒有道德價值觀的商人，他們對世界造成的害處可能會很大。雖然專業和品格兩者都很重要，但是若從造福人類的角度來看，我認為良好的品格更重要。人格特質關乎人文素養，超越了知識學習的範疇，那如何培養呢？這跟從小的教育培養有關：一個喜歡探索嘗試的人，視野就更寬廣。所以大學要注重培養學生自發學習的能力，並裝備優質的軟實力。我們要培養學生各方面的素養，包括耐力、協作精神、守規則、誠實，抗挫敗力等人格特質，這些軟實力所包含的品格教育、關懷之心、溝通技巧、價值觀、團隊精神、自律等，幾乎都無法完全從專業課裡學習，而要慢慢通過課堂外的跨領域學習以及書院住宿學習來培養。

記：　住宿式書院制度在培養學生人文素養的過程中擔任怎樣的角色？

程：　參考西方經驗，不論是英國牛津、劍橋的書院（college）或美國的博雅教育學院(college of liberal arts education)，生活學習都是核心教育理念。澳大新校園啟用後將全面推行住宿式書院，書院學習將以博雅教育的理念為核心——重視學習自由，追求相濡以沫的師生互動，書院生與書院導師一起生活，教學相長。這種書院生活就是培養具有人文素養的生活態度，培養書院生主動學習、主動解決問題，還有良好溝通、與人為善的學習和生活態度。唯有透過落實書院的生活學習與實踐，才能真正達到培養全人的目的。

C:　The modern view of higher education stresses integrated, multi-disciplinary education, which includes liberal arts education (or soft skills education) in addition to discipline-specific (hard skills) education. And in this respect, the Student Affairs Office (SAO) can and should play an important role. SAO should go beyond its service function and become a teaching unit or even a platform for soft skills acquisition. All SAO colleagues have a responsibility to educate students. We have set our goals in terms of helping students develop soft skills, and with that goal in mind, we will design some core capability indices. By way of various courses and activities, UM will help students reach those core indices.

J:　Why is character education important for students?

C:　People with professional expertise but without good character can cause great disasters to the world. For example, a lawyer who flouts laws, a businessman with no moral scruples. Although expertise and character are both very important, I think the latter is more important from the point of view of bringing benefits to humankind. Character traits have to do with internalised liberal arts knowledge and caring about humanity, and this is beyond the realm of specialty knowledge acquisition. So how do we cultivate these character traits? The answer is through education that starts at an early age. A person who likes to explore and experiment is bound to have a broader perspective. Therefore, it is very important for universities to help students to develop initiative to learn, and equip them with various soft skills. We need to help students develop various skills and traits, including endurance, cooperation, observance of rules, honesty, resilience against setbacks, a caring heart, communication skills, good values, team spirit, and self-discipline. These soft skills — and character education that is essential for developing these skills — are almost impossible to obtain purely from classroom education. They have to be slowly acquired from multi-disciplinary learning outside the classroom.

J:　What role does the RC system play in helping students internalise liberal arts knowledge and foster caring about humanity?

C:　Experience of Western universities, whether colleges at Oxford and Cambridge or colleges of liberal arts education in the United States, shows that learning through living is at the core of their education philosophy. After the new campus is put into use, UM will fully implement an RC system, which will embody the philosophy of liberal arts education — respect for academic freedom and encouragement of mutually beneficial teacher-student interaction through living together. This kind of RC life is a vehicle for instilling in students the right set of attitudes towards life and studies. It helps students to internalise liberal arts knowledge and to foster a caring heart. It also teaches students to use their initiative to learn, to solve problems proactively, to communicate effectively, and to be kind to others. Only through implementing RC-based learning through living and practice can we truly realise the goal of whole person education.

記： 如何協助學生充分使用課外時間加強軟實力？

程： 假設學生一星期上課五天，減掉備課、上課、睡覺、吃飯的時間，每週剩下的大概有68個小時由學生自行分配。學生可能會沒規則的使用這些時段，如上網、打工、運動、與朋友聚會等等，澳大「四位一體」的教育理念是由學生事務部和書院利用約每週10小時來幫助學生設計提升軟實力的各種課程、演講和活動。博雅教育的精髓不是機械式地教導某些課程，而是著重人與人之間的互動。書院對澳大而言具開創性，我們會為學生製造更多機會，吸引他們自發參與。書院有別於一般的宿舍生活，是很好的學習地方。由此方式推動全人教育，落實澳大「四位一體」的教育理念。

J: How does UM help students to make full use of their time outside the classroom to strengthen soft skills?

C: Let's say students attend classes five days a week, if we minus the time they spend preparing for and attending classes, sleeping and eating, they've only got about sixty-eight hours left at their disposal. And students may not use these hours in a well-planned way; they may spend it net-surfing, doing part-time jobs and sports, hanging out with friends, etc. The education philosophy of UM's "4-in-1" education model is to let SAO and each RC use these ten hours or so per week to organise well-designed courses, lectures and other activities to help students improve soft skills. The essence of liberal arts education is not the "chalk and talk" way of teaching, but rather lies in interaction. RCs are a pioneering move for UM. We will create more opportunities for students and make them truly want to participate. Living in an RC is different from living in a traditional dormitory. It's a wonderful place to learn. It is also a good vehicle for implementing the "4-in-1" education model and for advancing whole person education.

(The English is a translation of the interview conducted in Chinese)

程海東教授 *世界知名材料科學專家，在世界頂尖的美國西北大學取得材料科學及工程學博士學位，之後在美國伊利諾大學材料科學及工程系長期任教並取得終身教授職位。程教授歷任美國伊利諾大學學術副校長行政專員、香港城市大學物理及材料科學系系主任。2004年出任台灣東海大學校長，期間推動博雅教育，創立「博雅書院」，實踐培養學生知行合一的品格教育，使東海大學在招生、評鑑、教學、研究、訓輔等方面取得非凡的成果。2012年9月起出任澳大首任學生事務副校長。*

Prof. Haydn Chen *is a world-renowned expert on materials science. He received his PhD degree in Materials Science and Engineering from Northwestern University. He then taught in the Department of Materials Science and Engineering at the University of Illinois at Urbana-Champaign (UIUC) and became a tenured full professor there. He was administrative fellow of the Office of the Vice President for Academic Affairs at UIUC, and head of the Department of Physics and Materials Science and chair professor of materials science at the City University of Hong Kong. In 2004 he took office as president of Tunghai University, Taiwan. During his tenure as the president of Tunghai University, he actively promoted liberal arts education. He founded a liberal arts college to implement character education, which allowed Tunghai University to achieve extraordinary results in various areas, including student recruitment, teaching and research. In August 2012 he assumed office as the first vice rector for student affairs at UM.*

余小明：每分每秒都是教育的時機

就分工而言，課堂內的學習主要由各院系的任課老師負責，課堂外的學習則主要由學生事務老師統領。國外把「學生事務工作者」稱作「學生事務教育工作者」。余小明博士認為這觀念很合理，他自己也常對身邊同事說：「每分每秒都是教育的時機，所以我們組織學生活動要有教育目的，與學生每次的交流都有教育意義。學生事務首先是支持教學第一線，要為教學第一線服務；第二是要開展自己的課堂外教學，幫助學生拓展課外活動能力。」

上任澳大僅三個多月的余博士，發現澳大學生事務工作具有許多優點：「澳大不少學生都有兼職工作，各人對之評價不一。我認為這是學生了解社會、增加工作經驗、體現自我價值的好機會。澳大學生事務部的同事年輕、有活力，肯幹，實幹，辦了不少出色的活動。如最近我們增設『與教授茶聚』項目（tea with professors），讓學生近距離與老師對話；『學長扶助計劃』是另一個比較成功的項目，已經辦了10年了。參與學生可以提高自信，增進人際關係，建立正面積極的態度，學會有效地互相扶持，在校園內建立起一份關懷的氣氛。」

學生事務在大學應擔任甚麼角色？余博士概括指出，學生事務部主要負責處理三方面的關係：一、學校與學生的關係，幫助建立一種互動機制，建設同心同德、和諧的校園文化；二、學生與學生的關係，推動互助、互信、活潑的學生風氣；三、幫助或代表學校制定有關條例和處理個別案例，也就是學生管理。

余博士強調，在學生管理方面，要貫徹「懲前毖後、教育為本」的原則。在他最近處理的一個學生案例裡，當事學生一直被視為「麻煩分子」，多次與學生事務部同事發生爭執。余博士後來與該學生坐下來詳談，了解爭執起因，客觀梳理學生的情緒。談話後，該學生認識到自己性格衝動，更主動發道歉信予余博士。 余博士強調，處理學生個案時，要避免遞給學生一封處理意見信就完事的做法，「我們要清楚大學

學生通過「與教授茶聚」與老師近距離交流
Students speak with teachers face to face through "Tea with Professors"

Peter Yu: Every moment is a teachable moment

In terms of division of work, classroom education is mainly the responsibility of academic staff from various faculties, and education outside the classroom is mainly led by student affairs colleagues. In the West, student affairs professionals are referred to as "student affairs educators", which Dr. Yu thinks is very reasonable. He often says to his co-workers: "Every moment is a teachable moment, that's why we must turn every student activity and every interaction with students into a chance for education. Our first job is to assist teaching, and our second job is to carry out our own teaching outside the classroom to help students develop extracurricular skills."

Only three months into his new job at UM, Dr. Yu has already noticed many good things about student affairs work at UM. "Many UM students have part-time jobs. Different people have different opinions about that. But personally I think it's a good opportunity for students to learn more about society, to increase work experience, and to realise their individual value," comments Dr. Yu. "SAO colleagues are young, energetic, down-to-earth and willing to work hard. They have organised many great activities, such as the recent Tea with Professors, which aimed to help bring teachers and students closer. The Peer Support Programme is another successful example. It has been going on for ten years now. This programme boosts students' self-confidence, improves their interpersonal skills, helps them to cultivate a positive attitude, teaches them to support each other, and creates a caring atmosphere on campus."

When asked what kind of role student affairs work should play in a university, Dr. Yu pointed out that SAO is mainly responsible for handling three kinds of relationships. The first is the relationship between the university and the students, in which SAO helps to establish an interaction mechanism and to create a concerted, harmonious campus culture. The second kind is the relationship between students, in which SAO helps to promote mutual support and trust. The third is establishing rules and regulations and handling individual cases on behalf of the university – management of students, in other words.

Dr. Yu stresses that management of students should follow the principle of "learning from past lessons to avoid future mistakes with the aim of educating". He cites a recent case of a student who was considered a "troublemaker" and who has had many unpleasant exchanges with SAO colleagues. Dr. Yu sat the student down for a long talk to understand the cause, and he objectively walked the student through his feelings. After the talk, the student realised the excitable and impulsive side of his personality, and sent a letter of apology to Dr. Yu. Dr. Yu stresses that when handling student cases, one should refrain from just handing a letter notifying the student concerned of the disciplinary

是教育單位，與學生面談，幫助學生認識事情的嚴重性和後果，並解釋學校處理意見的教育意義，才能做到讓學生心服口服，而教育意義也能由此彰顯。」余博士説準備向校方提出，日後在學生紀律的處理方式內加上「社區服務」這一項，「我們的目的是教育，而不是懲罰」。學生事務部亦正計劃推動澳大學生參與社區服務，培養同學們的慈愛之心，同時還能透過組織活動提升學生的領導才能。

國外一流大學早已視學生事務為一門專業，投放了大量精力和資源，相對起步較晚的澳大在人員經驗和專業培訓方面仍有待加強。余博士算過，澳大學生事務部的30多位同事，人均學生事務工作經驗只有三年多，與一流大學相比還有差距。但余博士也指出，若論校方對學生事務的支持力度，澳大卻不輸蝕，如澳大在財務方面對學生活動和學生事務給予了非常大的支持，他説：「現在西方尤其在美國經濟衰退後，許多大學都削減經費，學生事務往往受很大影響。而澳大仍在財務上很『給力』，這是很多海外大學不如澳大的地方。」

澳大新校園明年落成使用後，校園擴大，設施倍增，可以預見學生事務的發展空間也會相應增加。因此，澳大學生事務部日後將陸續開展內部工作人員培訓，以應對新校園為學生管理事務帶來的新挑戰。

sanction, without any follow-up actions. “We should always bear in mind that a university is an educational institution, so we should talk to the student face to face and help him or her to understand the seriousness and consequences of the action,” says Dr. Yu. “We should also explain how the disciplinary sanction is really just a means of educating. Only then will the student be willing to accept the punishment, and only then will the purpose of educating be achieved.” Dr. Yu says he plans to propose adding “community service” as a form of disciplinary sanction. “Our purpose is to educate, not to punish,” he says. SAO hopes to encourage UM students to participate more in community service, because community service helps cultivate benevolence, and can also improve their leadership skills through event organisation.

Top universities overseas have long regarded student affairs as an area of expertise, and have invested considerable energy and resources in this area. In comparison, UM is a late starter and still has room to improve in terms of staff experience and professional training. Dr. Yu says that the more than thirty SAO colleagues have an average of three years of experience in student affairs, which is less than their counterparts at top universities overseas. But Dr. Yu also points out UM enjoys the advantage of top-down support for student affairs. “Many universities in the West began to slash funding, especially after the U.S. entered an economic recession, and student affairs took a hard hit,” remarks Dr. Yu. “But UM is still very generous in funding, which should make UM the envy of many overseas universities.”

Given the increased size and facilities on the new campus, it’s foreseeable that student affairs work will have greater room for development. Therefore, SAO will carry out internal staff training to prepare for new challenges that may arise in the future.

***余小明博士**於上海師範大學完成英國文學本科課程，其後在英國取得埃克塞特大學語言學碩士學位，美國維珍尼亞大學國際與比較教育哲學博士學位。畢業後先後出任美國維珍尼亞大學學生事務助理院長、副院長。余博士在美國從事了十多年的學生事務管理，對國際高等教育發展以及學生事務方面有非常豐富的經驗；他同時擁有10年教學經驗，曾於中國及美國等地任教和講學。2012年7月起出任澳大首任學生事務長。*

***Dr. Peter Yu** completed his undergraduate studies in English Literature at Shanghai Normal University. He received his master’s degree in linguistics from the University of Exeter, United Kingdom, and his PhD degree in International and Comparative Education from the University of Virginia, United States. After graduation he successively served as assistant dean of students and associate dean of students at the University of Virginia. Dr. Yu has worked in student affairs management positions for more than ten years in the United States. He also has rich experience in international higher education development and student affairs. He has ten years of teaching experience in both China and the U.S. In July 2012 he assumed office as the first dean of students at UM.*

學員：學生事務工作就是要幫助學生成為更全面的人

澳大快將搬入新校區並全面推行住宿式書院制度，可預見屆時將需要大量優秀的學生事務人員。那麼，目前該如何未雨綢繆呢？澳大今年5月特地開辦澳門學生事務高級研修班，課程由美國馬里蘭大學Susan Komives教授精心設計，是近年來亞洲最全面、最系統的高校學生事務精品專業課程。研修班課程分五部分，涵蓋高校學生事務工作的核心內容，分別邀請了七位來自美國的專家學者授課，包括：新澤西州羅格斯大學學生事務副校長Gregory S. Blimling博士、高等教育學生事務組織NAPSA管理執行董事Gwendolyn Dungy博士、愛荷華州立大學Robert Reason教授、俄勒岡州立大學學生事務教務長Larry Roper博士、維珍尼亞州大學Karen Inkelas教授、愛荷華州立大學特聘名譽教授John Schuh博士和聖地亞哥州立大學Marilee Bresciani教授。另外，時任台灣東海大學校長的程海東教授、北京大學副校長張彥博士、耶魯大學歷史學教授兼卡爾洪學院理事會主席Jonathan Holloway博士和中山大學學生處處長漆小平博士等，與學員們分享學生事務工作和住宿式書院的經驗。

研修班的59名學員來自兩岸四地的高校，大部分目前均從事與學生事務相關工作。澳大學生事務部學生輔導及發展處處長蘇桂龍（Elvo）是研修班學員之一，他形容為期十日的課程如一門紮實的理論基礎課。Elvo尤其對其中一位導師提出的「持續積極求變」(Positive Restlessness）的理論及實踐基礎深表認同，「我們舉辦學生活動面對不少挑戰，若不持續創新求變，就很難配合大學發展和學生需要。

蘇桂龍
Elvo Sou

Participants: Student affairs work should help students achieve well-rounded development

It won't be long before UM moves to the new campus and fully implements the RC system. It is foreseeable that a large number of outstanding student affairs professionals will be needed. So how should UM get ready for that? This May UM established the Macau Student Affairs Institute to offer an advanced course in student affairs, carefully designed by Prof. Susan Komives at the University of Maryland. The course was Asia's most comprehensive and systematic course in student affairs in recent years. It consisted of five parts, covering all key aspects of student affairs. It was taught by seven experts and scholars invited from the U.S.. They were Dr. Gregory S. Blimling, vice president for student affairs at Rutgers, The State University of New Jersey; Dr. Gwendolyn Dungy, executive director of NASPA – Student Affairs Administrators in Higher Education; Prof. Robert Reason from Iowa State University; Dr. Larry Roper, vice provost for student affairs at Oregon State University; Prof. Karen Inkelas from the University of Virginia; Dr. John Schuh, distinguished professor of educational leadership and policy studies at Iowa State University; and Prof. Marilee Bresciani from San Diego State University. Prof. Haydn Chen, who was then president of Tunghai University, Taiwan; Dr. Zhang Yan, vice president of Peking University; Dr. Jonathan Holloway, professor of history and master of Calhoun College at Yale University; and Dr. Qi Xiaoping, head of the student affairs office at Sun Yat-sen University were also invited to share their experience in student affairs and residential colleges with participants.

The fifty-nine participants of the training course came from higher education institutions from Macao, Hong Kong, Taiwan and mainland China. Most of them are currently working in student-affairs-related positions. Elvo Sou, head of the Student Counselling and Development Section at UM, was one of the participants. He thinks the ten-day course has helped him lay a solid theoretical and practical foundation. Elvo especially identifies with the concept of "Positive Restlessness" learned from the course. "We face many challenges in organising student activities," says Elvo. "And if we don't have 'Positive Restlessness', it would be very difficult to meet the needs of the students and the developing university. Not only does 'Positive Restlessness' apply to our work at Student Affairs, it also applies to our students. We expect them to learn and develop, especially in terms of soft skills such as team spirit and caring about humanity. We tell them our expectations and provide the necessary support to make their learning and development possible. Student Affairs has become a very strategic avenue to cultivate students' whole person development."

Another participant, Claire Ouyang, is a PhD candidate of the Faculty of Education. She says that the course has helped her to further integrate theories of student development as well as to better understand the role of student affairs in higher education institutions, and more importantly, it has reinforced her determination to pursue a career related to student development after graduation. "In order to help students to establish themselves in society, it's important for student affairs professionals to help them know more about themselves and achieve well-rounded development. In this process, teachers and student affairs staff should both play a role," says Ouyang.

持續積極求變不單適用於澳大學生事務工作，也適用於澳大的學生。我們希望學生不斷學習成長，尤其是在軟實力方面，如團隊合作精神、人文關懷等。我們將這些期望告訴學生，並提供必要的支持，來幫助他們學習及成長。學生事務已成為促進學生全人發展的一個策略性渠道。」

研修班的另一位學員歐陽白曉是澳大教育學院的博士生，她在碩士期間主修高等教育研究，目前的研究專注於生涯輔導和學生發展。透過這次研修，她認為自己更好地整合了學生發展理論，更瞭解學生事務工作在大學的重要角色和多樣的形式。這次研修經歷也令她更堅定了未來繼續在大學從事教育和學生工作的信念：「要幫助學生成長，並逐漸形成一個有關未來職業和生活的藍圖，學校的各個方面都很重要。」

澳大東亞書院導師黃才試(Kevin)也是參加研修班的學員，令他印象最深刻的，是有導師提出參與學生事務工作的人員——包括行政人員——都是教育工作者的觀念，「這觀念改變了很多澳大行政人員過往的看法，大家受到莫大的鼓舞，覺得參與學生事務很有意義。」Kevin表示，在大學工作的每位職員都有機會與學生接觸，你無法預計今天與學生的相處會對他們日後產生甚麼影響，但在他們畢業2、30年後再回想當年大學生活，可能是他們最大的收穫，「而這正是現時大學推行住宿式書院制度所希望見到的效果。」

現今社會發展日新月異，環境亦趨複雜多變。「一本通書讀到老」的時代已然不再，而大學教育也早已非職業教育、技能教育那麼簡單。大學畢業生投入與主修專業無關的行業亦日趨普遍。現代高等教育最重要的核心價值，除了培養學生的專業知識、跨學科知識、發掘和創造新知識的能力，更重視培養同學們終身自發學習、主動探索創新、高尚品格，以及對生活充滿熱情等全方位素質。

澳大師生員工很快將遷入比現校園大20倍的新校園，屆時透過更完備的軟硬件，將加快推動「四位一體」教育模式全面落實，全方位打造學生的軟硬實力，尤其通過住宿式書院，培養學生的品德、人格，並促進他們的群體合作精神。此時此刻，我們站在新起點，面對新方向，將推動澳大的教育事業走向嶄新的開闊局面，而新的教學及學生管理模式，也勢必給澳門及鄰近地區的高等教育體系發展帶來新啟示。▌

歐陽白曉
Claire Ouyang

黃才試（右）在研修班上與導師交流
Kevin (right) discusses questions with an instructor of the advanced course in student affairs

Kevin, a resident fellow at UM's East Asia College, also participated. He says what left the deepest impression on him was the concept introduced by one course instructor that all student affairs staff, including administrative staff, are educators. "This concept is very encouraging," says Kevin. "It changes the way many UM colleagues perceive their jobs and helps them realise that working in student affairs is actually very meaningful." Kevin says that every UM colleague has the chance to deal with students, regardless of their positions, and one simply can't predict how today's interaction is going to affect the students in the future. "You never know. Your one encounter with the student could have the biggest impact on him or her twenty or thirty years after graduation, and that's what UM hopes could happen with the RC system." says Kevin.

Today's world is fast-changing and complicated. Long gone are the days when people could rely on the education they received in the classroom to sustain and nourish them for the rest of their lives. University education has ceased to simply fulfill the function of vocational education or skills training, and it is becoming increasingly common for university graduates to work in professions not related to their major area of study. In addition to imparting knowledge, both in and outside the students' chosen fields of study, and teaching them to discover and create knowledge, modern higher education also attaches great importance to helping students cultivate a full range of qualities, such as initiative to pursue lifelong learning, willingness to explore and innovate, a noble character, and passion for life. This is also the most important core value of modern higher education.

With UM soon to move to a new campus that is twenty times larger than the current one, we find ourselves at a new beginning. We believe that the better facilities on the new campus and the advanced systems and education philosophy will accelerate the implementation of the "4-in-1" education model, which will in turn help the students to cultivate soft and hard skills. The RCs, in particular, will play a tremendous role in helping students to cultivate good character, personality and team spirit. The new mode of teaching and students management will certainly spur other higher education institutions in Macao and the neighboring regions to contemplate on their own development. ▌

「數學是我看世界的方式」

專訪錢濤教授

"Maths Is My Way of Looking At the World"

Interview with Professor Qian Tao

撰文｜鄧曉炯
Text by Joe Tang

人物攝影｜何杰平
Portrait images by Jack Ho

圖片及手稿提供｜錢濤
Pictures and manuscripts provided courtesy of Qian Tao

錢濤教授 *畢業於北京大學，曾在中國科學院系統科學研究所、澳州麥考瑞大學、弗林德斯大學以及新英格蘭大學等校從事教學及研究，目前任職澳門大學科技學院數學系。曾參與組織多次國際學術會議，發表會議論文及專著篇章共130多篇。*

Prof. Qian Tao *Graduated from Peking University, has worked at the Institute of Systems Science, Chinese Academy of Sciences; Macquarie University, Flinders University and the University of New England, Australia. Currently he works in the Department of Mathematics, Faculty of Science and Technology, University of Macau. He has been involved in the organisation of numerous international conferences, and has published over 130 conference proceedings, papers, books and book chapters.*

2012年10月19日下午，在首屆澳門科學技術獎頒獎典禮上，澳門大學（澳大）以榮獲九項科學技術獎、19名碩博士研究生獲「研究生科技研發獎」，在本澳高等院校中稱冠。澳大錢濤教授的「瞬變訊號的時頻分析和算法實現：信號的調和分析及Clifford分析」項目更榮獲唯一一項「自然科學獎」一等獎。然而，比起學術方面的彪炳佳績，原來錢教授的人生路卻更曲折跌宕。且讓我們一同走進他的數學世界，分享他的生命傳奇……

At the first Macao Science and Technology Awards Ceremony held on 19 October 2012, the University of Macau (UM) won nine prizes across three categories as well as the Postgraduate Science and Technology Research and Development Awards by nineteen postgraduate students, eclipsing all other higher education institutions in Macao. Prof. Qian Tao's project, *Time-Frequency Analysis of Transient Signals and Algorithm: Harmonic and Clifford Analysis of Signals*, won the sole first prize in the Natural Science Award category, representing yet another recognition of his impressive academic achievements. Even more impressive is Prof. Qian Tao's life story, which he will share with us in this article.

「保持求知慾，保持對新鮮事物的學習熱情。」

出生於知識份子家庭的錢濤從小就對數學執迷，初中時便展現出獨特數學天賦，因在數學競賽獲第一名而被保送至聞名遐邇的北京四中。雖然校內匯集全北京的優秀學生，如囊中之錐的錢濤很快嶄露頭角：高一出任三角科代表，高二被選為學習委員。然而，就在升讀高三之際，國內政治氣氛驟然一變——文革烏雲籠罩神州大地，錢濤因家庭出身被打入「改造」行列。1968年12月28日，在席捲全國的「上山下鄉」運動中，錢濤被分到山西省汾陽市峪道河公社，開始了在農村插隊落戶的艱苦歲月。

雖身處偏遠荒涼的農村，但錢濤對數學的執著卻絲毫未減，他不但堅持自學，更與四位志同道合、同樣從北京下放的「老三屆」中學生——程翰生、王明、張葆環和王世林於1969年7月20日成立了中學生現代數學研究小組。這個被數學界戲稱為「五人小組」的團體當年刻意保持沉默，其事跡後來於2001年被寫成《五人小組故事》，為海內外媒體爭相轉載，令這段中國數學界「老三屆」傳奇廣為人知。

錢濤說當時分散各地的五人小組大多透過書信聯繫，偶爾回北京也會向指導老師、數學家韓念國請益，但大部分時間還是靠自己努力。很長一段時間裡，錢濤每天完成繁重勞動後，便在小油燈下研讀至深夜，到早晨連鼻孔都被熏成黑色，他至今還記得一題一題啃《吉米多維齊數學分析習題集》，「那是蘇聯出的，4500多道題，非常難，我一般每天清早下地前先抄十題，然後一邊做（農活）一邊想，回家再把它（答案）寫出來。」錢濤的大學數學基礎及英文閱讀能力全靠自學而來，「比如說學英文吧，我就自己看書，第一個月，看初一的英文課本，30幾課，一天一課，學音標、詞彙；第二個月，再拿一本我想看的英文（數學）書，先讀序言，一天一句，把那句裡的單詞、語法都弄清楚，到第三個月就開始看（全）書了。」憑著鍥而不捨的拼博精神，他積累下紮實的基礎知識。

下放九年，錢濤耕過田、種過菜、放過羊，甚至當過赤腳醫生和鑽井隊電測員，但一直沒有放棄數學。70年代末，中國政治氣候漸露曙光。1977年8月，重返領導職務的鄧小平在一次重要講話中提到「恢復高考」，這消息給散佈各地的五人小組帶來了希望。韓老師更給歷經近十年磨難的五人打氣，「現在恢復高考和招

Stay Hungry, Stay Passionate

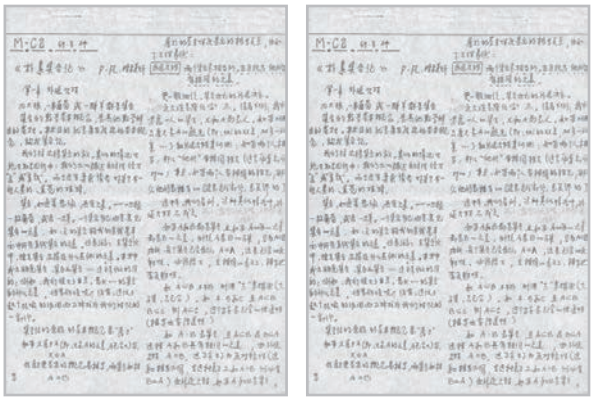
Born into a well-educated family, Qian Tao has been fascinated with maths ever since he was a child. His gift for maths became more apparent after he began secondary school. He was recommended for direct admission to the famous Beijing No. 4 Middle School after winning the first prize at a major maths competition. Even in the more-than-a-century-old school with the best students from Beijing, Qian Tao quickly stood out from the rest. In the first year he was appointed assistant to the geometry teacher, and in the second year he was elected assistant to the homeroom teacher in study-related matters. Towards the end of his second year at Beijing No. 4 Middle School, the political climate in China changed abruptly — the dark cloud of the Cultural Revolution spread over the whole country, and Qian Tao was soon classified into the group in need of "re-education" due to his family background. With the "Down to the Countryside" movement sweeping across the country in 1968, Qian Tao was sent to a village in Shanxi province, where he spent nine difficult years.

Being banished to the remote countryside didn't diminish Qian Tao's passion for maths one bit. Not only did he continue to teach himself, he also co-founded, on 20 July 1969, a modern secondary school maths study group with four other like-minded young men. This group deliberately kept a low profile during those turbulent years and remained obscure to almost everyone except a handful of senior mathematicians in Beijing, who gave the group the nickname "The Quintet". After a story about their experiences was published in 2001, The Quintet quickly became the object of extensive media coverage both at home and abroad.

恢復高考後，全部考入大學的「五人小組」返京後與韓念國老師（前排中）合照：錢濤（前排左）、張葆環（前排右）、（後排左起）程翰生、王明、王世林。

Group photo of members of The Quintet: QianTao (front left), Zhang Baohuan (front right), (back row, from left) Cheng Hansheng, Cheng Hansheng, Wang Ming and Wang Shilin with their teacher Han Nianguo (front middle) in Beijing.

當年破格考上北京大學研究生，轟動一時。
Qian Tao became the talk of the town when he was exceptionally accepted by Peking University as a postgraduate student



插隊時期錢濤邊幹農活邊自學的數學手稿
Manuscripts of maths books that accompanied Qian Tao while he was in the countryside doing farm work during the Cultural Revolution

研究生，就是為了把你們這樣的人招上來」，更鼓勵他們跳過大學本科報考研究生。同年12月，五人小組在恢復高考後全部考入大學。錢濤考進山西大學數學系沒半年，便向系裡提出報考北京大學研究生，此事在校內一石激起千層浪：校領導覺得這年青人太自滿 —— 一個落戶農村近10年的中學生，怎麼可能跳過大學去考北大研究生？學校安排了高等代數和英語兩門嚴格的考試。想不到，錢濤輕取98分（兩門課加起來滿分為100），其後再下一城，順利考取北大數學系研究生，更成為山西考入北大第一人，一時轟動全省。

「你必須要有一種眼光，對社會有自己的看法。」

回首前塵，錢濤說，農村近10年艱苦歲月對自己影響深遠，「進入北大深造當然很重要，但插隊時期在基礎知識方面的努力學習，以及意志鍛鍊也很重要。那段時期養成堅持自學的習慣，後來讀研、工作，我一直喜歡學習，不會因到了某個位置就停下來，這都是源於當年的經歷，一直保持求知慾，保持對新鮮事物的學習熱情。」

「堅持」兩字說來容易，但在那段非常時期，如何能在看似一片黑暗的前路，找到繼續前行的動力？「你問我動力來源，其實是對社會有自己的一些看法。」錢濤中學就曾學習馬列主義著作以及黑格爾、康德、羅素等大師的哲學思想，「當時就覺得這個（文化大革命）是

Members of The Quintet were scattered far and wide and mostly kept in touch through correspondence. Occasionally when they returned to Beijing they would consult with their teacher Han Nianguo, a mathematician, about maths problems, but most of the time they learned on their own. For a long time, after finishing each day's work, Qian Tao followed his daily routine of studying maths deep into the night by a dim oil lamp, and each morning his nose would be black from the oil. He still remembers how he worked through the *Boris Pavlovich Demidovich Exercise Book of Mathematical Analysis Problems*, one problem at a time. "That exercise book was from the Soviet Union, and it contained over 4,500 problems, which were very difficult," recalls Qian Tao. "Each morning before I left for farm work I would copy ten problems onto a piece of paper, and then I would try to figure out how to solve them while working, and I would write down my solutions after I returned home." Bit by bit, he taught himself the fundamentals of university-level maths, and also learned English. "During the first month, I studied the English textbook for form-1 students, one lesson a day," says Qian Tao. "I tried to memorise the new words and pronunciations. In the second month, I picked a maths book written in English that I wanted to read, and I started from the introduction, one sentence at a time, until I understood the words and grammar. In the third month, I was already reading the whole book."

During the nine years in the countryside, Qian Tao tilled the land, grew vegetables, tended sheep, and even worked as a barefoot doctor and a worker of a drilling crew, but he never stopped learning maths. In the late 1970s, the first streaks of light broke across the dark political landscape of China. In August 1977, the reinstated Deng Xiaoping mentioned in an important speech the government's plan to "resume national college entrance examination". The news shone a welcome ray of hope into nearly a decade of suffering endured by The Quintet. Their teacher Han Nianguo encouraged them to apply directly for postgraduate studies. He told them, "The resumption of the college entrance exam and postgraduate admission is exactly for people like you." In December of the same year, the five were

不對的。你說不需要學知識、學數學，這是不符合社會發展軌律的！你不可能想像，將來技術要發展、國家工業要發展，卻沒有好的基礎知識？這是不可能的。我不是外面說什麼就是什麼，而是有自己的判斷，你必須要有一種眼光，對社會有自己的看法。所以，就算在鄉下勞動的時期我也從沒放棄學習。」

進入北大後，錢濤拜在著名數學家程民德門下，專攻多元調和分析，1984年再獲北大數學博士，與程民德、鄧東皋老師一起取得豐碩研究成果：他的九篇論文分別發表於《中國科學》、《數學學報》等中國頂尖學術雜誌上，他更獲首屆國家科學進步獎，隨後進入中國科學院系統科學研究所任職。很快，錢濤出色的研究引起國外學術機構關注：1986年，澳洲科學院聘錢濤為博士後研究員，赴澳洲進行理論數學方面的研究，並於1992年起於新英格蘭大學任教。2000年，錢濤加入澳大，繼續教學和研究工作。

「對喜歡數學的人來講，這個世界就是數學的。」

「不同的人看世界的方式也是不同的。比如說音樂家像莫札特，他從花園散步回來就能寫成一首樂曲，因為他看世界是音樂的；還有畫家，他看世界是圖像的；對喜歡數學的人來講，這個世界就是數學的。」在錢濤眼中，生活處處都是數學，請他舉個例子，他信手拈來——「比如說，你過海關排隊，有時候短的隊伍未必一定快，因為你不僅要看長短，也要

與當年一起插隊的舊友重臨潤別30年的山西省汾陽市池家庄，在這裡錢濤渡過了近十載的知青歲月。
Back to Chijiazhuang, Shanxi province, with friends after 30 years. This is where Qian Tao spent a decade during the Cultural Revolution.

all accepted to universities. Less than six months into his new life at Shanxi University, Qian Tao dropped a bomb by expressing to his department his intention to apply to be a master's student at Peking University. The management of Shanxi University thought this young man was too conceited — how could a secondary school graduate, who had stayed in the countryside for nearly ten years, even begin to entertain the idea of skipping undergraduate studies and going straight to the most prestigious university for postgraduate studies? Finally, Shanxi University grudgingly arranged an extremely strict qualification test in two subjects, English and Advanced Algebra, invigilated by two teachers. To everyone's amazement, Qian Tao effortlessly scored 98 points on a 100-point scale, and he was the talk of the town when he became the first person from Shanxi province to be accepted by the Department of Mathematics at Peking University as a postgraduate student.

"You Must Have Vision and Think For Yourself"

Looking back, Qian Tao says those difficult years in the countryside have had a profound impact on him. "Of course entering Peking University was significant, but those years were just as significant in terms of forcing me to exercise my will and helping me to develop the habit of self-education, which continued to serve me well in my later studies and work," explains Qian Tao. "I will never stop and think that I've already arrived, and I always stay hungry for knowledge, and passionate about new stuff, and this is because of my experiences in those years."

Being persistent is much easier said than done, especially in that turbulent period. How did Qian Tao manage to find the courage and motivation to keep going and never give up when the future seemed completely dark? "My source of motivation was really just my independent thinking about the future trends of society," remarks Qian Tao. "I used to read works by great philosophers like Hegel, Russell and Kant, and I just felt it the Cultural Revolution wasn't right. They told me that maths, or knowledge as a whole, was not necessary? That was against the laws governing the development of society! I mean, how can you imagine a country developing technology and industry without its people possessing foundational knowledge? That's just impossible! I don't blindly believe what I'm told. You must have vision. You must look at the world with your own eyes, and think for yourself. And that's why I never gave up studying even in those years."

At Peking University, Qian Tao studied under the renowned mathematician Cheng Minde, specialising in harmonic analysis in Euclidean spaces. By the time he received his PhD degree from Peking University in 1984, he had already achieved some impressive results together with his teachers Cheng Minde and Deng Donggao. His nine papers were published in top academic journals in China including *Science China* and *Acta Mathematica Sinica*. He was among the first recipients of the National Science Progress Award. Later he went to work at the Institute of Systems Science, Chinese Academy of Sciences. It didn't take long before his outstanding research caught the attention of academic institutes overseas. In 1986, he was

與恩師Alan McIntosh教授（右）在一起，無論專業還是生活上他都是錢濤的良師摯友。
With Prof. Alan McIntosh, a great teacher and a mentor in Qian Tao's professional and personal life.

看速度，這『速度』就是求導數了，或者說求差分，比如說女性檢查員一般比較快，所以我會先觀察然後再選擇（排隊），這些實際都與數學有關。」

2000年錢濤加入澳大數學系之際，該系尚未培養過博士生，「我01、02年開始帶第一個博士生，就是澳大培養的第一位數學博士高潔欣。」對於教書育人，錢濤有獨特見解：「我教學生，不要求他們做很多paper（論文），而是要他們做學問。做學問和做文章是不同的，有時候學生跟在別人後面邯鄲學步，也能獲得認可或者發表。但問題是，你做的是人家基本理論的細化，自己並沒有任何創造。當然，開始的學習階段可以跟在一些大師後面做，但不能光做人家做剩的東西，最後還是必須要做自己的、有創建性的研究，所以我很重視學生的原創精神。」

錢濤認為澳門城市雖小，但教育水平和內地相比並不差，更擁有獨特優勢，「澳門處於中國和西方之間，（澳大）學術氛圍不錯，國際交流比較多，接觸層面比較國際化，學生在這裡讀完後，也相對比較容易再到外國深造。」錢教授1986年開始積極參與國際學術交流，至今走過十多個國家，與多國數學家共同研究、發表了大量學術論文，多次成為國際重要學術會議的特邀發言人。回顧自己在學術路上能不斷開闢新章，其實有賴求學期間扶持自己的恩

appointed postdoctoral research fellow by the Australian Academy of Science and went to Australia to carry out research on pure maths. He began teaching at the University of New England in 1992. In 2000 he joined UM, continuing with his teaching and research.

"For a Maths Lover, the World Is Mathematical"

"Different people look at the world differently," observes Qian Tao. "For example, Mozart could compose a piece of music after a walk in the garden, because to him the world was musical. A painter sees a pictorial world. Likewise, for a lover of maths, the world is mathematical." Qian Tao sees maths everywhere, and he didn't miss a beat when asked to give an example. "Let's say you need to go through immigration clearance, and you need to decide which queue to join, then you should pay attention not just to the length of the queue, but also the speed, as well as whether the officer is a male or female, because female officers tend to be faster," explains Qian Tao. "This actually has something to do with derivative and difference."

When Qian Tao joined UM in 2000, there was no PhD graduate from the Department of Mathematics. Around 2001 and 2002, Qian Tao had his first PhD student at UM, Kou Kit Ian, who was also the first doctor of maths to graduate from UM. Qian Tao has a unique philosophy about educating student. "I don't require my students to write many papers," he says. "I encourage them to be creative, to do something original. Of course they can start by picking up the crumbs left behind by masters, and there is a good chance that doing so could lead them to academic recognition or even published works, but eventually it's creativity that really matters."

師，如北京大學的程民德院士、澳大利亞的Alan McIntosh院士，「對學生來說，先要有好的老師或導師在前面指引他們。待修煉成熟後，就能發展屬於自己的學術成果。」

近年，澳大以國際化辦學方式、卓越的教學及創新科研培育優秀人才，全力打造具有區域特色、教學與科研並重的一流大學，而作為基礎學科之一的數學，自然也成為這一波教育改革的重點，「自趙偉擔任校長之後，他大力發展數學系，一方面支持發展本科教育，建立數學本科，破除了『澳門不需要數學本科』的說法；另一方面就是澳大在全世界範圍廣招資深、優秀的教授，優中選優，幾百個（應徵學者）裡只選幾個。所以我相信，澳大將來會建立起更強大的師資隊伍。」

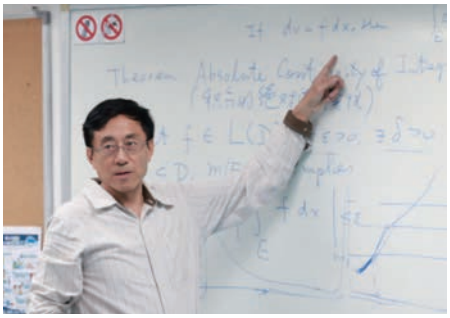
接下來，錢濤的日子將更加忙碌：除了教兩門課、帶三個博士後研究生之外，還要帶四個碩士生、六個博士生，明年可能還要招兩個，但錢濤卻樂在其中，「年輕人一定要有自己的興趣和方向，對於人生價值、想做的事，要有自己的認知和堅持。做為老師，我們應該鼓勵學生尋找追求的目標，讓學生有所作為。」

Qian Tao believes that despite its small size, Macao is on a par with mainland China in terms of education quality, and perhaps it is even blessed with a unique advantage mainland China doesn't have. "Macao is located between mainland China and the West, and the academic atmosphere of UM is quite good, with many international exchange opportunities," comments Qian Tao. "Students who have finished their studies here would find it easier to pursue further education abroad." In 1986 Qian Tao began to actively participate in international academic exchange activities. He has been to a dozen or so countries where he conducted research and published a large number of academic papers in collaboration with mathematicians from around the world. He has been invited to speak at numerous important international conferences. He credits his being able to constantly break new ground in his academic research to the help and guidance of his teachers, including Prof. Cheng Minde from Peking University, a former member of the Chinese Academy of Sciences, and Prof. Alan McIntosh from Australia, fellow of the Australian Academy of Science. "It's important for students to have good teachers or mentors to guide them, until they are academically mature enough to produce their own fruits."

In recent years, UM has launched a series of reform measures, with the goal of becoming a world-class with regional characteristics and equal emphasis on teaching and research, a university that produces outstanding graduates through an international-standard mode of operation, excellent teaching and innovative research. As one of the foundational subjects, maths naturally has been identified as a key object of reform. "Since he took office as the rector, Prof. Wei Zhao has spared no effort to develop our department," remarks Qian Tao. "He broke through the misconception that Macao doesn't need an undergraduate programme in maths, and supported the launch of an undergraduate programme in maths. Also we search internationally for outstanding professors through a very strict selection process. Usually we would select only a few out of several hundred applicants. So I sincerely believe UM's faculty will become stronger and stronger."

With four master's students, six PhD students and three postdoctoral students to supervise, two courses to teach, and probably two more new students to take under his wing next year, Qian Tao expects the coming days to be even busier. But he knows he will enjoy every minute. "Young people must have interests and direction, and once they decide what they want to do with their life, they should go for it and not give up easily. As teachers, we should encourage our students to pursue their goals," says Qian Tao.

錢濤鼓勵學生要有自己的興趣和方向，不斷尋找追求自己的目標。
Qian Tao encourages his students to have interests and pursue their goals



錢濤的理論拓展在數學、工程學等領域具有廣泛應用價值。
Qian Tao's research has enormous potential for extensive applications in maths, engineering and other areas.

錢濤獲首屆澳門科學技術獎唯一一項「自然科學獎」一等獎
Qian Tao receives the sole first prize in the Natural Science Award category at the first Macao Science and Technology Awards Ceremony

錢濤教授獲獎項目：「瞬變信號的時頻表示及算法實現」

評審委員會委員評價錢濤教授獲獎項目時指出，其具有「新發現」的重大意義。而此項目更獲五名知名專家一致評定非常出色，理論研究取得相當進展，學術建樹甚大。那麼，這項研究到底是關於什麼的呢？

「把複雜的東西用簡單的方法來表示」

「按最古老的分類方法，數學大致可分為三個大方向：分析、代數、幾何。我這項目是屬於分析類的，實際上就是微積分的進一步發展。函數的作用就是把一個數變成另外一個數，而核心就是怎樣把一個複雜的函數用一些簡單的、可以掌握的函數來表達，也就是一種變換或分解。實際上我的(研究)就和這個有關。」

錢教授向經典的傅里葉分析理論發起挑戰，「我們將他的理解、範圍、表達往前推了一步，過去傅里葉理論就像在一間學校裡，不管學生高矮胖瘦，只有一套校服，而我們則量體裁衣，根據你的特徵來做。這樣收效就更快，用簡單表達複雜的，用幾項就能達到原來能量的百分之九十幾。比如說傳輸一個信號，我可以用較少的參數來表達複雜的函數，若是要傳輸到別的地方去，就比較快也比較省時間。」可以想見，錢教授開啟的理論基礎，日後在數學、工程學等領域具有廣泛應用價值，尤在數碼科技日新月異的當下，在數據及訊號分析及處理技術方面的應用潛力更不可限量。

Prof. Qian Tao's Prize-winning Project, "Time-Frequency Analysis of Transient Signals and Algorithm: Harmonic and Clifford Analysis of Signals"

The Assessment Committee rated Prof. Qian Tao's project as having the significance of "new discoveries". Five well-known experts unanimously considered it to be exceedingly outstanding, with marked progress and impressive achievements in theoretical research. What is this research about?

Expressing Complex Things in Simple Ways

"According to the oldest classification method, maths can be roughly divided into three areas — analysis, algebra and geometry, and my research belongs to the first category," explains Qian Tao. "It's actually a further development on calculus. What a function does in layman's terms, is to change figure A into figure B, and the core problem is how to express a complex function in some simple, more workable ways, which is in effect a process of conversion or division. And my research has to do with this."

In his research, Prof. Qian challenged the classic Fourier theory. "We took his interpretation, scope and expression one step further," explains Prof. Qian. "The classic Fourier theory is like a one-sized school uniform for students of different heights and sizes. Ours is more like a tailor-made suit. We tried to express complex things in simple ways, so we could achieve approximately the same effect faster. For example, if I need to transmit a signal, and if I could use fewer parameters to express a complex function, that would mean less time in transmitting." It is not hard to imagine the enormous potential of this research in terms of practical applications in maths, engineering, data and signal analysis and processing technology, especially given the rapid advancement of digital technologies.

「學術探索無止境」

錢教授透露，接下來一方面會致力於如自適應傅里葉變換(AFD, Adaptive Fourier Decomposition)在數學以及工程技術方面的應用，另一方面會繼續深化研究，「比如不僅在一維，還在高維，將是更新、更複雜的數學結構。學術探索無止境，我們在不斷奠定這方面的基礎。」

在首屆澳門科學技術獎勵頒獎典禮上代表全體獲獎人發言時，錢濤衷心感謝評審委員會對「發明」的認同，以及澳大趙偉校長和馬許願副校長為代表的澳大研究委員會的巨大支持。但因台上發言時間有限，錢教授說其實背後功臣還有很多，更念念不忘這些名字：李落清，諶秋暉，李紅，徐躍生，張海樟，王蕊，燕敦燕，顏立新，李登峰，張立明，譚立輝，王彥波，黨培，米文，李爽，何耀堂，梁英德，高潔欣，李志雄，麥偉雄，Michael Steesin，Elias Wegert，Wolfgang Sproessig等等。

澳門雖小，卻蘊含相當潛力。是次科技獎勵評審委員會有委員認為，兩岸四地科技發展中，澳門進步顯著。運輸工務司司長劉仕堯也在頒獎禮致辭時強調，日後政府將加大對科研和科普的投入，為廣大科技工作者施展才華提供廣闊平台。相信在特區政府支持之下，在一大批如錢濤教授般兢兢業業、鍥而不捨的科學技術工作者的努力之下，澳門科技研究與教育事業的明天，必定更加燦爛耀眼。

No Finish Line in Scholarly Pursuit

Prof. Qian discloses that his next focus will be on the application of Adaptive Fourier Decomposition in maths and engineering technology, and in the meantime will continue with his research in a more in-depth manner. For him, there is apparently no finish line in scholarly pursuit.

In his speech at the first Macao Science and Technology Awards Ceremony on behalf of all the other prize recipients, Qian Tao thanked the Assessment Committee for its recognition of the invention, and thanked UM's Research Committee, especially UM Rector Prof. Wei Zhao and Vice Rector Prof. Rui Martins, for their great support. He regrets that due to time limitations, he was not able to include in his speech the names of the following people to whom he also owes a debt of gratitude. They are Li Luoqing, Chen Qiuhui, Li Hong, Xu Yuesheng, Zhang Haizhang, Wang Rui, Yan Dunyan, Yan Lixin, Li Dengfeng, Zhang Liming, Tan Lihui, Wang Yanbo, Dang Pei, Mi Wen, Li Shuang, Ho Io Tang, Leong Ian Tak, Kou Kit Ian, Li Zhixiong, Mai Weixiong, Michael Steesin, Elias Wegert, and Wolfgang Sproessig.

Macao is a small city with big potential. Some members on the Assessment Committee commented that among the four territories of Macao, Hong Kong, Taiwan and mainland China, Macao has made visible progress in science and technology development. Lau Si Io, secretary for transport and public works of Macao SAR, also stressed at the award ceremony that the SAR government will increase resources in scientific research and science popularisation in order to provide a bigger stage for scientists and engineers to demonstrate their talent. There is every reason to believe that with the support of the SAR government and the dedication of outstanding scientists like Prof. Qian Tao, Macao's science, technology and education will have a bright future.

澳門科學技術獎

澳門特區政府於2011年初頒佈了《科學技術獎勵規章》，設立科學技術獎，研究生科技研發獎，及特別獎勵。其中，科學技術獎又分自然科學獎、技術發明獎及科技進步獎。此獎項設置目的是藉獎勵在澳門科學技術活動中做出貢獻的人士或機構，以提高本地科學技術工作者的積極性和創造性，加快本地科學技術事業的發展。

Macao Science and Technology Awards

In 2011 the Macao SAR government promulgated the "Regulations of Science and Technology Awards" which states the launch of Science and Technology Awards, Postgraduate Science and Technology Research and Development Awards, and Special Rewards. The Science and Technology Awards are divided into three categories: Natural Science Award, Technological Invention Award and Science Technology Progress Award. The purpose is to reward individuals and organizations who make significant contributions to science and technology in Macao, thereby motivating local scientists to be dedicated and creative in order to accelerate the development of science and technology in Macao.

澳門大學：創一流大學 擔社會責任

University of Macau: Aiming For World-Class, Fulfilling Social Responsibility

策劃｜編輯部
Planned by the editorial board

攝影｜何杰平、黎詩琪
Photos by Jack Ho, Kay Lai

作為澳門本地規模最大的國際化、綜合性公立大學，澳門大學（澳大）除了著力培養各方面的優秀人才之外，更責無旁貸地肩負起社會責任，積極參與及推動澳門社會的蓬勃發展。

As the largest comprehensive public university in Macao, the University of Macau (UM) is duty bound to fulfill its social responsibility to contribute to the development of Macao, in addition to producing outstanding graduates.

貢獻學術力量 協力社會發展

一直以來，澳大極力貢獻自身學術力量，充分配合澳門政府部門、公共機構以及民間社團及社區團體，透過多方位合作，提供科研及學術支援，以專業知識服務社群。據澳大科技學院譚錦榮教授透露，早前他曾受澳門電訊管理局委託，組織研究團隊協助調查澳門電訊（CTM）嚴重斷網報告，「鑑於斷網一事影響廣大市民，故特別受關注。當時電信管理局委託澳大的團隊去開展調查並作分析報告，調查小組除到現場視察外，亦與CTM進行了多次面談會議。」譚教授更表示，「儘管過程不易，但在相關領域的專業性受到認同，並能為社會出一分力，個人感到很欣慰。」事實上，譚教授指出，現時大學實驗室的不少科研項目，均會針對公眾社群所需而進行深入研究，如：利用無線射頻識別技術（RFID）。RFID在澳門社群的創新應用，包括圖書館自動化管理和智能郵政服務，以優化澳門當前的公共設施服務。又如目前正在研究階段的、主要針對澳門世界文化遺產構想的防火安全系統探測器（Wireless UV Sensor），應用光學感應原理，透過火焰的紫外線特定波長來偵察建築物內火警發生的情況。

Further the Development of Society

All along, UM has actively provided academic and technological support to government departments, public organisations, and private associations, hoping to serve the local community with its expertise. Prof. Tam Kam Weng from UM's Faculty of Science and Technology (FST) was commissioned by the Bureau of Telecommunications Regulation of Macao SAR earlier to investigate CTM's major mobile and internet service failure. "Given the widespread effect of the incident, the bureau requested us to investigate and write an analysis report," recalls Prof. Tam. "In addition to field inspection, we also held several meetings with CTM personnel. The process was not easy, but I was gratified that my expertise was recognised and I had the chance to do something for the community." Prof. Tam says that many research projects conducted by the laboratory seek to answer the needs of the local community. He cites the examples of the Radio Frequency Identification technology (RFID), whose innovative applications have led to improved public facilities and service, such as automated management of the library, intelligent postal service, etc., as well as the Wireless UV Sensor, which is still in the R&D stage and which is mainly for fire prevention for world heritage sites in Macao.

譚錦榮教授（右一）組織研究團隊協助調查澳門電訊斷網報告（圖片由澳門電訊管理局提供）
Prof. Tam's (first from right) team was commissioned to investigate CTM's mobile and internet service failure (Photo courtesy of the Bureau of Telecommunications Regulation of Macao)

澳大科技學院的無線通訊實驗室參與多項應用於澳門社群的研究
Many research projects conducted by the Wireless Communication Laboratory seek to answer the needs of the local community

工程研究及檢測中心人員為建築工程進行檢測（圖片由澳大工程研究及檢測中心提供）
Centre for Engineering Research and Testing staff are testing a structure (Photo courtesy of the Centre for Engineering Research and Testing of UM)

此外，在早前發生沙梨頭海邊街善豐花園因主力結構柱受損而導致的樓宇結構安全事件中，受相關政府部門委託，澳大科技學院屬下之工程研究及檢測中心，結合科技學院土木及環境工程系的技術支持，開展相關科學監測工作，包括以持續實時監測手段，於鄰近受損構件的臨時加固設施、立柱等安裝監測儀器，藉以了解臨時加固後構件的行為變化，並提供監測數據予政府相關部門作參考依據。由此可見，澳大不但在相關學術領域的專業水平深受認同，更主動發揮學術力量，對社會事件提供積極支持與配合。

Another example that shows UM's active participation in social affairs and public recognition of its expertise is the earlier Sin Fong Garden incident arising from the building's damaged main support column. After the incident, UM's Centre for Engineering Research and Testing (CERT) was commissioned by the government to monitor the structure of the building, with technical support of FST. In order to understand the behaviour of the structural members of the building and to provide updated monitoring data to the Macao SAR government, CERT and FST reinforced the damaged column and installed several instruments on the temporary facilities and the adjacent columns through a real-time monitoring system.

澳大和同善堂透過學術合作推進澳門慈善事業研究（圖片由澳大澳門研究中心）
UM hopes to promote philanthropy in Macao through academic collaboration with Tung Sin Tong (Photo courtesy of the Centre of Macau Studies of UM)

澳大於首屆澳門科學技術獎獲獎數量為本澳高等院校之冠
UM wins more awards than any other higher education institutions in Macao at the first Macao Science and Technology Awards Ceremony

在學術合作方面，如今年澳大和澳門同善堂聯合主辦的「紀念同善堂創建120周年座談會」，就是一次透過學術合作推進澳門慈善事業進程的良好嘗試。澳門同善堂是一所創辦於1892年的本地慈善機構，一直致力透過助貧施濟、贈醫施藥、免費教育托兒以及緊急救援等範疇服務本地社區。在這次與同善堂的合作中，澳大充分發揮學術優勢，邀請來自本澳、葡萄牙、廣州和香港的相關教授及專家學者，圍繞多個議題展開深入討論，透過學術探討和座談交流，在系統記錄和評價同善堂發展歷程的同時，亦推動澳門和中華民族慈善事業的發展。

展現學術實力 推動科技進步

澳大在2012首屆澳門科學技術獎取得佳績，榮獲九項科學技術獎、19名博士及碩士研究生獲「研究生科技研發獎」，在本澳高等院校之中稱冠。其中，「自然科學獎」項內，澳大錢濤教授以「瞬變訊號的時頻分析和算法實現：信號的調和分析及Clifford分析」項目榮獲唯一一項「自然科學獎」一等獎；王一濤、李銘源、陳修平、陳美婉及陸金健的「中藥藥理與質量關聯研究」項目獲二等獎；吳恩華、吳雯、朱鑒及徐添辰的「對基於現代圖形處理器的通用計算（GPGPU）的研究與創新」項目獲三等獎；「技術發明獎」項內，澳大團隊馬許願、余成斌、麥沛然及冼世榮的「模擬與混合信號介面接口——應用於無處不在的微電子世界」項目獲二等獎；黃民聰、戴寧怡及陸耀強的「三維脈寬調制技術及其在三相四線制有源濾波器中的應

Earlier this year UM and the Macau Tung Sin Tong Charitable Society (Tung Sin Tong) co-organised a seminar in celebration of the 120th anniversary of Tung Sin Tong, representing a successful attempt on the part of UM to promote philanthropy in Macao and China through academic collaboration. A local charity founded in 1892, Tung Sin Tong is dedicated to serving the local community through various charitable deeds, including raising money for the poor, providing free medical consultation, medicines, nursery and emergency rescue services to the needy, etc. In co-organising the seminar, UM invited experts from Macao, Portugal, Guangzhou and Hong Kong to carry out in-depth discussions on a range of issues and to systematically record and evaluate the development of Tung Sin Tong.

Advance Science and Technology

At the first Macao Science and Technology Awards Ceremony held earlier this year, UM won nine prizes across three categories of the Science and Technology Awards, as well as nineteen prizes in the Postgraduate Science and Technology Research and Development Award category, eclipsing all the other higher education institutions in Macao. In the Natural Science Award category, Prof. Qian Tao's project, "Time-Frequency Analysis of Transient Signals and Algorithm: Harmonic and Clifford Analysis of Signals", won the sole first prize. The project, "Association Study of Pharmacology and Quality in Chinese Medicine", by Wang Yitao, Lee Ming-Yuen, Chen Xiuping, Chen Meiwan and Lu Jinjian, won a second prize. The project, "Investigation and Innovation in the General Purpose Computation based on GPU (GPGPU)", by Wu Enhua, Wu Wen, Zhu Jian and Xu Tianchen, won a third prize.
In the Technological Invention Award category, Rui Martins, U Seng Pan, Mak Pui In and Sin Sai Weng won a second prize for their project, "Analog and Mixed-Signal Interfaces for a Ubiquitous Electronic World". The project, "Three-Dimensional Pulse Width Modulation Techniques and Its Applications in Three-Phase Four-Wire Active Filters", by Wong Man Chung, Dai Ningyi

用」項目與譚錦榮、蘇蔭強及何雪琴的「應用於防火的無線紫外線火焰探測器」項目，則同獲三等獎；在「科技進步獎」項內，澳大黃輝、董名垂、鄧志偉及Francisco de Oliveira的「葡中機器翻譯系統技術與應用」項目獲二等獎；黃志剛、盧展宏、林紹昌、董名垂、韓英鐸的「澳門電網穩定問題及環流問題分析及工程對策的應用」項目，王鎮登、董名垂、林棟、梁博文及杜志標的「構建澳門電子政府入口網站及數據安全性、及時性、一致性、完整性保障技術及實施」項目，則同獲三等獎。

在頒獎典禮上，榮獲唯一一項「自然科學獎」一等獎的錢濤教授代表全體獲獎人發言時指出，「在邁向成功的征途上，我們的信心來自對科研工作的信念和憧憬。與此同時，也需要社會的支持和認同。因為我們從事的事業是科技發明，是一項從無到有的創造。現在我們不僅為自己的信念所鼓舞，也為社會的肯定所鼓舞。而這些鼓舞將化為巨大的動力，促使我們繼續攀登事業的高峰，探究更深入更新更有意義的研究。」錢教授尤其提出，「近年澳門高等教育得到飛速發展。如今澳門政府高度重視並推動科技研究，相信在不久的將來會有越來越多高水平的科技成果在澳門湧現出來，為中華民族的科技繁榮發展作出貢獻。」由此足證，澳大在科技研究與教育方面，不但追求學術層面的卓越成就，更注重與社區的發展關聯。日後澳大亦將繼續努力，不斷推進相關科研與教育工作的力度，努力提升本校科研水平之外，亦不遺餘力推動澳門整體科學技術水平的發展與進步。

and Lok Io Keong, and the project, “Wireless UV Flame Detectors for Fire-safety Applications”, by Tam Kam Weng, Sou Iam Keong and Ho Sut Kam, each received a third prize. In the Science and Technology Progress Award category, the project, “Technologies and Applications of Portuguese-Chinese Machine Translation System”, by Wong Fai, Dong Mingchui, Tang Chi Wai and Francisco de Oliveira, received a second prize. The project, “The Analysis of Stability Problem and Loop Flow Problem in Macau Electric Network and Its Implementation”, by Wong Chi Kong, Lou Chin Wang, Lam Sio Cheong, Dong Mingchui and Han Yingduo, and the project, “Establish Macau e-Gov Portal and Data Safety, Prompt, Coincidence & Integrity Protection Technology & Implementation in e-Government”, by Wong Chan Tang, Dong Mingchui, Lin Dong, Leong Pok Man and Tou Chi Pio, each received a third prize.

At the award ceremony, Prof. Qian Tao, recipient of the sole first prize in the Natural Science Award category, gave a speech on behalf of all the other prize recipients. He said: “On the road to success, we derive our confidence from our faith in—and our vision for—scientific research, but at the same time, we also need society’s support and recognition, because scientific invention is about creating something from scratch. Now we are motivated not only by our faith but also by society’s recognition, which translates into greater motivation to spur us to scale new heights and to carry out new, meaningful research projects.” He added: “In recent years, higher education in Macao is developing very quickly. With the SAR government’s great support for scientific research, I believe it won’t be long before we witness the emergence of more fruits in science and technology.” Prof. Qian’s words echo UM’s determination to tie its pursuit of academic excellence with the development of the community. In the future, the university will step up its efforts in education and research, in order to contribute to science and technology advancements in Macao.

共享服務設施 強化社區聯繫

澳大不但著力為澳門培養各方各面的優秀人才，更積極參與推動澳門社會的蓬勃發展。目前完工在即的橫琴新校園，澳大預計將於明年4月開始安排職員進駐，並展開交付後的整理、驗收、測試、裝修及設備安裝等工作，爭取明年秋季新校園投入運作。屆時，澳大更將推出一系列新措施，服務澳門廣大市民，包括：計劃在現校園建立城市中心，開辦多元化成人持續進修課程，直接服務澳門社區。據趙偉校長透露，新校園擁有完善校園硬件設施，未來計劃增設文學院、創意設計學院和健康科學學院，並推出主要為澳門在職人士而設的實用型碩士課程，如：法學、教育、社會和管理等專業，一方面有助提升澳門市民的個人素質和競爭力，另一方面也滿足澳門特區社會發展的殷切人才需求。

對於坊間擔心因新校園成本上升而增加學費，趙偉校長早前表示，若澳大調整學費，升幅不會超過社會的通脹率，而趙偉校長更保證，校方甚至教師職員將會提供一切協助，絕不會出現澳大錄取的學生因經濟困難交不上學費而放棄讀書的情況。事實上，校方多次強調，澳大遷入新校園後，將擴大為澳門社區服務的領域，履行取之社會、回饋社會的責任，尤其是在澳大新校園投入使用後，透過開辦適合本地在職人士持續進修的多元化課程，與澳門其他兄弟院校及醫院共用先進生化醫學設備，以及在不影響師生學習的情況下，向澳門市民開放新校園圖書館、文化中心、體育中心等大型服務設施等，努力強化澳大和澳門社區的聯繫，達致社會資源分享。

教育的本質是實現人的全面發展，使之適應社會的需求，進而引領時代的進步、人類的發展。故此，澳大將在追求學術卓越的同時，亦擔當起自身的社會責任，努力打造全天候、多方位全人教育模式，透過專業教育、通識教育、研習教育和社群教育的四位一體教育模式，努力創建一所具特色、高水準的世界一流大學。

Share Facilities for Closer Ties with Community

In addition to producing outstanding graduates, UM also plays an active part in advancing the development of the Macao society. Construction of the new campus will be complete soon. According to the tentative plan, some staff will move to the new campus first around next April to carry out cleaning, quality inspection, testing, furnishing, equipment installation, etc. If everything goes smoothly, the new campus should be put into full operation around next autumn. After that, UM will launch a series of new measures to serve Macao residents; one measure will be establishing a continuing education centre on the current campus to provide a diverse range of programmes for adults. Rector Wei Zhao indicated that the new campus will be equipped with a complete set of advanced facilities, with possible addition of a faculty of arts, faculty of creative design and faculty of health sciences in the future. He also disclosed that after relocating to the new campus, UM plans to launch practical master's programmes in a variety of fields, such as law, education and management, which will mainly target working people, in order to improve Macao residents' quality and competitiveness and to meet the Macao society's demand for a high-calibre workforce.

In response to public concerns that the rising cost of the new campus may lead to higher tuition fees, Rector Wei Zhao said earlier that even if UM adjusts tuition fees, the increase will not exceed the rate of inflation. He promised that the university will provide all necessary assistance to make sure not a single admitted student will have to give up his or her place at UM due to financial reasons. UM has repeatedly stressed that after moving to the new campus it will continue to fulfill its social responsibility by expanding its scope of community service. Concrete measures will include opening a diverse range of programmes tailor-made for local working people, sharing advanced biochemical and medical equipment with other sister educational institutions and hospitals in Macao, and opening campus facilities such as the library, the cultural centre, and sports venues to the public to the extent that staff and students' work and study are not affected—all for the purpose of sharing resources and enhancing the university's ties with the community.

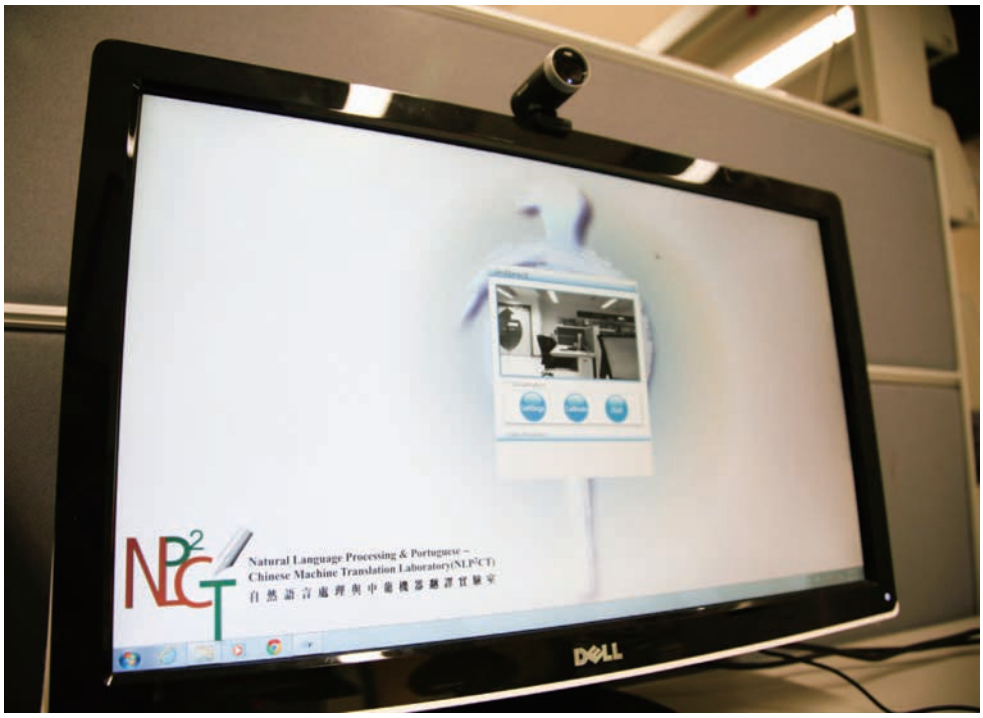
An intrinsic function of education is to help students achieve well-rounded development so that they can better meet the demands of society and play a leadership role in the progress of society and humanity. Therefore, while pursuing academic excellence, UM actively fulfills its social responsibility, and works hard towards the goal of becoming a world-class university with regional characteristics through a multifaceted "4-in-1" education model that consists of discipline-specific education, general education, research and internship education, and community and peer education.

科研讓生命更精彩
「*i*INTERACT」眼球追蹤系統

Scientific Research Enriches Life—*i*INTERACT Eye Tracking System

撰文｜李巧雲
Text by Albee Lei

攝影｜吳景洪
Photos by Kidonis Ng



普通鏡頭加電腦已可實現眼球追蹤
A regular computer mounted with a camera can realise eye tracking

英國著名物理學家、宇宙學家霍金因肌肉萎縮性側索硬化症不能動也無法說話。藉著先進的科技，他借助感應面部肌肉運動的紅外線感測器完成多場精彩演說，但由於其控制面部肌肉運動的能力正在持續惡化，霍金可能轉用創新的眼球追踪技術。相類電子儀器的價格動輒數十萬，一般家庭難以負擔，為使更多有需要的人士受惠，澳門大學（澳大）科技學院電腦及資訊科學系畢業生李綺琪及黃旺經過兩年研究，成功開發出低成本、高效能和簡單易用的眼球追蹤技術。

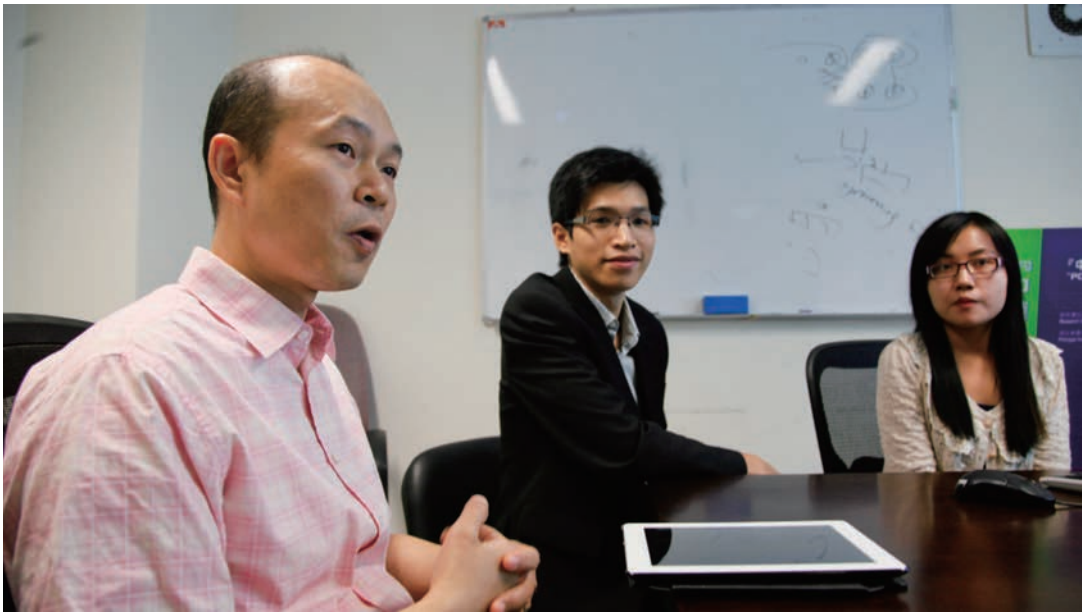
「*i*INTERACT」效益巨大

眼球追蹤技術是近10年的熱門研究課題，一般舊式系統的體積大、成本高，不便攜帶。李綺琪及黃旺所研發名為「*i*INTERACT」的系統，其獨特之處在於使用者只需擁有一部帶鏡頭的電腦或手提電話，裝上該程式便可使用。李綺琪介紹，程式以注視點和熱圖方法分析和顯示眼跡，殘障使用者便可透過眼睛操控鼠標或按鍵與外界溝通，如發送電郵、瀏覽網站、處理文件，甚至玩遊戲等等。而「*i*INTERACT」將來更可應用於商業、工程、軍事領域的專業研究及系統開發，可為相關企業帶來巨大效益。

Stephen Hawking, the renowned British physicist and cosmologist, couldn't move or speak because of motor neuron disease, but with the help of an infrared sensor that detects his facial movements, he has given many mind-blowing lectures to the general public. As Hawking's ability to control his facial movements continues to decline, scientists are investigating more motion-sensing technologies, including eye tracking technology. While eye tracking devices can help those with disabilities to interact and communicate with the world, the high price keeps the technology out of reach of ordinary people. "How to use this technology to benefit more people in need?" was the question that motivated Lei I Kei (Wendy) and Wong Wong (Jacky), two graduates of the Department of Computer and Information Science, Faculty of Science and Technology (FST), University of Macau (UM), to spend two years developing *i*NTERACT, a low-cost, easy-to-use eye tracking system.

Enormous Potential of *i*NTERACT

What sets *i*NTERACT apart from traditional eye tracking devices, which are usually expensive and bulky, is that it's ready for use after being installed in a computer or mobile phone mounted with a conventional digital video camera. Wendy explains that by analysing and displaying eye movement in the form of gaze plots and heat maps, the system enables the user to control the mouse or keyboard with his or her eyes, thus communicating with the world and performing various activities like sending email, surfing the Internet, processing files and playing computer games.



（左起）黃輝博士、黃旺和李綺琪三師徒
(From left) Dr. Wong Fai, Jacky and Wendy

「*i*INTERACT」雖應用廣泛，但技術上仍可進一步提高，指導老師黃輝博士及周沁博士坦言，若使用者眼睛轉動速度太快，眼動儀可能來不及追蹤。欲追求系統的追蹤速度，需以最少演算法來實現目標追蹤；欲追求精準，則需給予系統更多參數作運算。希望日後再進一步研究，在準確性以及效能速度上找到一個平衡點，開發更靈巧的眼球追蹤系統，使之最終能成為普及型產品在市面流通，讓人類生活更美好。

提早研究　成果加倍

澳大鼓勵本科生進行高端科研，在資源上給予大力支持，李綺琪和黃旺便是因為參與暑期實驗室研究計劃而觸發其提早進行研究。當時他們跟隨黃博士做研究工作，受濃厚學術氣氛的薰陶，對科研的興趣越來越大，更開始構思自己的項目。而黃博士得知他們在研究眼球追蹤技術之後，雖知困難重重仍全力支持，透過深入淺出的引導和鼓勵，一次又一次引領李綺琪及黃旺走出研究困局，師生間建立了深厚情誼，故此，即使如今李綺琪和黃旺已經畢業，但還經常在下班後回校與導師討論工作。

回想研發「*i*INTERACT」的過程：「我們大二開始準備，用了兩年多完成這個程式，第一年主要是翻閱文獻，掌握技術；第二年寫程式時嘗試了各種方法，曾遇到很多難題，我們日思夜

While *i*INTERACT has enormous potential in terms of applications in business, engineering and military realms, Dr. Wong Fai and Dr. Chao Sam, supervisors of Wendy and Jacky, say the system still has room for technical improvement. “For example, if the user’s eyes move too fast, the system might not be able to keep up. To increase tracking speed, you need to use the least number of algorithms, but to improve precision, you need to give the system more parameters. So we hope to achieve an optimum balance between speed and precision and develop a more flexible system, so it can become popularised and better the lives of more people,” says Dr. Wong.

The Early Bird Catches the Worm

UM encourages undergraduate students to carry out advanced research and provides generous support in this area. The idea of *i*INTERACT was born during Wendy and Jacky’s participation in a summer research programme under the supervision of Dr. Wong where they grew increasingly interested in scientific research because of the rich academic atmosphere—so interested, in fact, that they began to wonder if they could undertake a project based on their idea. After learning Wendy and Jacky were doing research on eye tracking, Dr. Wong committed his full support although he foresaw they would encounter numerous difficulties. He was right. Over and over again, Wendy and Jacky got stuck. Over and over again, Dr. Wong cheered them on and guided them to achieving one breakthrough after another. Their efforts bore fruit in the end, in the form of *i*INTERACT as well as a close bond that formed between them. Now Wendy and Jacky have graduated, but they often visit Dr. Wong after work to consult his opinions on research-related issues.

“We started preparing in our sophomore year, and we spent over two years developing the system,” recalls Jacky. “We spent the first year poring over

想、逐一擊破，想起雖然覺得辛苦，但很有滿足感，可謂有付出有收穫。」黃旺頓了頓，繼續說道：「這項目風險高，不知是否能成。不過，做研究就要有fail的心理準備，不行再試！」李綺琪講述比賽的難忘經歷：「還記得我到重慶參加比賽時，一位當地學生對我說了一句話：『你很有想法！』，令我緊張的心情化為喜悅去迎接評審答辯的挑戰。每次比賽都是一個經驗累積，為了應對各個科研比賽，賽前都會回校與導師商討，針對技術、功能、演講技巧等方面作出相對應的改善，務求盡善盡美，把最好的一面展示給各方評審。」他們回憶著開發過程中的點點滴滴，僅是鏡頭設置就嘗試過多種方法，比如笨重的頭戴式、眼鏡式等等，弄壞幾個鏡頭後，最終研究出以電腦鏡頭追蹤眼球運動的方法。

永不言棄的他們終於順利在畢業前完成項目，而且得到老師的肯定，更獲得校內科技學院（院長榮譽榜）優秀畢業設計獎，令其他在大四才開始著手研究的同學既佩服又羨慕；而從沒想過會得獎的李綺琪和黃旺，更先後在其他賽事中囊括獎項，包括：IEEE 2012科研項目比賽第一名，2012年度安利杯大學生計算機作品賽金獎及最佳創新獎，澳門資訊及通訊科技大獎賽的優異獎及2012年度亞太區資訊及通訊科技大獎的優異獎（大學生組）。

見愛徒有如此好成績，黃博士自然樂見其成：「眼球追蹤是個新科研領域，當中包含了多種技術，對本科生來說比較艱深，但他們從研究的過程中不斷發掘出新知識，有艱辛，亦有得著。」

科研動人之處，是其不僅豐富了研究員的生命，也讓別人的生命更精彩。期待「*i*INTERACT」早日走進人們日常的生活。

technical literature, and during the second year we tried various methods to write the programme. We encountered many problems that kept us awake at nights, but we overcame them one by one. It was hard, but it was very fulfilling, and our efforts paid off in the end." Jacky pauses before he adds, "This project was risky in that we didn't know if we could succeed. But I guess with research, you just have to be prepared to fail and try again and again." Jacky says even with the relatively trivial technical detail like the setup of the camera, they failed many times—they broke several cameras trying different methods, like a head-mounted camera and glasses camera, before finally deciding on the current computer-mounted camera. Wendy recalls the unforgettable experience of participating in a competition. "I remember going to Chongqing for a competition and feeling a bit nervous, and then a local student said to me, 'You've got some really cool ideas!' That made me a lot more relaxed and I even looked forward to facing the judges' questions," says Wendy. "Every competition is an opportunity to gain some experience, and in preparing for these competitions, I would seek my supervisor's advice on how to improve my speaking skills as well as the technical and functional aspects of the project, to make everything as perfect as possible before presenting the project to the judges."

The fact that Wendy and Jacky successfully developed the *i*INTERACT system before graduation, when most of their fellow students were just beginning to consider the subject of their research, made them the envy of their peers. But even Wendy and Jacky didn't expect the project to bring them so many honours, including the Dean's Final Year Project List Award, a first prize at the IEEE (Institute of Electrical and Electronics Engineers) Project Competition 2012, the Gold and Creativity Prizes: Amway Cup 2012 University IT Project Competition, a Merit Award: Macau ICT Awards, and a Merit Award (Category: Tertiary Student Project) at the Asia Pacific Information and Communications Technology Awards 2012.

Dr. Wong is happy for Wendy and Jacky. He says, "Eye tracking is a new area of research, which involves various technologies, so it's very difficult for undergraduate students. But they managed to constantly discover new knowledge in the process, which was hard but also rewarding."

The beauty of scientific research is that it enriches life and opens up endless possibilities. We look forward to the day when the *i*INTERACT system fulfils the purpose that prompted Wendy and Jacky to develop it in the first place—to benefit more people in need.

「iINTERACT」已獲多個獎項
iINTERACT has won several awards

新的字母時代
The New Alphabet Era

撰文 | 黎寧 Text by Rose, Neng Lai
中文翻譯 | 陳靜 Chinese translation by Ruby Chen

我第一次接觸"QE"是在小學的歷史課上，那是「英國伊莉莎白女皇」的英文縮寫。雖然英女王伊莉莎白二世仍在位，但現在很多人口裡說的"QE1"和"QE2"卻不是指「英女王」而是「量化寬鬆」，美國、英國和歐洲都通過ECB實施的政策——等一下！ ECB是什麼？那是歐洲央行的英文縮寫。那IMF又是什麼？是國際貨幣基金組織的英文縮寫。那TARP和LTRO呢？…… 不經意間我們已進入一個新時代：字母時代。這個字母時代的成因是近年的全球金融危機，全球金融危機這個人為災難則是由兩個「字母國家」— U.S.A.（美國）和U.K.（英國）—引起的。本文將從金融的角度向大家介紹字母時代，希望大家喜歡。

全球金融危機（GFC）源自美國：2007年，美國樓市在惡化了一年半後，終於誘發美國金融危機。2008年9月15日，雷曼兄弟控股公司（有意思的是，除了雷曼兄弟之外，其他陷入困境的銀行都有英文縮寫，如香港上海滙豐銀行有限公司HSBC，瑞士聯合銀行UBS，法國巴黎國家銀行BNP等）宣告破產，對金融危機帶來災難性的影響。

為什麼美國樓市惡化會對全球經濟影響如此巨大呢？事情的起因卻是簡單的一個「貪」字。20世紀90年代末至21世紀初，美國政府決定實現「居者有其屋」的目標，於是銀行降低利率，按揭貸款也輕而易舉。按揭貸款評估承保變成了獨立的過程。要明白這過程，不妨想像一下：假如你不是很有錢而又準備買房地產，一般你會用積蓄支付首期，剩餘部分則向銀行貸款。貸款前，銀行會進行風險評估，確保你有能力按時供款。貸款過程被分成幾個環節，每個環節又由不同實體負責。在此情況下，貸款按揭發起人要做的其實只是將貸款申請交接至下一個環節，與此同時為樓宇購買者取得資金去支

The first time I learnt about "QE" was in a history course in primary school, and it was a reference to Queen Elizabeth of the United Kingdom. To date, many people have used the words "QE1" and "QE2" not because they want to talk about the queens, even though QE2 is still reigning. Rather, "QE" is the abbreviation for "Quantitative Easing". The USA, the UK, and Europe, through ECB, have all done it. Pause for a minute! What is ECB? The Europe Central Bank! What is IMF? The International Monetary Fund! How about TARP and LTRO? Without noticing you have entered a new age – the alphabet era – that was formed by the most recent man-made disaster of GFC, created by the alphabet countries: USA and UK! This article aims to walk you through this era from a financial angle. Hope you will enjoy it!

The Global Financial Crisis (GFC) started in the United States of America (USA, the first alphabet country in this article) in 2007 after its housing market deteriorated for about 1.5 years, and reached the disastrous climax following the collapse of Lehman Brothers on 15 September 2008. Interestingly, unlike other banks that also experienced trouble, like HSBC (the Hong Kong and Shanghai Bank Corporation), or UBS (the Union Bank of Switzerland), or BNP (Banque Nationale de Paris), Lehman Brothers does not have an abbreviated name.

So why did a deteriorating housing market have such a tremendous effect on the global economy? The story begins with more alphabets, although the cause is best summed up by the simple word "GREED". Back in the late 1990s and the early 2000s, the USA government decided that more people should own their own homes. To make this possible, interest rates were reduced and mortgages were made readily available. Coupled with this was the unbundling of the mortgage underwriting process. To understand this, imagine you are about to buy an apartment. Assuming you are not wealthy, you would tend to use your savings for the down-payment and then seek a mortgage loan from a bank which will check to ensure you could make monthly payments on time. When the underwriting process is unbundled, as was the case in the USA, the process is broken down into several steps, with a different entity responsible for each individual step. The mortgage originator only originated the mortgage by passing the application down the line to the next step while getting the money for the buyer to pay the seller. Subsequent collection of monthly payments from the mortgagors was handled by the

作者為澳門大學工商管理學院副院長及金融系副教授，專門從事期權定價模型、風險管理、不動產金融及管理學及行為金融學等方面的研究。
The author is the associate dean of the Faculty of Business Administration and associate professor of finance at the University of Macau. She specialises in Option Pricing Models, Risk Management, Real Estate Finance and Economics, and Behavioural Finance, among others.

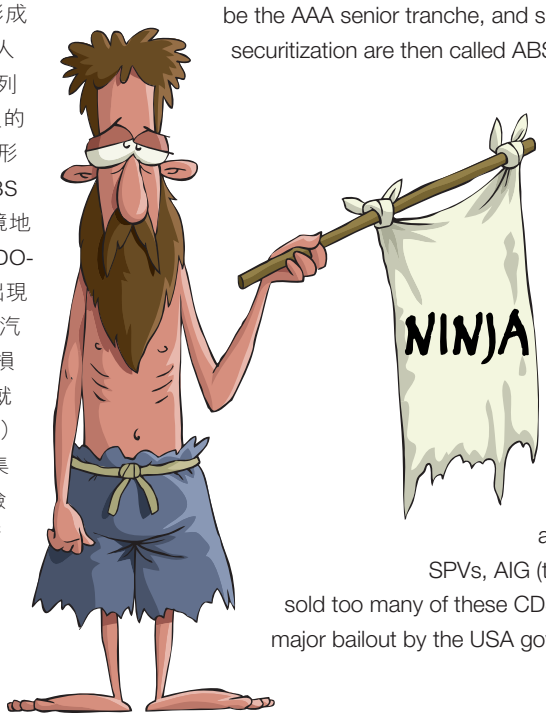
付賣方。之後每個月由貸款服務公司負責收取按揭還款，而貸款服務公司收到還款之後，會將款項交給資金提供者（通常是包括銀行在內的金融機構，簡稱FI），FI則從金融市場籌集資金作為貸款來源。如遭違約，FI將承擔全部違約責任，同時負責將資金還給金融市場的投資者。換言之，第一和第二環節的相關方不會有任何損失，因此他們也就沒有必要去全力確保貸款人是否信譽良好，或符合貸款條件，他們唯一注意到的只是這些「不太符合資格」的貸款人持有的是「次級貸款」。另一邊廂，如果FI無法負擔它要支付投資者的股息或利息而不得不申請破產的話，最終的輸家將會是投資者。

那麼，如果整個過程存在著這麼多隱憂，投資者為什麼還要投資FI呢？那是全拜「金融創新」所賜！金融機構通過分拆的獨立實體（通常叫做「特殊目的實體」，簡稱SPV）將不同按揭貸款重新捆綁成各種級別的證券，以吸引不同風險偏好的投資者，這個過程稱為「證券化」。而為了推銷這些證券產品，SPV會聘請專業評級機構（如穆迪、標準普爾等）進行評級，將證券產品分成AAA（最高投資級別）的優級系列、中級系列和最低級的股本系列。因為這些稱為抵押擔保證券（MBS）或商業抵押擔保證券（CMBS，如果標的資產是商業物業）的證券是用標的資產做抵押，所以又稱為資產抵押證券（ABS）。請注意，每一次證券化後形成的證券大多數都屬於中級系列，但令人難以想像的是，SPV再將幾個中級系列的證券重新捆綁、評級，分成AAA級的優級系列等，這些「二次證券化」之後形成的證券稱為ABS債務抵押債券（ABS CDO）。這樣的證券化過程亦可無止境地重複，通過捆綁類似證券形成新的CDO-CDO等。若投資者擔心所購CDO會出現違約，可以進行風險規避（類似購買汽車保險，以抵銷萬一出事故將蒙受的損失）。那麼，如何進行風險規避呢？就是通過購買「信用違約互換」（簡稱CDS）與另一間FI進行風險互換。美國國際集團（簡稱AIG）就是為規避SPV違約風險而售出太多此類CDS，迫使美國政府不得不在必要時注入巨資救市。

那麼，在危機中到底是哪裡出了問題呢？由於利率上漲，導致借款

mortgage servicers, who then pass the money to the fund provider, often a financial institution (FI) that was not necessarily a bank. The FI would raise money from the financial market to fund the mortgages. In case of default, it would be this FI that bore all the risk of default while paying back the investors in the financial market. In other words, participants in the first two steps would have no loss, and therefore no incentive to ensure the mortgagor was qualified or creditworthy for the loan. All they would note was that these "not very qualified" mortgagors held what was called "subprime mortgages". At the other end, if the FI could not afford the dividend or interest payments it owed to the investors and therefore had to file bankruptcy, the ultimate losers would be the investors.

So, why did people invest in these FIs if the process operated in such an insecure manner? We can thank financial innovations! The FIs, often through spin-off separate entities called Special Purpose Vehicles (SPV), rebundled the different mortgages into new securities with various grades to attract investors with different risk appetites, a process called "securitization". To be able to market these securities, rating agents such as Moody's and Standard & Poor were employed to give each one a rating, from AAA (the top investment grade) "senior tranche", to the middle "mezzanine tranche", and to the lowest grade "equity tranche". These are called mortgage backed securities (MBS), or commercial mortgage-backed securities (CMBS) if the underlying assets are commercial properties. And because there are underlying assets to back up these securities, they are also called asset-backed securities (ABS). Notice that the majority of each securitization is made up of the mezzanine tranche. What is unbelievable was that the SPVs of the FIs then bundled several mezzanine tranches and then re-rated them so that the top would be the AAA senior tranche, and so on. The securities from this second securitization are then called ABS CDOs to stand for "ABS collateralized debt obligations". The securitization process can be replicated endlessly by bundling similar securities together to form CDOs of CDOs and so on. Any investor who worried that the CDOs he or she bought would default could always hedge the risk (that is, to offset the amount of risk-taking, similar to buying car insurance to protect against accidents). They did so by buying credit default swaps (CDS) which swap the risk with another FI. In an attempt to insure against default of SPVs, AIG (the American International Group, INC.) sold too many of these CDS and that created the need for the major bailout by the USA government.

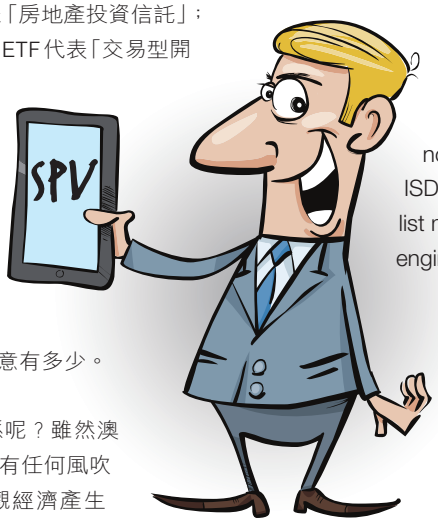


人(特別是NINJA「三無借款人」，無收入、無工作、無資產)無法償還樓宇貸款。更糟糕的是，借款人的按揭合同充斥大量艱深晦澀的專業術語，令他們誤以為還房貸的代價很低。但他們顯然不知道，世上「沒有免費午餐」的道理同樣適用於金融市場。比如不同於常規的每月償還本息安排：有些要求借款人開始時只需償還利息，但在還款期末則需償還大額本金。這帶來的連鎖效應就是，SPV無法定期向投資者支付證券投資收益，以致證券化過程最後的CDO-CDO股本系列最先違約，之後是中級系列，然後是倒數第二個CDO-CDO，如此類推。這也是為什麼在雷曼兄弟破產之後，「迷你債券」事件牽涉不同金額的賠償，這正是因為投資者所持證券的級別不同的原因。

SPV倒閉後，銷售CDS的FI也因無法代違約方償還巨額債務而倒閉；又因為SPV屬於FI，所以銀行也隨之關門大吉。最終剩下銷售了大量CDS的AIG，還有那些「大到不能倒」(簡稱TBTF)的大規模銀行，不得不由美國政府通過各種融資渠道(如「問題資產救助計劃」TARP)出手相救，全世界一片恐慌。俗語有云：現金為王！倖免於難的機構自然也不願意借錢。這樣一來，全球都陷入資金短缺的境地。

2008年11月美聯儲啟動首輪「量化寬鬆」(簡稱QE1)。這個看似充滿創意的新名詞說白了就是「印鈔票」的意思，之後幾年我們陸續目睹了QE2和QE3的出台。當城門失火的美國殃及歐洲池魚的時候，歐洲中央銀行開始推出「長期再融資計劃」(簡稱LTRO)以及「歐洲金融穩定基金計劃」(SFSF)(這一短期計劃將被相對長期的「歐洲穩定機制」ESM 取代)，冀解救在困境中的歐盟國家於水火。

這其中牽涉的字母還有很多很多，姑且再舉幾個比較常聽的吧：REIT是「房地產投資信託」；CFC是「遠期貨幣合約」；ETF代表「交易型開放式指數基金」；CLO是指「貸款抵押債券」；CLN表示「信用連結票券」；OTC合約意為「場外交易合約」；ISDA全稱是「國際掉期與衍生工具協會」……這些縮寫字母表有多長，完全取決於金融工程師們的創意有多少。



那這些和澳門有什麼關係呢？雖然澳門沒有金融市場，但全球有任何風吹草動都可能對澳門的微觀經濟產生

What went wrong during the crisis? Because of interest rate increases in the mid-2000, mortgagors could no longer pay mortgages. This was especially true for those NINJA (the mortgagors who have “no income, no job and assets”)! What is worse was that their mortgages were written with strange terms that they did not understand, and many people thought that their mortgage payments would be inexpensive. They obviously did not know the famous finance maxim: “No free lunch!” For instance, there were some that required only interest payments at the beginning, but a major sum of principal at the end of the mortgage period, as opposed to the normal mortgage of monthly interest-plus-principal repayment. The chain effect then became SPVs not being able to pay periodic returns to the investors of the securities. The equity tranche of the last CDO-CDO in the securitization series defaulted first, followed by the mezzanine tranche, on to the second last CDO-CDO and so on. This is why the mini-bond case after the collapse of the Lehman Brothers included different compensations according to the tranches the investors held.

When the SPVs collapsed, the FIs that sold CDS also collapsed because they could not afford to pay the huge debts on behalf of the default parties. And because the SPVs belonged to the FIs such as the big banks, these big banks also failed. Finally AIG, which sold a lot of CDS and other big banks that were “too big to fail” (TBTF) were bailed out by the USA government through various funding channels such as TARP (“Troubled Asset Relief Program”). The whole world panicked, cash was “king”, and institutions that were not in trouble were not willing to lend money to others. As a result, there was a global shortage of funds.

In November 2008, the Fed started the first round of Quantitative Easing, dubbed QE1, an innovative term that really just means printing money. For the rest of the years in between, many of us heard about QE2 and the recent QE3 in the USA. When the problem spread to Europe, the European Central Bank started the “Long Term Refinancing Operations” (LTRO), and the European Financial Stability Facility (SFSF), which is a short-term programme, and will be replaced by the longer-term European Stability Mechanism (ESM), all to help the ailing EU countries.

To extend the list of abbreviations, here are some more commonly heard terms – REITs for “real estate investment trusts”, CFC for “currency forward contracts”, ETFs for “exchange traded funds”, CLOs for “collateralized loan obligations”, CMOs for “collateralized mortgage obligations”, CLNs for “credit linked notes”, OTC contracts for “over-the-counter contracts”, and ISDA for “International Swaps and Derivatives Association”. The list may go on and on, depending on how innovative the financial engineers are.

So how does this story affect Macao? For better or for worse, Macao does not have a financial market. Yet the local micro-economy is easily prone to impacts from whatever happens around the globe. The most recent incident happened on 13 September 2012, when Ben Bernanke, president of the USA Federal Reserve, announced

影響。最近一例發生在2012年9月13日：當日美聯儲主席伯南克宣佈啟動第三輪量化寬鬆（QE3）。一週後，香港特區政府宣佈將對所有湧入香港的大額國際資金及時採取行動，尤其會對增長已超預期的樓市（當時香港的樓市價格已超過1997年歷史高位）加以特別關注。澳門似乎滿足於將QE3的潛在影響作為茶餘飯後的談資，而澳門特區政府也已透過金融管理局（簡稱AMCM）表示，會採取一切必要的緊急措施，遏制因QE3熱錢湧入澳門而加劇的泡沫。但事實是，雖然澳門已享受了連續八年的經濟增長（據世界銀行的統計數據，2011年澳門人均GDP達65,550美元），高通脹、高樓價，以及日益擴大的收入分配差距等問題，仍然令普通市民疲於應對甚至深受其害。而不管熱錢會否湧入澳門，這個事實都難以改變。雖然澳門人常常緬懷小城舊日的平靜，但恐怕沒人願意放棄眼前令人羨慕的繁榮發展，返回昔日時光。因此，澳門人必須學會「好壞兼收」，面對經濟高速發展所帶來的高通脹、高樓價和日益擴大的財富差距。（值得補充的是：根據世界銀行公佈的排名，澳門人均GDP全球排名第三，超過位居第四的新加坡和第八的香港。至於貧困線以下的統計數據，澳門全球排名第250位，香港則排第240位，說明香港貧困線以下的人口百分比比澳門高。）

不少人認為澳門政府總是反應慢(起碼比香港政府慢)。事實上有時如此，有時則不然。當香港政府為遏制炒樓風，於2011年推出15%高額印花稅政策，澳門則決定實施更高的20%印花稅，連地產經紀都覺得這新政嚴苛得有點過份。一年後，市民開始抱怨這令樓價不降反升，因賣方把價調高20%以抵消印花稅。更甚者是，這還波及原本無須繳納該項印花稅的零售市場。平心而論，澳門是個微觀經濟體，有說「大陸打個噴嚏澳門就感冒」，因此，對於這微觀經濟體內部的多層次經濟問題，很少有包治百病的靈丹妙藥。雖說增加土地供應量是最有效的方法，但當土地資源如此稀缺，增加供應量說易做難。

總的來說，如果人類少一點貪心，多一點知足，全球金融危機可能就不會發生。收入少了，風險也少了啊。本文希望有助大家管中窺豹，大致了解全球金融危機的前因後果，以及是什麼讓人們的生活在一夜之間為之改變：有屋的人失去房子無家可歸，有工作者則丟了工作而須靠領政府救濟金過活。回顧澳門，也曾發生有樓一族賣樓轉租，但尋尋覓覓之後，不禁唏噓地發現，自己已買不起大小、品質相當的單位。▌

a third round of Quantitative Easing (QE3). A week later, the Hong Kong SAR government announced that it would react promptly when faced with significant inflows of international funds, and would pay particular attention to the real estate market which was already experiencing an unprecedented boom (by that time, prices of the housing market had already surpassed the record high in 1997). The Macao society in general seems content to just have discussions about the possible impacts of QE3. No doubt that the Macao SAR government, via the Monetary Authority of Macao (or AMCM in short), has expressed the intention of adopting any acute policy to curb any growing bubble because of hot money from QE3. The fact is, however, that, while the local society has enjoyed economic boom for eight years by now, with a GDP per capita of USD 65,550 in 2011 according to the World Bank. Macao people also must cope with, if not suffer from, high inflation, unaffordable property prices, and wider and wider gaps in income distribution. And this is true whether or not hot money actually floods into Macao. Even though local people often miss the former tranquility and simplicity of this small city, probably no one wishes to leave this prosperous development that many other emerging cities envy. Hence, people in Macao will have to learn to face the evolved economy that also comes with high inflation, high property prices, and widened wealth gap as a “prosperity package”. (Incidentally, according to the World Bank, Macao ranks No. 3 in GDP per capita, ahead of Singapore and Hong Kong, ranked No. 4 and 8 respectively. Macao ranks No. 250 in terms of percentage of population living below the poverty line whereas Hong Kong ranks No. 240, indicating that a larger percentage of Hong Kong’s population lives below the poverty line than in Macao).

The general perception is that the Macao government always reacts slowly, certainly slower than Hong Kong. This is true sometimes, but not all the time! When Hong Kong decided to stop speculation in the property market by introducing a 15% heavy stamp duty in 2011, Macao decided to implement an even higher stamp duty of 20%, which was effective to the extent that real estate agents thought it was an overly harsh move. One year later, the market complained that the heavy stamp duty had become a cause of even higher property prices because sellers simply increased their asking prices to cover this 20%. Worse off! The effect spilled over to the retail market which was free from this special stamp duty. Nonetheless, to be frank, very few governments in the world could have a panacea for this multi-dimensional economic problem in this micro-economy that will always catch the flu when the motherland sneezes. Increasing supply is definitely the most effective cure for the problem. Yet, the actual implementation is far more difficult than plain talking when land is so scarce.

Overall, if human beings had been less greedy and more content, the global financial crisis probably would not have happened. With less income comes less risk! I hope this short alphabet story can give you a snapshot of what happened and what changed the lives of so many people: those with homes became homeless, those with jobs suddenly found themselves living on government social funds, and, in Macao, those who used to own apartments are now renting and finding that they can no longer afford to buy any apartment of the same size and quality as the one they previously sold. ▌

發展管理中的制度缺失

Institutional Voids in Development Administration

撰文：吳德榮 | Text by Tak-Wing Ngo　　中文翻譯：陳靜 | Chinese translation by Ruby Chen

制度研究一直是公共行政領域的重要課題。學者一早已認識到制度對於促進經濟發展及穩定管治的重要性，市場和政策要想正常有效的運行，必須有一套能促進經濟交流和仲裁社會矛盾的制度。「先理順制度」已成為傳統智慧，它在國際組織（例如世界銀行、國際貨幣基金組織）倡導的各種良好管治項目中都發揮著重要的作用。

The study of institutions has been a central concern in the field of public administration. Researchers have long recognised the importance of institutions in fostering economic development and effecting stable governance. For the market to function adequately and the polity to operate effectively, it is necessary to have in place a certain set of institutions that facilitate economic exchanges and adjudicate social conflicts. “Making institutions right” has become conventional wisdom. It plays a key policy in various good governance projects advocated by international organisations such as the World Bank and the International Monetary Fund.

作者為澳門大學社會科學及人文學院政治學教授，專注於政治經濟、國家建構及規管與治理的研究。
The author is a professor of Political Science of the Faculty of Social Sciences and Humanities at the University of Macau. He specialises in political economy, state making, and regulation and governance.

儘管制度對發展的重要性已毋庸置疑，很多發展中經濟體仍然缺乏亟需的制度來規管市場交換、調配經濟資源、協調政策實施以及管理發展項目。當這些制度缺失的時候會發生什麼？能否建立新的制度填補缺失？在什麼樣的情況下新的規定才能制度化？這些都是本項目研究的問題。本項目由多個跨國研究機構合作開展，包括荷蘭規管與治理研究中心，新加坡國立大學的管治、制度及組織研究中心，法國社科院南亞研究中心，鹿特丹大學伊拉斯姆斯歷史、文化與傳播學院，浙江大學以及澳門大學。

該項目採用新方法新角度去研究制度。到目前為止，有關制度缺失的問題都是從國家能力、市場失靈或者管治不善的角度去進行分析。亦因此關注焦點一直圍繞著市場失靈或國家失敗的後果。在承接現有研究成果的同時，本項目從不同的角度進行分析，探討的起點是：制度缺失有時是由非傳統的行為者/機構所填補的。這些非傳統行為者在協商和建立新規定新資源的過程中，導致了另類管治形式的出現。

本項目的核心課題是探討制度缺失填補背後的邏輯。試圖回答的問題包括：在哪些條件下制度缺失會得到填補？由誰來填補？為什麼有些制度缺失得到填補，有些卻沒有？本項目不僅僅探討制度冗餘、機構弱勢或國家失敗的後果這些話題，還進一步重點分析具體案例。在這些案例中，各種形式的機構、做法和行為者履行其協調或規管職能，以求解決制度缺陷的問題。通過對這些具體案例的分析，本項目探討哪些歷史、政治和社會條件是有利於制度缺失的填補的，哪些則是不利的。雖然課題有深遠的理論和實證意義，但目前並沒有任何綜合框架去分析制度缺失對個人行為者帶來哪些機會和問題，以及個人行為者作用的後果。因此，如何透過對大量不同的實證案例進行歸納比較，從而構建一個關於制度缺失填補的理論，就成為一個較大的挑戰。

制度缺失的定義

制度缺失的概念，最早是由兩位管理學專業的學者在對新興市場企業行為進行研究的過程中提出的。這個概念在管理學領域日益受到認可，但是理論化仍然不足，應用也相當有限。為了構建制度缺失的新理論，我們已在巴黎、鹿特丹和多倫多舉辦了一系列的研討會和工作坊，不久還將在萊頓、新加坡、鹿特丹和澳門

Notwithstanding the established wisdom that institutions matter in development, most developing economies are characterized by the absence of much-needed institutional arrangements to regulate market exchange, mobilise economic resources, coordinate policy implementation, and administer developmental programmes. What happens when such institutional arrangements are absent? Can new institutions be created to fill the void? And under what circumstances can new regulatory rules be institutionalised? These are the questions addressed by the project on institutional voids. This is a cross-continental project jointly undertaken with a number of leading research institutes including IIAS Centre for Regulation and Governance (Leiden), NUS Centre for Governance, Institutions and Organisations (Singapore), CNRS-EHESS Centre d'Etudes de l'Inde et de l'Asie du Sud (Paris), Erasmus School of History, Culture and Communication (Rotterdam), Zhejiang University, and the University of Macau.

The project underlines a new approach to the study of institutions. So far the question of institutional inefficacies has been analysed in terms of weak state capacity, market failure, or bad governance. The central concern has hitherto revolved around the consequences of market or state failures. While acknowledging the insights that have emerged from existing studies, this project approaches the problem from a different set of concerns. The point of departure is that institutional voids are sometimes filled by unconventional actors/organisations. In the course of negotiating and creating new rules and resources, these unconventional actors have contributed to the emergence of alternative forms of governance.

The central concern of the project is to discover the logic that shapes the filling of institutional voids. The main questions to be answered are: Under what conditions will an institutional void be filled, and by whom? Why are some voids filled but not others? While it shares the long-standing concerns about the consequences of institutional redundancy, organisational weakness, or state failure, the project goes one step further and focuses on specific cases in which various forms of organisations, practices, and actors perform coordinating or regulatory functions in an attempt to address institutional inadequacies. By doing so, it explores the historical, political, and social conditions that are conducive or averse to the filling of voids. And despite the enormous empirical and theoretical implications of this topic, there is currently no comprehensive framework that analyses the opportunities and problems institutional voids offer to individual actors, as well as the consequences of their agency. The challenge is therefore to construct a theory of institutional void filling from an inductive comparison of a wide range of empirical cases.

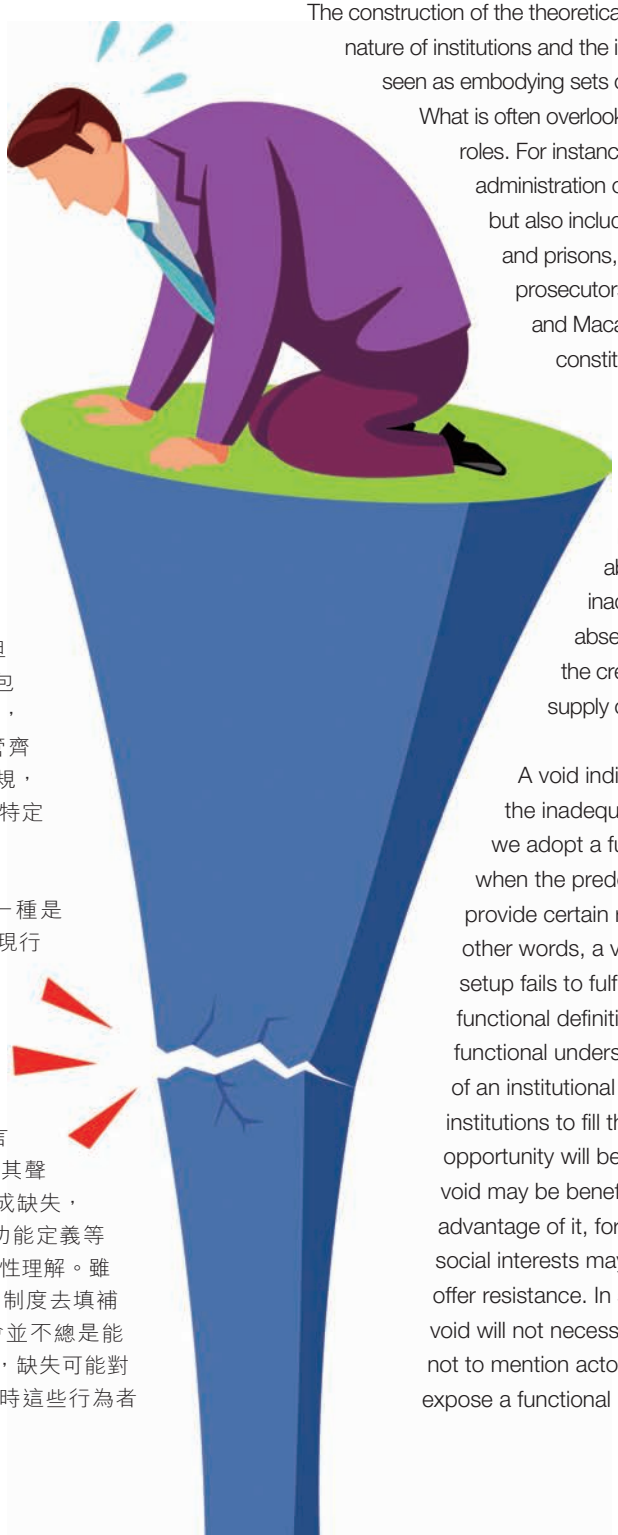
Defining Institutional Voids

The idea of institutional void was first proposed by two researchers in management studies in their study of firm behaviour in emerging markets. The concept has gained some popularity in management science, but remains

舉辦另外幾場研討會和工作坊，進一步改進理論框架，對亞洲、歐洲和非洲的實證案例進行比較分析。

構建理論框架的第一步是對制度的性質及缺失的概念進行清晰的界定。傳統觀點認為，制度是由一整套正規及非正規的規定、權利和慣例組成的。但「職能角色」不可或缺的職能卻經常被忽視。例如，法律體系作為一種司法制度不僅僅涉及法律法規，還包括諸如法院監獄之類的國家機關，以及由檢察官、律師、法官等履行的職能角色。香港和澳門沒有反壟斷法，這無疑造成壟斷規管領域的制度缺失；但是，缺乏精通反壟斷案件的合格律師也同樣會導致制度缺失。在這個案例中，法規和職能角色都是構成制度的不可或缺的一部分。因此，當我們討論制度缺失的時候，不但包括法規慣例的缺失，還包括職能角色的缺失。因此，要填補缺失，就必須雙管齊下，一方面建立或修訂法規，另一方面供應或替換履行特定職能角色的行為者。

制度缺失有兩種情況，一種是制度完全不存在，一種是現行制度存在缺陷。這裡，我們對缺失採用功能定義。當佔主導地位的制度基礎不能夠履行其特定的規管或協調職能的時候，就構成缺失。換言之，當現行制度不能履行其聲稱會履行的職能時，就構成缺失，但是，不應將「缺失」的功能定義等同於對「缺失填補」的功能性理解。雖然缺失的存在創造了讓新制度去填補缺失的機會，但這種機會並不總是能轉化為功能需求。有時候，缺失可能對某些強大行為者有利，此時這些行為者



poorly theorised and limited in its application. To construct a new theory of institutional voids, we have organised a series of seminars and workshops in Paris, Rotterdam, and Toronto. Several workshops are forthcoming in Leiden, Singapore, Rotterdam, and Macao to refine the theoretical framework and to compare empirical cases across Asia, Europe, and Africa.

The construction of the theoretical framework begins with a clarification of the nature of institutions and the idea of voids. Institutions are conventionally seen as embodying sets of formal and informal rules, rights, and norms. What is often overlooked is the indispensable function of institutional roles. For instance, a legal system as an institution for the administration of justice concerns not only laws and statutes, but also includes organisational functionaries such as courts and prisons, as well as functional roles as performed by prosecutors, lawyers, judges, and so on. In Hong Kong and Macao, the absence of anti-trust laws will no doubt constitute an institutional void in the regulation of monopolies, but by the same token the shortage of qualified lawyers specializing in anti-trust cases will also create a void. In this case, both rules and roles are part and parcel of the institution. As such, when we talk about institutional voids, we refer not only to the inadequacy of rules and norms, but also to the absence of roles. The filling of voids thus involves the creation or modification of rules, as well as the supply or replacement of specific roles by actors.

A void indicates not only a complete absence but also the inadequacies of existing institutional set-ups. Here we adopt a functional definition of void: a void exists when the predominant institutional infrastructure cannot provide certain regulatory or coordinating functions. In other words, a void is present when an existing institutional setup fails to fulfil its ostensible functions. However, a functional definition of void should not be equated with a functional understanding of void-filling. While the presence of an institutional void creates an opportunity for new institutions to fill that void, there is no guarantee that this opportunity will be translated into a functional demand. The void may be beneficial to certain powerful actors who take advantage of it, for instance through rent seeking. Other social interests may simply be too weak or fragmented to offer resistance. In such circumstances, the presence of a void will not necessarily generate a demand to fill that void, not to mention actors to fill it. Put differently, institutional voids expose a functional inadequacy, but this in itself is insufficient to

會通過種種方式(比如尋租行為)去利用這種缺失獲益，其他的社會利益群體可能力量太弱或者太零散而無法抵抗。在這種情況下，缺失的存在不一定會產生填補缺失的需求，更不用説填補缺失的行為者了。換言之，制度缺失暴露出功能性缺陷，但這本身不足以確保缺陷得到補救。缺失的填補受社會過程和政治過程的影響，而這兩個過程並不受制於功能性的需要。事實上，發展中國家的很多缺失仍然未得到填補。這也是本項目試圖探討缺失填補措施必需條件的原因。

制度缺失的類型

在構建制度缺失理論的過程中，確定缺失的類型是關鍵一步。因為不同類型的缺失需要用不同的方法去填補，克服現有政治及制度障礙的過程也各不相同。我們從缺失的種類、來源、領域和時間四個角度對缺失進行分類。從種類的角度，我們將制度缺失分成兩類：一種是法規慣例的缺失，一種是職能角色的缺失。

第二個是從來源的角度，不同的制度密度(制度不存在，制度缺陷，制度冗餘)會產生不同的缺失。 進行市場改革的社會主義國家(如俄羅斯、東歐、中國和越南)，由於缺乏市場機制，制度不存在的問題也最為明顯。相反，有些國家存在過多的並行規定或重疊的管控職能，因而面臨制度冗餘的問題。以中國為例，同一件事情往往牽涉到多個官僚機構，導致婆婆太多的情況。

第三個角度是缺失的領域。按此可將缺失粗略的分為公共部門內的缺失和市場內的缺失兩大類。有兩種情況，一種是必要的國家制度無力解決社會矛盾和制訂國家計劃；另一種是缺乏相應的市場制度去分配資源、組織交換、安排生產、籌集資金和鼓勵創新。

第四個角度是缺失的時間性。有些缺失起因於長期的制度設置，有些則起因於迅速變化的環境。起因不同的缺失，填補缺失所必需的條件也不盡相同。存在時間相對較長的缺失容易被既得利益者視為不可避免的現實。各利益集團可能會利用其中的漏洞，藉機確立自己在現狀中的地位。在這種情況下，缺失被填補的可能性相對較小。

ensure remedies. Void-filling is shaped by social and political processes not singularly responding to the functional needs of restoring the effectiveness of the system. As a matter of fact, many voids in developing countries remained unfilled. That is why the project seeks to identify the conditions under which void-filling initiatives are undertaken.

A Typology of Institutional Voids

One of the key steps in constructing a theory of institutional voids is to develop a typology. Such a typology is needed because different types of voids will need different remedies and hence will generate vastly diverse processes to overcome the existing political and institutional barriers and bridge the gaps. We have categorized voids along four axes according to the kind, source, locus and temporality of voids. The first axis deals with the kind of void. We have distinguished two types of institutional voids: voids in institutional rules and norms, and voids in institutional roles.

The second axis concerns the source of voids. Here a distinction is made between different degrees of institutional density, which give rise to the emergence of voids as a result of institutional absence, inadequacy, and redundancy. Institutional absence is most obvious among countries which are moving away from a centrally planned socialist system (such as Russia, Eastern Europe, China, and Vietnam) when the infrastructural frameworks for market mechanisms are lacking. In contrast, voids arising from institutional abundance can be found in countries with too many parallel rules or overlapping roles competing for control. In China, for instance, many bureaucratic units are involved in one single task, which leads people to complain about too many “parents-in-law”.

The third axis relates to the locus of the voids. A broad distinction can be made between voids in the public sector and those in the market. The locus of voids differs between the situation when the necessary “state institutions” are too weak to manage social conflicts or formulate national plans, and when “market institutions” are absent to allocate resources, organize exchanges, distribute production, raise funds, and encourage innovation.

The fourth axis concerns the temporality of voids. The conditions for void-filling differ according to whether the void originates from a long-existing institutional setting or whether it derives from rapidly-changing circumstances. Voids that have a more permanent character may be more accepted by all stakeholders as an inevitable reality. Groups may take advantage of the loopholes and establish themselves as part of the status quo. In such cases, voids are less likely to be filled.

缺失填補者

瞭解制度缺失的不同類型對於揭示缺失填補的機制至關重要。制度缺失可以由很多行為者共同填補，他們按照缺失的性質、手中擁有的資源以及宏觀社會政治條件而採取不同的策略。我們可以將缺失填補者粗略的分成三大類：策略行為者、社會團體、普羅大眾。

策略行為者是有影響力的行為者，他們能修改制度規定，建立新的做法，履行職能角色。他們可能是公共實體（如國家）、組織機構（如政府部門或商業協會）或有影響力的個人（如政治領袖、政府官員或商業大亨）。策略行為者可以是充當市場協調角色的公職人員，也可以是承擔公共責任的私營部門人員。我們在案例研究中遇到過很多行為者履行特殊任務的例子。例如，台灣的美援會曾一度成為經濟發展的總規劃師，印尼的大房地產企業承擔起城市規劃和市政服務的責任，中國的當舖成為中小企業的融資平臺。

第二類的社會團體包括非政府組織、利益集團、宗教組織、專業協會、民間自發的懲罪團體、甚至社會運動。這一類的行為者目前受到的關注也是最多的。環保團體的活動，慈善機構的社會服務，非政府組織在政府無作為時發起的一些旨在預防或補救社會負面效應的運動，這些我們都並不陌生。與策略行為者不同的是，社會團體可能不具備充足的資金、行政權力、市場影響力這些優勢。因此，它們常用的策略就是和其他組織合作共同發揮影響力，藉此實現共享資源，為其行動爭取更廣泛的社會和民意支持。

目前為止，最令人意外的缺失填補者是普羅大眾。與策略行為者和社會團體相比，普羅大眾只是普通人，無權無勢又無錢，可供使用的資源少之又少，也不會同心同德為了一個共同的目標而努力。現有的理論慣於假設普羅大眾的惰性，在沒有激勵的情況下，很難動員大眾發起集體行動，即使這樣做符合其共同利益。然而，實證研究顯示事實並非如此，尤其是在當今這個信息時代。例如，普通人民（特別是網民）已開始將互聯網作為一種防止政府違法瀆職的公共監督機制。「人肉搜索」也已成為遏制官員失職瀆職的有效工具。從這個意義上來說，普通人通過自發無組織的共同匿名行動，也可能起到部分填補缺失的作用。

Void-Filling Agents

Understanding the variations in institutional voids is instrumental to unveil the mechanisms of void-filling. Institutional voids can be filled by a multiplicity of actors who deploy different strategies in relation to the nature of the voids, the resources these actors control, and the broader socio-political conditions. At the risk of simplification, we can broadly identify three categories of void-fillers: strategic actors, social groups, and commons.

Strategic actors are powerful actors who change institutional rules, establish new practices, and perform functional roles. They can be a public entity such as the state; an organisational establishment such as a specific government department or business association; or an influential individual such as a political leader, bureaucrat, or business tycoon. Strategic actors can be public servants fulfilling a market coordinating role, or private actors taking on public responsibilities of regulation and governance. We have come across many unexpected actors in our case studies. For instance, a development aid agency turned into an economic planning bureau in Taiwan; real estate companies assumed the responsibilities of town planning and municipal services in Indonesia; and pawnshops took over the role of banks for private enterprises in China.

The second category, social groups, includes NGOs, interest groups, religious organisations, professional associations, vigilante groups, and even social movements. This category of actors has so far received the most attention. We are familiar with actions of environmental protection groups, social services provided by charities, and NGO movements which seek to remedy or protect against social externalities when governments fail to act. Unlike strategic actors, social groups may not be endowed with sufficient financial resources, administrative power, or market leverage. Because of that, they often rely on a strategy of exercising influence in collaboration with other organisations, which allows groups to share resources as well as to broaden the basis of social support, hence gaining a higher level of popular legitimacy for their course of action.

By far the most unexpected category of void-fillers is the agency exercised by the common people. In contrast to strategic actors and social groups, the commons are simply ordinary people, often powerless in terms of money and position, with few resources at their disposal, and barely organized for a common purpose. Existing scholarship tends to assume that it is difficult to realise collective action among commons in the absence of selective incentives to motivate participation, even if it is in their mutual interests to act. However, empirical studies have shown otherwise, especially in the age of information. For instance, ordinary people, especially the so-called netizens, have used the internet as a public surveillance mechanism against government malfeasance. The “human-flesh search” has become a kind of deterrence against official misconduct in public. In this sense, the common people, through anonymous, concerted and yet spontaneous and uncoordinated actions, create a practice that serves to remedy a void, even if this is at best a partial remedy.

填補缺失的條件

由於缺失的填補要求通過建立或修改制度規定和職能角色去糾正功能失調，整個過程必然會導致制度的變革。當前關於制度變革的爭論往往陷入功能觀和政治觀的兩級化。

關於制度缺失的探討則有助避免這種兩極化。我們在分析時將近距的制度與大背景制度加以區分。通常，對新解決方法的功能性需求可能會導致近距制度的修改。但是，大背景制度的變更所涉及的政治和歷史過程則未必與功能性需求相關。一種新的做法是否能夠完全制度化，還是只能作為一種臨時性解決方案，取決於它與現有社會政治結構的契合與衝突。

我們發現很多種社會政治結構發揮作用的方式。首先，與現有國家制度的結合是一個重要條件。由於非國家行為者對缺失的填補僭越了國家的權力，因此填補缺失的措施以及新的規定和結構能否獲得國家的認可就變得至關重要。成功制度化的另一個條件是新的做法滲透到現有的社會經濟結構中。新的做法與其他制度和利益越早形成共生關係，成為永久性做法的可能性就越大。同理，避免與現有利益相關者發生直接的利益衝突，可以減少新做法制度化的阻力。

吊詭的是，由非國家行為者來填補缺失固然能解決一些問題，但經常也帶來一些新問題。在很多發展中國家，並不缺少願意行使公共權力的行為者。這些個人和機構行為者將填補缺失視為進入公共領域的重要政治機會。結果是衍生出不少政治代理人和行政代理人。公共權力由此變得零散、重疊、模棱兩可，由各種不同的機構和政治掮客來行使。這樣，一個缺失的填補也導致了另一個缺失的出現。

Conditions of Void-Filling

Since void-filling requires the creation or modification of institutional roles and rules to remedy dysfunction, the process necessarily results in institutional change. The existing debate about institutional change tends to polarise into functional versus political views of institutional change. The inquiry about institutional voids makes a contribution to this debate by avoiding such polarisation. Our analysis makes a distinction between proximate institutions and background institutions. Very often, the functional demand for new solutions may trigger off modifications to proximate institutions. However, a change in background institutions involves political and historical processes that are not necessarily related to any functional quest. The likelihood of a new practice being fully institutionalised as a regular set-up rather than an ad hoc solution will depend on its “mesh and clash” with the prevailing socio-political structure.

We hypothesise a number of ways in which the broader socio-political structure plays a role. First and foremost, linkages with existing state institutions are an important condition. Since the filling of voids by non-state actors trespasses the authority of the state, state sanction of void-filling initiatives as well as the subsequent ratification of new rules and structures by the state is therefore instrumental. Another condition for successful institutionalization is the penetration of new practices into the existing socio-economic structure. The sooner they establish a symbiotic relationship with other institutions and interests, the greater the chance of success that such practices will have in becoming a permanent set-up. Likewise, the avoidance of direct conflict of interests with existing stakeholders will lower the resistance of the status quo in the institutionalization of new practices.

Paradoxically, the filling of voids by non-state actors resolves some problems but often at the price of creating new problems. In many developing countries, there is no shortage of actors who are eager to exercise public authority. These actors – be they individual or organisational – consider the filling of voids important political opportunities for launching into the public sphere. The result is a proliferation of political and administrative brokerage. Public authority becomes an amalgam of fragmented, overlapping, and ambivalent powers exercised by a variety of institutions and political brokers. In this regard, the filling of one void creates a new void.

對澳門的啟示

制度缺失的研究對澳門與珠三角地區的經濟一體化以及橫琴的合作開發具有重大啟示。

中央政府鼓勵澳門與珠三角地區經濟一體化的願望是清晰明確的，但是目前卻缺乏相應的制度安排，去有效協調發展計劃，解決澳門、珠海以及廣東其他城市之間存在的分歧。這裡就存在一個重要的制度缺失。這個缺失如何填補，由誰去填補，也勢必成為影響該區域未來發展的關鍵因素。

事實上，由於各級省市地區作為增長、競爭及爭議源頭的重要性日益加強，中國已經出現了多層次管治方面的新問題。當缺少相應的制度安排去仲裁地區間競爭及協調各省市縣鎮合作時，就會產生制度缺失的問題。國民政府在規管協調地區間競爭合作方面的能力有限，但是中層的管治制度又完全不存在。如何填補這個缺失將成為中國未來幾年的重要課題。

Implications for Macao

The study of institutional voids has major implications for Macao's economic integration into the Pearl River Delta region and the joint development of Hengqin.

While the intention of the national government in encouraging Macao's integration into the Pearl River economy is strong and unequivocal, there is an absence of institutional arrangements that can coordinate development plans and adjudicate differences between Macao, Zhuhai, and other cities in Guangdong. We can detect a major institutional void here; how this void can be filled and by whom is thus a key issue for the region's future development.

In fact, the increasing importance of sub-national territorial units as the source of growth, competition, and political contention has resulted in new problems about multi-level governance in China. The problem of institutional voids arises when the institutional arrangements needed to arbitrate inter-local competition and coordinate inter-provincial cooperation are in short supply. The national government has limited capacity in regulating or coordinating sub-national contention and cooperation, while institutions of meso-level governance are completely absent. The filling of this void will soon become a central concern for China in the coming years.

「學院專欄」內容僅代表撰文者個人意見。
The views expressed in the Faculty Column are solely those of the author, and do not necessarily reflect the views of the umagazine or UM.

歡迎澳大各學院之教職員投稿。
UM Faculty members are all welcome to contribute articles to umagazine.

澳門大學

UNIVERSIDADE DE MACAU

UNIVERSITY OF MACAU

ISSN 2077-2491