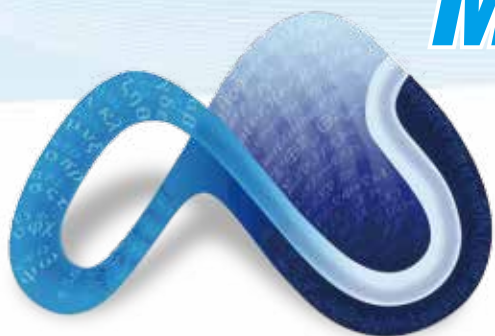# Department of Mathematics

Issue 12

Newsletter 2014-2015

Editorial

In this issue we have interviews with three alumni: one of them became a successful real-estate developer, and the other two assistant professors. Also included is one very short account of a mathematics alumni dinner gathering, as well as an anecdotal article on a perhaps forgotten 20th century mathematics giant, Emmy Noether.

But to begin with, we have a short description on our new student exchange program COSINE.

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COSINE program

The Department of Mathematics in CUHK launched a China and Oversea Study, Internship and Exchange (COSINE) program in 2013. The aim of the COSINE program is to enhance the mathematics and career trainings of students by providing them additional outside-classroom activities.

To accommodate various interests, the Department has arranged diversified activities such as summer research, summer schools and summer internships for the students.

For summer research, the Department has created summer research positions in top universities in the United States, Canada as well as Mainland China. The aims of these summer research opportunities are to let the students receive early research training, develop interests in mathematical research and prepare for further studies. In the summer of 2014, the Department placed four students in Oak Ridge National Laboratory, two at the University of Delaware, three at the University of Waterloo, two at the Michigan State University and two at the Shenzhen Institute of Advanced Technology. Many students who participated in these summer research activities have subsequently received graduate school offers from very good universities with full scholarships. On the other hand, for students who want to learn more advanced mathematics, the Department has placed them in summer school organized by top universities in Mainland China. These students took classes offered by international experts in various topics not included in standard undergraduate curriculum.

For summer internships, the Department has arranged some educational summer internships in local high schools and some industrial summer internships in local companies. The aim of these summer internships is to give them early career training. In the summer of 2014, the Department placed two students in CASH and five in Hong Kong Educational Publishing Company.

The Department sees the need for more opportunities for students, and would continue to strive to create more outside-classroom activities for them.

李思廉訪談

李思廉先生在大學時熱愛運動，於1978年從中文大學數學系畢業後第一份工作是證券金融從業員，在1993年跟朋友創業。廣州富力地產股份有限公司成立於1994年，為廣州主要的房地產開發公司之一，其業務分佈在廣州、北京和上海等二十五個中國核心城市開發房地產項目。李思廉先生現職富力地產董事長。

編：可否簡述一下你於1978年從數學系畢業後的經歷？

李：我畢業後一直從事不同的工作，1985年起從事中港貿易，直到1994年才跟朋友合資成立房地產公司。當時正值改革開放，我屬於第一批後期的人前往內地發展。那時候我手頭上的資金有限，我仔細比較香港和內地的情況，發現如果我留在香港的話，最多只可炒樓，但如果以同一筆資金到廣州的話，我卻可以開展房地產業。所以，我再三思量後選擇了廣州創立了現在的富力地產。

編：說起內地的房地產，我們不期然就會聯想起「豆腐渣工程」，你作為地產商怎麼看這件事？

李：這是一個不正確的指控。富力地產現時的在建工程量比整個香港地產公司的總和還大，而內地有十多間規模相若的公司。要明白只要是人做的事就會有出錯的機會。所謂「豆腐渣工程」，實際是因為有些小型公司在早期工程因資金不足及疏忽而產生的問題。但在今時今日，建房屋要經多方監察，批核和監管，所以這個問題很少出現。

編：專精房地產的你如何看待香港樓價呢？

李：我們都知道，香港的地價樓價高得嚇人。然而，高企的樓價象徵了當地城市的價值。試想想，假如一個地方沒有潛力的話，又怎會持續有錢湧入？紐約、東京，倫敦等等都是高房價的地方，人願意以高價在這些地方置業，就表示了她們有其優勝之處。

至於我們怎樣去看一個地方前景好不好？其中一個指標就是看樓價。我們正處於一個正常健康的經濟體制下，自然香港樓價的大方向就是看升了。

（左起）李思廉先生，陳漢夫教授

編：樓價再升的話我們就統統不用買樓了。

李：只計自住的話，一個人的一生正常只會面對一次樓價，因為在買樓前後的樓價都跟自己無關。有趣的是，人對於樓價是沒有忠誠度的，他們一般買樓前希望跌，卻在買樓後開始想樓價升。根據歷史，樓價只會在經濟最不景氣時下跌最多30%，其後會慢慢恢復，然後超越本來的水平。樓價跌得最多的時候，一來大家都手頭緊，二來一般人不是到了絕境也不會賣樓，所以成交量反而是最少的，所以祈求樓價大幅下跌而買到心頭好的房子機會很小。

編：你覺得香港還有發展的空間嗎？

李：香港有兩大優勢：一. 人才；二. 自由的金融體制。只要香港的金融體制尚未崩潰，香港就有她的價值。實際上，有錢人最著重錢的流動性，他們除了要求資金能自由流動外，還著眼在合理的私隱度，這一點無疑香港是有優勢的。香港雖然有很多人材，但是這些人才不夠集中。假設一家德國投資公司想在亞洲設立本部，他們的首選是上海，因為在上海很容易找到一批德語流利的商業人才，但相反在香港就比較難找到，所以只屈居次選。

編：年輕一輩大多抱怨難上車，你又怎樣看這個現象？

李：正如我剛才所講，歷史是不斷循環的，十年前的美國，現在的香港，可能就是十年後的廣州。根據時間推移，未來會在更內陸的城市發生，關鍵在於你對發展流向的觀察力，以及是否願意離開香港？又有沒有心理準備吃苦頭？所以說，年輕一代要更努力才能成功。

編：香港學生即使是上課也忙於使用手機，相較內地學生明顯專注力稍遜，加上內地學生也大多比較勤奮好學，令香港學生倍感壓力。你認為香港學生面對內地生的競爭該如何自處？

李：香港學生應有正確的定位，只要他們認同香港是中國的一個城市，那自然可以放眼中國。香港跟中國交通連接方便，相較以前往返內地動輒一天，現在幾個小時便能連貫東西南北實在方便得多。香港學生實在不必劃地自限，限制自己一定要在香港工作，反之應多接受去不同城市工作的機會。

舉個例子，香港現在有一份12K的工作，而廣州有一份8K的工作，雖然香港的人工較高，但廣州的晉升機會較多，可能未來一兩年薪金便能調升至20K。以我所見，很多美國一流大學的畢業生都選擇在中國發展，香港學生也不應輕易放棄在內地發展的機會。

很多香港的中小學生一次也從未踏足內地，由此可見部分學生對內地的認識不足。香港學生應從小就多親身看看內地城市的各個面貌，好的和不好的一面都要多看，這樣才能面向內地，有助日後把握機遇。

編按：

把握機遇，逆境自強。

經歷分享　李文俊教授

李文俊教授於中文大學數學系修畢學士課程，之後在史丹佛大學(Stanford University) 完成博士課程，其後在英屬哥倫比亞大學(University of British Columbia)及麻省理工學院(Massachusetts Institute of Technology)完成博士後，本年度起擔任本系助理教授。

編：你是從何時想唸微分幾何學呢？

李：2004年。當時我跟 Prof. N. C. Leung 和 Prof. Tom Wan 做Project，另外也跟 Prof. L. F. Tam 做Project，讀了一些Differential Topology，然後獲Stanford取錄為博士生。在Stanford的第一年只是讀書，其後考Qualifying。Stanford的 Qualifying Exam 是筆試，相比起口試要容易很多了。第二年則跟了Prof. R. Schoen, Prof. L. Simon 及 Prof. Li Jun讀一些文章。

編：可以講一下你在Stanford的經歷嗎？

李：Stanford是一間很好的學校，我的同學們喜歡組織讀書小組，例如不同數學鄰域的會一起present papers，所以在其他人身上學了不少東西。另外Stanford 環境非常優美而且它本身是一個小社區，日常所需品都一應俱備，所以學生不一定需要開車，很方便。

編：跟我們談一談你的博士導師Prof. Rick Schoen好嗎？

李：談到我的導師R．Schoen，因為他收的學生不多，所以他每週都會約學生面談數學。起初他建議我先讀一些papers，直到第二年中，他問我要不要嘗試一個新idea……他的整個指導過程都是非常緊密的。

他的太太 Doris Fischer-Colbrie也曾是數學家，是 B．Lawson的學生，現在專注造陶瓷；他們的女兒是唸生命科學的。

編：你唸PhD的過程順利嗎？

李：雖說我唸PhD尚算順利，但也有不少掙扎。因我論文需要用到Geometric Measure Theory，它是既細緻也難學的東西，這跟我本來所想做的更幾何的問題略有不同，因此我花了不少工夫才學會。

編：可以跟我們分享你畢業後到UBC唸博士後(Postdoc)的故事嗎？

李：畢業後我在Stanford遇到Schoen以前的學生(即是我的師姐)Alina Fraser，她邀請我到 UBC 唸 Postdoc。在UBC的兩年及之後MIT的工作讓我有不少體驗。Stanford, UBC和MIT各有不同的工作節奏及風格，回想起來，西岸的大學似乎更relaxed，也許跟天氣也有關係吧！

編：在你到過的幾個地方中你最喜歡哪兒呢？

李：我比較喜歡Boston，因為文化氣息濃厚，Charles Bridge也很漂亮。

編：除了地方以外，你在教學的過程中一定也接觸過來自不同地方的本科生吧！在訪談結束之前可以跟我們談一下嗎？

李：我在UBC，Stanford和MIT都有教書，談起教學，我覺得比起UBC，中大的學生也算不錯，甚至比他們更優秀。至於Stanford及MIT的同學當然很聰明，但他們在數學的表達上有時不及香港學生完整，這也許就是香港和美國中學教學文化差異的緣故吧！

學問之路　楊葆霖教授

楊葆霖教授於香港中文大學數學系學士及碩士畢業後，在美國普林斯頓大學(Princeton University) 完成博士學位，並於美國羅格斯大學 (Rutgers, the State University of New Jersey) 及英國牛津大學 (University of Oxford) 從事教學及研究工作，今年回流香港，成為本系新任助理教授。

編：當年你為何選擇選修數學？

楊：我覺得數學是一門很特別的學科。已證明的數學定理，無論在何時、何地都是真確的，可以一直傳承下去，歷久不衰。而且數學當中蘊藏了許多很漂亮的想法。所以我在唸中學時已對數學有濃厚的興趣。

編：你修讀本科時，曾跟幾位志同道合的同學一起建立了一個名為「數學資料庫」的網站，為什麼有這樣的一個想法？

楊：其實「數學資料庫」的前身是數學系另一位朋友 Carto 的個人網站，提供了他於中學時期製作的數學資源（主要是筆記）。當時互聯網上的資源沒有今天豐富，要找好的數學筆記並不容易，所以Carto後來集合了一班志同道合的同學，希望建立一個推廣數學的平台，可以讓大家交換筆記、交流數學，而我是這班同學之一。

編：在中大數學系最大的得著是什麼？

楊：我有幸在數學系遇上了許多良師益

友，他們對我後來的發展影響深遠。我記得當時很多同學的數學都非常好，有些中學時已曾代表香港出賽國際數學奧林匹克 (IMO)，也有同學大一時便已掌握了整個大學本科數學課程的知識。所以我們當時學習的氣氛很濃厚。

我亦受益於不少系內的老師，例如指導我碩士論文的劉家成教授；一年級時教我實分析、引領我發現分析之奧妙的吳恭孚教授；永遠很耐心、很和藹也很嚴謹的陸慶燊教授；讓我參與數學英才精進課程 (EPYMT)、對我很有啟發的區國強教授；很平易近人也很有原則的梁子威教授；經常為我指引前路的張家麟博士等等，還有太多未能盡錄。

在我本科第二年暑假，有幸獲得中大數學系推薦，到美國康奈爾大學 (Cornell University) 參加一個暑期研究計劃。這是現在 COSINE program 的前身。當時我在 Prof. Bob Strichartz的指導下，參與研究分形上的分析 (analysis on fractals)。那是我第一次真正接觸研究工作，當中的經歷和滿足感至今難忘。記得在我離開 Cornell 的那一天，Bob 跟我說：you should come to this country for a PhD. 這造就了我後來出國深造。

編：能分享一下你在外國學習及工作的經驗嗎？

楊：我很幸運遇到我的博士論文導師 Prof. Eli Stein，他給我很大的自由，並經常鼓勵我多涉獵數學不同的範疇，說學得越多越好。他的認真、專注和對數學的熱誠，都使我難忘。

我也很喜歡和其他同學和同事交流。他們學識淵博，除了自己的研究方向外，對其他數學的領域都有很深刻的瞭解。他們都十分主動學習，喜愛發問，不怕犯錯。我認識的同學中，不少更是運動健將，對烹飪及音樂等也很有心得，可說是多才多藝。

編：你現在的研究方向是什麼？

楊：我研究的主要方向是調和分析 (harmonic analysis)。我們知道，一首樂曲是由很多不同的音符組成，要分析一首樂曲，其中一個辦法便是把樂曲分解成音符。

而數學上，要研究一個函數，也可以把函數分解成不同的頻率，這便是 harmonic analysis 裏常用的手法，對研究偏微分方程 (partial differential equations)、多複變函數 (several complex variables)、甚至數論 (number theory)、組合 (combinatorics) 和電子工程 (electrical engineering) 都很有用。

編：你對中大的師弟師妹有什麼寄語及期望？

楊：我希望他們一方面可以成為一個正直、誠實、有理想、有邏輯、有批判能力、能獨立思考的人，同時可以享受學習，多嘗試其他範疇，探索人生不同的可能。

編按：

學問之路，永不止息。

Brief Notes on Math. Emmy Noether

Cassandra Lee

In secondary school, you learn Pythagoras' theorem, the Elements by Euclid, De Moivre's theorem and more. Usually, it's men who prove theorems. As a girl, I naturally asked myself: has there been a woman who has proven a substantial theorem?

The discovery of the Higgs boson two years ago has agitated mathematicians and physicists worldwide. At a seminar on it on π day, also Albert Einstein's 135th birthday, Professor M.C. Chu mentioned "Noether's theorem", proven by Emmy Noether, the female mathematician I came across, thanks to an ignited interest in abstract algebra (course codes: MATH3030, 3040). But who was Emmy Noether?

On March 23, 1882, a Jewish girl, Amalie Emmy Noether, was born in Erlangen, Germany, the first child of Max Noether, himself a maths professor. The family later had three sons. She led an ordinary childhood and her secondary schooling did not emphasize maths or science. In April 1900, the 18-year-old Emmy Noether excelled in state exams on English and French, and could have taught modern languages at elite girls' schools for a living – but she didn't.

Noether sat in at maths lectures at the University of Erlangen (Erlangen), as women could not study officially at German universities until autumn 1903, after she had passed the entrance exam in July 1903. She grasped the best and latest mathematical ideas during the 1903 – 1904 winter semester at the University of Göttingen, David Hilbert and Felix Klein among her professors. In 1907, supervised by her father's colleague Paul Gordan and the only woman among 47 doctoral students at Erlangen, she became the second lady to have earned a doctorate in maths in Germany – the first being Sofia Kovalevskaya.

As German universities forbade the fairer sex from becoming lecturers, she researched and supported lectures without pay at Erlangen from 1908 to 1915. At Göttingen, Hilbert and Klein, while studying Einstein's just-completed general theory of relativity, needed her help despite the unfair university policy. Hilbert anecdotally said: "The faculty is not a bathhouse." Still, Hilbert helped her by advertising her lectures as his.

Hilbert and Klein were perplexed over a crisis posed by Einstein's general theory of relativity: under classical physics, energy was not conserved in general relativity. Noether showed that another conservation law was at work in proving what is now known as Noether's theorem.

In dynamical systems, a function is said to be symmetric if its variables and derivatives undergo group transformations and we still get the same function. Noether's theorem states that for every differentiable symmetric function, there is a corresponding conservation law determined by the system's Lagrangian.

In analysing physical systems independently of coordinates, physicists ran into problems, such as a nonzero mass for photons – but light has no mass! By Noether's theorem, they theorized that the extra mass was made up of mass particles called Higgs bosons.

Following Germany's defeat in World War One, women could teach officially in German universities. In 1919, Göttingen hired Noether. Developing the algebraic theory of rings and ideals in the 1920s, she was one of the first mathematicians to study topology algebraically. She eventually was paid a small salary in 1922. Her colleague B.L. van der Waerden (1903 – 1996) and student Max Deuring (1907 – 1984) published textbooks based on her rapid and highly interactive lectures.

In 1933, Adolf Hitler (1889 – 1945) expelled all Jews from government jobs, which included university teachers. Noether lost her hard-won position, and was never promoted to full professor. Somerville College, Oxford, hoped to take her but hesitated to fund her. The all-female Bryn Mawr College in Pennsylvania, U.S.A, offered her an official teaching post. Thanks to the Institute of International Education and the Rockefeller Foundation, she fled to the United States.

Safe in the U.S., Noether had enthusiastic students and supportive colleagues, and lectured weekly at Princeton's Institute for Advanced Study. She could have soared to even greater heights, but following an operation on a uterine tumour and seemingly recovering, she passed away on April 14, 1935, shocking everyone who knew the warm, ingenious lady. She was 53 and never married.

Adapted from: *payhip.com/b/Psoc* (*coupon code CUHKMATH*)

Enrichment Programme for Young Mathematics Talents (EPYMT) 數學英才精進課程2015

培育新一代數學人材
新高中學生暑期課程

Date: To be announced

Website:
http://epymt.math.cuhk.edu.hk/index.html

New Wave Talk Story

扭轉乾坤！ 漫談「掛谷猜想」
The Kakeya conjecture turned around!

大家也許都試過轉筆。有否想過，要把一枝筆在平面上扭轉180度，筆桿所掃過的面積最小是甚麼？這個看似簡單的問題，在現代數學中有很重要的地位，它跟幾何、組合、代數、拓樸、分析以至微分方程都有深刻的連繫，欲知詳請，講座中自有分曉！

楊葆霖教授
2015年3月21日 (星期六)
上午10:30至中午12:00
李兆基樓 LT5

Mathematics Department Alumni Dinner

On June 14, more than forty CUHK math alumni from different years took part in a dinner gathering in the Chung-Chi College Staff Club. During that cozy evening, we discussed the possibility of setting up a CUHK math alumni association. With the enthusiastic assistance of Tommy Wong from the CUHK Physics Alumni Association, we had a really wonderful exchange of ideas. We hope that all this would result in our setting up a warm alumni association which not only reconnects alumni of the Mathematics Department in the future, but also nurtures future alumni.

2014

Personalia
New Faculty

Dr. CHAN Kai Leung
Lecturer

Field of Interest:
Symplectic Geometry and Mirror Symmetry

Dr. LIU Chun Lung Kelvin
Lecturer

Field of Interest:
Algebra, Algebraic Geometry,
Algebraic Cobordism,
Group Action in Algebraic Geometry

Visitor 2013-14

Every year, scholars from all over the world come to our Department and the Institute of Mathematical Sciences.
Their active participation and provision of expertise in our seminars, courses and other academic events have contributed substantially to our Department's research and academic programmes. Due to space limitation, we present here a partial list of our visitors in 2013-14

- Habib AMMARI, Ecole Normale Superieure
- Julien BARRAL, Université Paris 13
- Abraham BERMAN, Technion-Israel Institute of Technology
- Michael W. BERRY, The University of Tennessee
- David J. BRADY, Duke University
- Moody CHU, North Carolina State University
- Bernardo COCKBURN, University of Minnesota

- Gary Chalom COHEN, ENSTA ParisTech
- Yalchin EFENDIEV, Texas A&M University
- Bjorn ENGQUIST, The University of Texas at Austin
- David GABAI, Princeton University
- Nicolas GILLIS, Faculté polytechnique, Université de Mons
- Ivan G. GRAHAM, University of Bath
- Alexander GRIGORIAN, Universität Bielefeld
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