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中大數學系的女生
CUHK's Maths Girls

編者的話 From the Editors' Desk

2015年對數學界的女性別具意義，這年適逢是女數學家愛達・勒芙蕾絲 (Ada Lovelace) 的200歲生辰，也是史上首個讓女性入會的數學組織——倫敦數學學會 (London Mathematical Society) 創會150週年。關於女性與數學，總能引發一些好奇的問題：數學講求理性思考，而女性長久而來被視為較感性，她們的數理能力是否因此亞於男性呢？綜觀近幾十年，卻有愈來愈多女性加入數學領域，為甚麼她們會選擇數學？過程中遇到甚麼挑戰和機遇？讀數學就是要機械式地過活嗎？選擇這科會局限將來的出路嗎？第十三期簡訊嘗試從學生的角度出發，以中大數學系的女生為主題，邀請了幾位本系的女畢業生及本科生，分享學習路上的故事。同時讓讀者知道，本系的女生雖然較男生少，但是能力同樣出眾。

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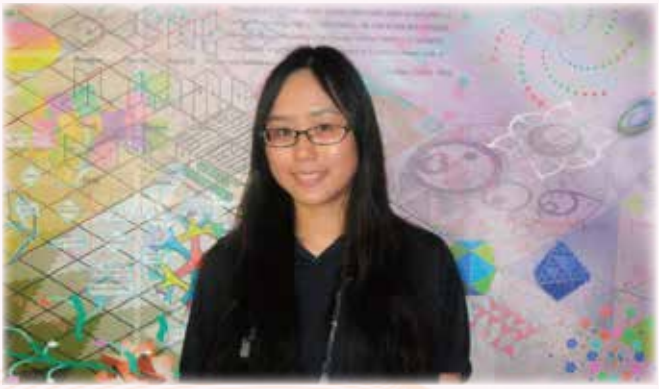
香港中文大學數學系校友會
CUHK Mathematics Alumni Association

去年校友晚宴上，我們開始構思成立中大數學系校友會。經過一年多時間，有賴大家的支持，我們很高興能把構思化作行動，正式在2015年見證本系校友會的誕生。

《女性與學術界：反思平等機會》 張汶慧 Mandy

張汶慧是中大2008年數學系本科畢業生，於香港科技大學取得碩士學位，後往加州大學聖地牙哥分校 (UCSD) 深造，再負笈劍橋大學完成博士學位。她研究代數表示論 (Representation Theory)、眾代數 (Cluster Algebra) 與代數幾何 (Algebraic Geometry)。

男女平等實在是一個重複又重複的古舊話題。今時今日，女性已不用纏足，又可以大模大樣外出工作，又何謂不平等之有呢？如果各位往外國升學，更會發現有部份職位或基金明文指出要給女性多一點機會。曾經有一位男同學跟我說，如今女生有那麼多幫助，為何還要爭取「男女平等」呢？



談起「偏幫女性」，不少女性朋友都表示討厭這類職位的存在。她們希望能通過正常渠道，在公平競爭下獲得職位，而不是靠「優待女性」的影響。這些職位令人感到受聘者能力次人一等，只是因為性別關係才獲得較多機會。而且，這類「平等機會」更可能促使各學系刻意在平常的職位不聘請女性，為的就是申請更多「平等」經費。所以，這種形式上的「平等」並不能切實解決現實中招聘的不平等情況。

提到「公平競爭」，也許大家會認為人人考一樣的試卷，享有一樣多的途徑發表文章，當中實在沒有不公平。可惜，不少大型研究發現同一份論文，若用女性名字刊登，往往得到較差評分。在實力相近的情況下，大眾會很慣性地認為男性的能力較強。我遇過不少出色的女同學，她們背後不約而同有聲音指出，她們成績較好，只是因為得到教授的支持，同學的幫助，抑或純屬運氣而已。其實，無論是男是女，都是用能力來爭取好成績的。要實現男女平等，最困難但亦最需要的是消除各人潛意識的偏見。

我們習以為常的事情，有時並不代表沒有問題，也許過一段時間再回首，才會發現當時的不當。例如現在我們都認同，在工作環境中要與每一位使用者共享公共資源。但在二、三十年前，卻還沒有這個概念。機緣巧合下曾跟一名女教授聊天，說起她當年在某名校念博士時的故事。當時該系有一間研究生休息室，休息室的牆上貼滿了裸女海報。六、七十年代美國風氣不像現今開放，女孩看到裸女會感到不自在，所以女教授嚇得不敢再踏足那房間。儘管如此，她和大部分女同學卻不曾想過為此向男同學發聲。直至後來，另一位女同學徹底清理了休息室的海報，她才驀然發現那房間寬敞舒適。休息室是眾人共用的，實在不應讓部份人感到不自在。這個例子牽涉的或是較廣泛的公平工作空間概念，但「男女平等」所追求的，基本上也就是眾人平等而已。

任何改變，都需要從生活的每一小步開始。

Portia Pong, Forensic Investigator

by Cassandra Lee

Portia, Sze Lok Pong (龐士洛), a 2010 CUHK Mathematics graduate, completed her Master's degree in Forensic Science at the University of Strathclyde in 2011, specializing in forensic chemistry, and from then on she has been working in Hong Kong. Portia's story reveals how flexible maths training is – a sound training in mathematical thinking is useful, wherever you go, whatever you do.

"I was an exception." Portia remarked in a pleasant British accent as we ambled to a quiet coffee shop. "The teachers said a pure science combination only prepared us for an engineering degree," as if the slightest prospect of becoming nerdy mocked the prestigious girls' school's pride in its liberal artistic heritage. "That discouraged several peers, but I took only science electives anyway. The school had scholarships for 'choir members who excelled in Chinese literature', but none for girls good at maths or physics." She took the four EPYMT courses that are now summer courses and got to know over half the class. "My interests also lay in forensic science. It's amazing that one could determine what had happened while absent from the scene at the time." Yet, she added, "Hong Kong has no forensic science degrees, and the closest to it here is only forensic psychology."

In CUHK, she played table tennis and joined dormitory activities, "but I wasn't the most active." With the course time-slots in Physics and Mathematics the timetables managed to rearrange, she could make sure her classes did not clash, eventually obtaining her minor in Physics, thus highlighting the importance of academic advice. Having more boy classmates did not bother her. "I was not concerned whether anyone was present or absent in class, or what they said or did. I just studied," she said, savouring her pie.

Her faith played a determining role in her final year when she was anxiously deciding between mathematical research and forensic science. "I considered Jesus Christ's imminent return," she said. "If I chose maths, I might prove a substantial theorem, but the Lord might come back before it had any impact. How then could I account to Him how my work had helped mankind and expanded His kingdom? However, the other option, forensics, could make a visible impact. For more than a dozen times, God even spoke to me through strangers and people I knew. I would pray to God the night before, 'Maths or forensics?' and the next day someone would bring up the question of my future path, and say, 'Forensics? Cool!' to my answer."

So she read forensic science at Glasgow, specializing in forensic chemistry. "Having graduated in the Enrichment stream did not matter."

For courses requiring long answers, the royal road to high scores "turned out to be paraphrasing the same sentence — not just concept — three times!" Yet the no-nonsense writing style typical of mathematical proofs helped her ace assignments imposing a maximum word limit, with plenty of room to spare, astonishing her classmates from non-maths backgrounds who wondered about her secret of success. "'How did you do it?'"

Her postgraduate degree led to her job, but not as smoothly as envisioned. "In 2011, the UK's Forensic Science Service announced their close-down, and 20% of fresh graduates the previous year in all disciplines remained unemployed. I had to return to Hong Kong, though a forensics job there seemed unlikely."

"I'm now a 'Fire and Explosion Investigator'," she said. "I work with insurers and loss adjusters — independent personnel to assist in settling insurance claims — to determine the cause of the fire or explosion, who's responsible and who's to pay the damages. We send samples to an independent laboratory for testing, but for terrible cases, I have to put on my full gear: hard hat, goggles, face mask, overalls, gloves, safety boots… In writing reports, forming arguments to reach the conclusion is very similar to the thinking process in mathematics."

It took Portia a while to recall an unforgettable case. "A stinking fire in a cold storage." In case the reader thinks it's impossible, Portia explained that the fire partially cooked the food there [releasing edible chemicals], "and in a patch about this big, there would be about twenty flies 'resting'." She formed a rectangle with her thumbs and index fingers straight. "You could imagine the rest of the swarming mass around the place. The bathroom smelled better than on the outside."

"The best part of my job is: although I'm junior

and clients may doubt my abilities, the company treats me just like their much more experienced members. I could ask for and be granted time to understand unfamiliar things. The company shows confidence in me. Moreover, as their first local employee, I am their unofficial translator on site."

In retrospect, "I have played the piano and very briefly the violin, and I was in the school choir," said Portia. "Yet I follow rhythm much better than melody. Given sheet music, I could play a key, but not the right one!" She now plays drums at church. Just as her musical ability suited her for a certain instrument, "it's not the case that every maths student has to do further studies in maths."

Portia has no regrets being who she is now. "Keep an open mind" regarding undergraduate and postgraduate studies, and "be flexible. I think I'm doing quite well!"

Allez en avant, et la foi vous viendra: Kewinsa's Quest for Self-Discovery

by Cassandra Lee

(Push on and faith will catch up with you – original French quote by mathematician Jean d'Alembert)

Kewinsa's petite frame knows abundance and bareness, courage and despair, excellence and fear. (Note the alphabet in there?) As Joseph Fourier, the founder of Fourier Analysis, did his work on heat in hot, sweaty rooms, so did I as I interviewed my friend Kewinsa Ching Hang Ho (何靖衡), a 2011 entrant and 2015 CUHK Mathematics graduate. "I'm not used to the air conditioner since my return from France. More on that later."

Plan A No More

"I have a knack for categorizing a tangled mess into neat little boxes." A high achiever in Chung Chi College, she did all "five university things" (大學五件事) as a freshman: she earned coveted scholarships and praise from professors for excellent grades; she led a dorm life; she taught multiple subjects part-time; she oversaw the campus maths society; and she had a boyfriend. "Professor Jun Zou, my seminar advisor, even invited me to do summer research with him."

Midway through her sophomore year, this strong and beautiful rose met life's equivalent of liquid nitrogen, and shattered. She fainted during an exam and awoke in hospital very weak. She couldn't even eat uninterrupted, not to mention study, when every other moment, she had to burst into the washroom almost stumbling, slump her frail body over the toilet bowl and feel yucky all over. When would this debilitating, repulsive infirmity just… plain… stupid… end?

As she struggled to piece her life back together, the pressure to excel strangled her. A Sir Ken Robinson-esque wise man – she calls him her "teacher" – suggested, "Why not put maths aside and explore other things? Perhaps you may find your element there."

Dungeon-ship (not internship, mind you)

For the rest of her second year, she interned at a seemingly harmless guild, departing greatly from a job history of teaching Chinese, English and Maths. However, its flexible working hours translated into phone calls at 3am. "When we employees raised glasses at gatherings, we didn't say 'cheers'. We uttered swear words at the boss!" She laments that publicity materials featuring her enticed some of her acquaintances to follow her into the dungeon. She quit that summer.

Hong Kong's JoAnne Growney*

Since then, Kewinsa has also been reading novels and nonfiction, swathing her Facebook wall in prose and poetry. A "Budding Poet" in secondary school, she wrote award-winning essays and poems, "but I didn't enter them myself!" she insisted. "My teachers stole them." Because of that, she stopped writing in her first year.

I told her the Karl Weierstrauss quote, "A mathematician who is not also something of a poet will never be a complete mathematician." Exclaiming, "I've never heard of that!" she smiled, sensing a kindred spirit in me.

*N.B. JoAnne Growney is an acclaimed poet and professional mathematician in the US.

Transforming Community: Tough

Canadian author Charles de Lint expresses Kewinsa's vision best: "I want to touch the heart of the world and make it smile." An occasional volunteer in her neighbourhood, she joined in her third year a 3-month Chung Chi College South-Asians service-learning project at the HKSKH Lady MacLehose Centre. It quickly disillusioned her.

"Our problems went beyond the language barrier. All the women promised to come even minutes before cooking class began, but only two arrived while we've prepared everyone's ingredients. The children we trained for a skipping performance did not show up and we had to improvise Gangnam Style. They also left behind soft drink cans, burger boxes and other litter on the beach – and in the sea! – at a picnic we organized. Disgusted, my friend and I remained to clean up, while the coach drove them home. You have to get your hands dirty."

Devotion to the Different

"During my sickness [in Year 2], I took a sign language course and studied the extra-curricular activities of ordinary and hearing challenged students at Kowloon Bay Saint John the Baptist Catholic Primary School. It was the first-ever study of that sort." In her paper on the study, she wrote, "The students did not hesitate to say that they like playing with their hearing peers and even tried to name some of them, sharing with us that they have close friendship." She said, "I cannot thank enough CUHK's Centre for Sign Linguistics and Deaf Studies for their profuse generosity – they sent their trained staff and interpreters to me for free. The children were so excited they gestured like dancing – sign language being their native language.

"My greatest finding?" Her eyes gleamed. "Deaf kids join choir and drama performances! They were very, very joyful, and they made me very happy too. I was so, so sick at the time. Deafness is a difference. I enjoy such fun and meaningful social scientific research."

"A blind student told me he couldn't understand plane geometry in maths class, as the blackboard contained the equations and diagrams he couldn't see, yet he was in an 'integrated' (challenged-students-treated-as-ordinary) class. In language class, though, he did better as speech and blackboard doodles go hand in hand. 'Integrated education' does not work," she said.

French Chose Me

[In her second year,] "I was so sick I randomly enrolled in classes to have 12 credits to scrape by," she said, "one of them being French I. Yet I find French classes the happiest I've ever taken. For the first time ever, no one had 'great expectations' of me. I remember getting a lovable French professor to buy me a bar of chocolate at the supermarket. My French is built up together with my new life and has become an essential part that can never be discarded from me. My Cantonese, English, sign language and French bring out different sides of me.

"French nouns have gender," she added. "Two French mathematics professors, Eric and Frédérick, visited CUHK during summer 2014," she said, "and we got to know each other. One of them – I forgot who – revealed to me that the French word for calculus was masculine, but that for algebra is feminine! We played games guessing the gender of mathematical objects – I've never met such a childlike professor anywhere else. 'Next time you find me,' he said, 'it's got to be a maths question. Give the other one difficult (maths) theorems to translate!' As a souvenir before returning to France, he wrote in my language notebook Pythagoras' Theorem in French."

Reminiscing her recent solo vacation in France, she remarked, "The French honour and respect mathematics very much. In Hong Kong, everyone responds to my maths major grunting, 'What'd you do after graduation?' The French, however, admire and marvel at that. They greet all the time and are indeed a cute and lovely people. Back in Hong Kong, I couldn't get used to the absence of those amiable greetings."

Kewinsa's message to CUHK Mathematics students is a type of poem called a *haiku*. "Dare to try, to fail, and to explore yourself. So,

Live with no regrets.
Wrong turns don't exist, ***but don't***
Jail yourself in maths!"

A Tale of Two Girls in Enrichment Mathematics

compiled by Cassandra Lee

2015 was the *annus mirabilis* for **Helsa, Heishun Chan** (陳希淳), and **Kiki, Yin Ki Ng** (吳彥琪), two girls among the first cohort of HKDSE entrants admitted to CUHK Enrichment Mathematics. In spring, the duo went on student exchange at the University of Waterloo (UW) in Canada; in summer, as part of our COSINE program, they did computational mathematical research at the University of Tennessee and Oak Ridge National Laboratory (ORNL) in the United States; and, enthusiastic artists themselves, they had been designing the look and feel of our new departmental website launched in August 2015.

Distribution of pies on Pi day (photo at UW by Helsa)

We managed to ask the busy beavers how the entire experience was like.

What was the most unforgettable experience when you were at UW?

The sign reads:

"You see things; and you say 'Why?' But I dream things that never were; and I say, 'Why not?"
– George Bernard Shaw
... the spirit of 'why not?'

(photo at UW by Kiki)

Helsa: My exchange at UW was great in general. One unforgettable experience I recall was the Pi day event where UW maths society would traditionally offer pies and organize pi-related events such as the souvenir sale (for this year it's the ultimate pi-day T-shirts since it's 3/14/15). I really hope to see more events like that in CUHK too.

[Pi ($\pi = 3.1415926\ldots$) is the ratio of circumference to diameter in a circle. It is not equal to 22/7.]

Kiki: I suppose the most special experience was getting to know seniors from Hong Kong studying mathematics at UW, old boys and old girls. We could exchange study tips and learn how further studies would be like for us. It was pleasant studying at UW and a reason is UW's excellent reputation in mathematics and computer science. Therefore, to be known for studying mathematics was acceptable and understandable there, unlike in Hong Kong where such an embrace is yet to be felt.

How about in doing summer research?

Helsa: I would say the experience of going to another country for summer research is remarkable and unforgettable enough. Maybe the experience that we get to make great friends from the other side of the world?

Undergraduate summer researchers at ORNL
Front row: Kiki, left 2 and Helsa, right 2 (photo by Helsa)

Spallation Neutron Source (photo by Helsa)

Kiki: Visiting the Spallation Neutron Source at ORNL. It was heavily guarded, enormous, and studded with red push buttons everywhere! As we held our breath exploring the place, I couldn't help singing, "I wonder what's this red button do?" – and that came from the viral YouTube song "Dumb Ways to Die" [The song may be found at: https://youtu.be/IJNR2EpS0jw]

It felt like walking through laboratories in science fiction and secret service movies. When I was very, very small, I dreamt of becoming a scientist, and to my shock, this trip showed me for the first time that my dream was no mere fantasy – people actually did such cool things at work.

As for your designs for the departmental website…

CUHK Mathematics: new official website

Helsa: To me, the most exciting part, out of everything we designed, was the CUHK maths logo. I came up with the idea and we combined our efforts to produce the logo. I expected a simple and neat design with some mathematical elements. "Klein bottle" came to my mind immediately, and clearly it was relevant to our department's emphasis on analysis and topology. The blue colour followed that of the old department website – not only is it my favourite colour, but it's also commonly known as the "neutral" colour, for it does not bear any other associations (unlike green that reminds people of environmental issues). We aligned the Klein bottle to resemble the letter "M" for mathematics. In fact, the letters "C" and "U", which together stand for CUHK, are also subtly included in the logo too.


Kiki's Klein bottle

Kiki: The Klein bottle in the background – I designed it the most happily for the website. It's one of my favourite mathematical objects, and I was still drawing it during my midterms in the first semester. In case you think otherwise, I delighted in drawing it because I could curl up in bed, write everything I had to review on the bottle, and then trick myself into thinking, *Hmm, I'm revising diligently* *a naughty smile*.

I fondly recall a book I read in my childhood called *Nature's Numbers: The Unreal Reality of Mathematics* by mathematician Ian Stewart, and it explains the role mathematics plays in nature. Ever since reading it, I found mathematics "beautiful" – every creation in the world and our existence are so incredible that mathematics, being able to describe them, should be elegant and sophisticated, intriguing yet appreciable by us all. Mathematics is popularly mistaken for complicated and needless calculations, whereas art, being more down-to-earth, captures precisely the "beauty" of mathematics. One of my favorite quotes belongs to G. H. Hardy in *A Mathematician's Apology*: "Beauty is the first test: there is no permanent place in this world for ugly mathematics."

You're both young ladies doing amazing things in mathematics. What would be your take-home message for younger students considering a major in (Enrichment) Mathematics?

Helsa: Enrichment maths courses are typically seen as "more difficult and abstract" compared to any other courses you see in university. Don't be too discouraged by the hard theorems and statements. Once you get through the hard part, the experience of beauty in mathematics would be truly rewarding.

Kiki: If you decide to go for mathematics, remember your conviction – your reason and belief – for choosing it. As there will be things you've never heard of and people better than you, a conviction worth fighting for will carry you through challenges big and small along the way.

You may find out more about their summer research at http://www.jics.utk.edu/csure-reu/csure15. We wish them all the best in their studies and beyond.

The Difference Women Make in Maths

The drive to close the gender gap in science, technology, engineering and maths can degrade into a ridiculous exercise in pushiness. Tech giant IBM was recently criticised for pandering to gender stereotyping in its "Hack A Hair Dryer" campaign intended to attract girls into scientific disciplines. Before proceeding, it is perhaps more fitting to narrow down our focus to maths, and start with how girls like me come to choose it.

We do maths because we find it fun, beautiful and useful, not because of a craze. Yet long-cherished stereotypes have dissuaded many other girls from seeing maths' importance in today's world and hence studying it diligently. In particular, Mandy's sharing highlights the influence of academic settings on whether women stay in maths. For more girls to take maths seriously, we must ask: What difference do mathematically literate women make that maths-phobic ones cannot?

In developed regions, such ladies show other women struggling in maths that difficulties can be overcome. Yet more startlingly, female educators are in demand worldwide. In many developing countries, local women are violently discouraged from schooling or employment on religious and/or political grounds. However, women-only universities flourish there because students are aware that knowledge is power and education is the key to a free and open society. For these institutions to be safe havens for girls, women teachers are hired. Moreover, some of us become mothers one day and how we impart our life wisdom affects the next generation. It was my mother who instilled in me the conviction that maths is useful. As more branches of knowledge require maths, the social sciences included, women must be prepared to draw upon their mathematical expertise anytime and anywhere.

I came up with the idea for this newsletter to encourage juniors, irrespective of gender, in their quest for mathematical knowledge. Inspired secondary school students and undergraduates may also write about professional women whose jobs involve maths and enter the Association of Women in Mathematics' essay contest at https://sites.google.com/site/awmmath/programs/essay-contest, which closes on 31 January every year. Ultimately, mathematics is not about calculations, patterns, or even ideas. *Mathematics is about people solving problems together.*

Cassandra, Yieng Lee (李瑩), editor, 2015

Enrichment Programme for Young Mathematics Talents (EPYMT)2016
數學英才精進課程2016

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新高中學生暑期課程

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Personalia New Faculty

Dr. Pan Li Lily
Lecturer
Fields of interest:
Operations research, Optimization and Scientific Computing.

New Wave Mathematics Story

幾何分析：從肥皂泡到黑洞
Geometric Analysis:
from soap bubbles to black holes

每個人小時候一定都玩過肥皂泡，可是你們有沒有想過肥皂泡為什麼是我們看到的形狀？這些美麗的肥皂泡背後其實隱含著有趣的幾何和物理現象。它們跟宇宙中神秘的黑洞到底有什麼相似的地方？我們將在這個講座裡探討肥皂泡的數學和愛恩斯坦的相對論之間微妙的關係。
講者：李文俊教授
日期：2016年3月5日 (星期六)
時間：10:30am - 12:00noon
地點：香港中文大學 鄭裕彤樓 LT1