香港高等教育的回顧與展望：科技發展的難題
(The Past and Future of HK Higher Education: Difficulties in Development of Science and Technology)

丘成桐
Director of IMS and Distinguished Visiting Professor-at-Large, The Chinese University of Hong Kong &William Caspar Graustein Professor of Mathematics, Harvard University

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I grew up and received my early education in HK.
It was not until 1969 when I first went abroad, leaving The Chinese University of HK for graduate school in Berkeley. Much of my experience has been covered in my recent autobiography, The Shape of a Life, which was written with Steve Nadis and published by Yale University Press. Let me share some insights into these problems Hong Kong is facing, based on my personal background and history with CUHK.
As we all know, HK was a colony of the British empire until 1997 when sovereignty returned to China. But even during colonial times, HK could not separate itself from China, both economically and politically.

Over the past 35 years, as many of you know, China has been the world's fastest growing economy, and in that time the country has transformed itself in terms of its infrastructure, manufacturing base, and technological capabilities overall.

Higher education, however, is one area where China has lagged behind the Western world. In my opinion, a big part of that problem is cultural. Historically, universities in mainland China were more advanced in research compared with HK. Before 1949, The University of HK was the only university in the colony. It was not until 1963 when The Chinese University of HK was formed. The University of HK was established in the beginning as a medical school, and later expanded to train colonial officers. But Hong Kong occupied a unique position at a unique time. The city attracted many great talents

from the mainland when they believed they were prosecuted in the mainland for various reasons. After 1949, a large group of intellectuals emigrated to HK. Some of them were faculties and students of major universities in the mainland. This included the famous scholar of history 錢穆 who was one of the founders of New Asia College which later became part of The Chinese University of HK.

New Asia College attracted many great talents in Chinese philosophy, Chinese history, and Chinese literature. Within a few years of its establishment, the College attracted the attention of Yale University, which established a "Yale in China" fund to give partial support to New Asia College. Many scholars in Chinese philosophy and history were trained at New Asia College. This includes 余英時 who is now world-renowned in Chinese philosophy.

CHUNG CHI College is a Christian college. In the beginning, quite a few faculties came from 廣州嶺南大學。Later 凌道揚 became the president of CHUNG CHI College. He has the distinction of being the first scholar in HK with a Ph.D. Dr. Ling took his degree in America and naturally he tried to run the college in the style of American universities. Financially the college was supported by the church from funds that used to support 13 Christian colleges in mainland China before the communists took over.

United College is another college; together with New Asia College it was formed The Chinese University of HK (CUHK).

These three colleges had different cultures and different campuses of which United College had a closer relation with HK government before the time of CUHK. President (Vice-chancellor) Lee 李卓敏 was a famous professor in Berkeley. He made a big effort

to move the campuses into the CUHK campus in Shatin which was then in the backwaters of Hong Kong with limited infrastructure. I remembered when I returned to HK in 1976, some of my former teachers were very bitter about the move.
Personally I think the move helped the development of CUHK. However, some niche fields such as Chinese philosophy in New Asia College got distracted**.** The renowned master 錢穆 was not comfortable in the new university's administrative set up as he could not speak English fluently. He moved to Taiwan shortly afterwards.

Let me now share some of my personal experience to describe what HK education was like in the old days.

I was born in China and raised in Hong Kong. The most powerful influences on my education have been my father—an historian, philosopher, and expert on Chinese literature and poetry—and my mother, who was determined to see her children obtain the best education possible.

I did poorly on my first math test, which I took when I was five years old, and was not an especially good student in my youth. When I was 11, I wandered the streets aimlessly with a group of kids when we were supposed to be preparing for an important high school entrance exam. This juvenile delinquent phase was not my proudest chapter, representing my "lower" rather than "higher" education.

But it was valuable for me, nevertheless. I learned how to think on my feet and deal with some tough situations (including confrontations with rival "gangs"). I was figuring things out on my own – not just doing what my teachers or parents wanted me to do.

My father died when I was 14. That was an incredibly sad event for my family and me—one I have not fully gotten over. But it did force me to mature more quickly. I had

to start making decisions on my own and earn money for the family right away. I also knew that I could not afford to squander my education. I had one chance and would have to make it count.

Chinese parents and teachers are very protective—too protective in my opinion. Students need some independence. If they are to thrive and eventually make new contributions to their chosen field. However, Chinese students are not given enough opportunities to work and think independently. That needs to change, I believe, before China can become a true leader in the academic world.

At Chung Chi College in Hong Kong, I was lucky to have taken a mathematics course with Stephen Salaff who taught our class in the "American style," encouraging his students to speak up and participate at all times.

Chinese students, myself included, were not used to this approach. We'd been encouraged to be passive, quietly taking in knowledge without interrupting the teacher's train of thought.

But Salaff would have nothing of that. He urged us to become active participants in the classroom and, in that way, to take charge of our own education. This class (on differential equations) marked a turning point for me. And it has shaped my views on education ever since.

Most of my experience in higher education came from universities in America. I graduated from UCBerkeley in 1971 and then became a postdoctoral fellow at the Institute for Advanced Study (IAS) in Princeton.

After that I taught at a number of universities, including Stony Brook, Stanford, IAS, and UCSD before joining the faculty of Harvard where I've been since 1987. I've also had visiting appointments at Berkeley, Caltech, Cambridge University, Columbia, UCLA, UC-Irvine, and the University of Texas. So it's fair to say that I'm reasonably familiar with universities of the Western world.

I returned to HK in 1976 and then to Beijing in 1979. Since then I have spent a couple of months each year at various universities in China and at the Chinese Academy of Sciences. I started to visit HK much more often after 1992 when President Charles Gao invited me to start a mathematics center at The CUHK.

My graduate students have come from all over the world, though the majority are from America and China. Hence I am reasonably familiar with higher education in both HK and China.

By the late 1990's, the HK government has formed another university, called the Hong Kong University of Science and Technology. The process to upgrade a number of post-secondary institutions and colleges to universities were also under way. The number of capable scholars, scientists and engineers was increasing steadily. l thought that was a golden opportunity for HK to establish its high technology industry to compete with the other dragons in Asia. In an interview by a HK TV station, I said that if HK does not invest into high tech ., HK will 玩完(it will be the end of HK)。The next day, my friends in business circles became mad at me and declared that I am totally ignorant of the reality of business. They insisted that finance and real estate were the future of HK !

They may indeed be right because they made a lot of money out of finance and real estate. They successfully lobbied the government to help their businesses. The only

problem is that HK citizens cannot afford reasonable housing anymore! Regular businesses, especially those representing the old culture of HK, are disappearing due to unaffordable rent. After making huge amount of profits in real estate, few of our real estate developers look into the well being of our young students and their future. Some HK scions pour money to support American universities but have forgotten the importance of Hong Kong's future. Now of course it's their money to put to use as they see fit, , and I would only observe that a large part of their fortunes came from the hard-working HK citizens and forty years of 改革開放 (Chinese economic reforms).

It is disappointing to watch HK gradually losing its edge to many cities in China, including our neighbor Shen Zhen. Shen Zhen has built the most advanced high tech center in China, while HK has turned most of its industrial establishments and start-up initiatives to real estate developments. In fact, in the name of development of high tech, PCCW was able to make a large sum out of real estate in HK.

I remember I was supervising a couple of Ph.D students in CUHK. They were rather capable students. But they suddenly dropped their Ph.D study. I asked why? They explained to me that they would not like to leave HK after they graduate. But they said that if they graduate with Ph. D, they would not be able to find a job in HK.
That surprised me although I found out what the students said was indeed true!

There was simply not enough decent jobs in HK to retain our locally trained Ph.D . Many of them left HK and went to America or mainland to look for decent jobs. There is a well known Chinese idiom 楚材晉用 which described how the talents trained in the kingdom of 楚 moved to the kingdom of 晉 where they were more appreciated. I should point out that the great high tech centers such as Silicon Valley and Boston area have been very successful because of the strong support of world-class universities:

Stanford, Berkeley, Harvard, MIT and the like. High level technology needs a large number of young and energetic talents. Only great universities can provide large numbers of such talents.

Ex-vice-chancellor Charles Gao was awarded the Nobel prize 20 years ago based on his pioneer work on fiber optics. He thought a center of mathematics in CUHK would be important as technology is based on a solid theoretical foundation. Indeed, if we look up the major universities in America that excel in technology such as MIT, Stanford, and Berkeley, they are all very strong in theoretical research and mathematics. Since I am always fond of HK and I took my undergraduate degree at CUHK, I decided to help CUHK establish The Institute of Mathematical Sciences (IMS).

Over the years, the Institute of Mathematics of The Chinese University of HK has trained more than 60 Ph. D , most of them supervised by Professor Zhouping XIN and Professor Conan Leung . The quality of these Ph. D are excellent and comparable to those from the best universities in the world. Some of them joined famous IVY league schools in America postdoc or assistant professors, and some of them are now tenure faculties in major universities such as Tsinghua University.

The academic operations of the IMS has been funded largely by the money I raised from donors in HK. Government funding for IMS has been minimal compared with any other major center of Mathematics in the rest of the world. Moreover, following a government policy change, the CUHK decided to slash the funding in conjunction of the training of our Ph.D. research students. The amount of this funding is not a large sum but we have relied on it in the last two decades to help us partially in paying our professors. If this situation continues we will soon lose our distinguished professors to other higher institutions. Since the establishment of IMS the plan has been to retain ten professors but, now, due to cost-cutting of this sort, the outlook is gloomy regardless of the

tremendous efforts of our colleagues.

Some of you may question why we need a research center in HK. Well, not only does it provide the foundation for science and the technology needed for industry, but it also helps to lift the quality of students in the university. Twenty five years ago, the grades of an average math student in CUHK were close to E, after the diligent efforts of the dept and the center, the grades are in general above B, while both quality and quantity of our research is among the very best in Asia !

In the last few years, the HK government has started to recognize the importance of developing high technology. However, administrators in the government and in the universities do not seem to understand the basic principle behind the development of any new technology. As they see it, they would like to see fast return for the money they invest. The general hope is that the GDP of HK can be greatly increased after a couple of years and the university can show their serious contribution to such efforts. As a result they invest almost exclusively into applied oriented researches at the expense of cutting budgets for basic research. Engineers think that they can ignore the very basic principle that mathematics and fundamental physics are the foundation of these high tech developments! Without such foundation, the best accomplishment in high tech that we can hope to achieve is to follow leaders in America or Europe.

In most cases, they choose to ignore such issues because it may take five to ten years to build a solid foundation, when investments in the basic sciences are in general miniscule compared with the investments in applied science.

Does HK government lack the money to support fundamental science? Not really! There has been significant surpluses in the HK government's budget for several fiscal years. But the government decided to " share the fruits of our economic success with the community in various ways as if funding for research and the education system are adequate enough!

The funding provided by the university/government is mainly determined by reference to the number of students taking math major, while giving very little consideration to the importance of mathematics for other disciplines such as science, economics and business administration. The degree of support for projects appears to favor applied or popular subjects and also very much depend on the personal preference of academic administers. For instance, the major research directions in CUHK have been geared with the thought that fundamental physics, especially the spring theory, has already passed its peak and so no longer a worthy subject for research.

This is rather unfortunate as these subjects have unfathomable depths with an intimate relationship to mathematics, and to forgo the opportunity of making significant contributions to the knowledge in meaningful areas based on the prejudice of a few, is a departure from the spirit of academic freedom so highly valued by society since the Renaissance.

Hong Kong is a part of China, its cultural and higher education issues, fundamental pillars of the society, cannot be separated from the Mainland of China. Let me now discuss why higher education in China is still lagging behind the western world. We should note that one hundred years ago, the famous May 4 student movement attempted to tackle the root of this exact same problem. This is very much related to the difference in cultures between the western and eastern worlds.

I believe the higher educational system in China has been very much influenced by traditional Confucian thinking. There has been little need to search for the truth because it was all contained in Confucius' teachings –just as the Bible had been the main source of knowledge in the West, prior to the Renaissance period.

Over the past 100 or so years, Chinese educators have struggled to integrate their traditional modes of thinking with more modern and very different Western approaches.

In ancient days, education was confined to the nobility, and with Confucius, the then novel concept of 有教無類 (education for everyone, irrespective of background) brought about profound changes which later evolved into the system known as 科舉制度 (Imperial Examination)。This was essentially the precursor of the modern public open examination, it was a fair system that allowed common people, no matter their station in life or distance from the capital, to travel to the capital to be examined by the emperor, as long as they excelled in their studies, and if found satisfactory, the route to important posts in the government. The system gave hope to poor people from the provinces far away from the central government, and it is this system which contributed to keeping the greater China united. In many ways, the present matriculation 高考 ("Gaokao", The National University Exam) system in mainland China is similar . But the quantity of students is much bigger and it is much more difficult to manage the examination due to sheer scale. The best students are also not given the chance to meet with the president of China! It would be interesting to imagine the consequences of introducing 高考 into HK.

Current economic and social development has made the educational mandate even more pressing, as the government needs to train its workforce to adapt to increasingly niche, high-tech and new industries, which may not even have existed when the bulk of the workforce was in school, especially in areas such as artificial intelligence and genetics, which have the potential to change our lives in dramatic ways – possibly for the better and possibly for the worse. Prudent oversight is clearly needed.

It is a general perception that mathematics and basic science are important as they are useful in application to daily life - commerce, industry and time-saving technology. But

much more than that, the abstract approach attached to these disciplines is the very root of all revolutionary novelties/discoveries – curiosity about our world and everything in and around it, free thinking and pursuit of truth/beauty. The vital factor that has enabled America in the last century to lead the world was its ability to utilize all sorts of new ideas commercially, e.g. aeroplanes, electric generators, computers, the Internet. If we want to excel we must not be satisfied with shortsighted applications or simply borrowing ideas from others, but aim at truly fundamental outcomes that would attract others to follow rather than to follow others. In this connection, if Hong Kong were to evolve from a city built on real estate and finance to one making significant contributions to art, science and engineering in the new era, she could occupy a page in history as a great city like 長安，洛陽，南京，北京 in the long history of China, along with Rome, Paris, London, Berlin in Europe and New York, Chicago, Boston, Washington, San Francisco and Los Angeles in the United States. Universities with vision should and can play a leading role in such developments, as did the Sapienza, la Sorbonne, Humboldt, Oxbridge, and prestigious universities in the US.

In the decades that I've taught at Harvard and other universities, I have worked with many graduate students who came from China. Some of them have since become very accomplished mathematicians. Others have not, even though they may have had considerable talent. A lot of that has to do with the mindset that these students held as a result of their upbringing and education in China.

Many American students have a love for mathematics that I rarely see in their Chinese counterparts. While the most successful American students have a fascination with the subject itself, many Chinese students have a more utilitarian attitude. They don't have such strong feelings about mathematics but instead see it as a field in which they can

hold a respectable job and earn a comfortable living. They are not driven primarily by the desire to unlock the profound secrets that this discipline harbors.

The Chinese attitude to education has deep cultural roots that relate to the goals of education in China and the goals for life in general. In education, the usual goal is not to train people so that they'll be in a position to pursue the truth and otherwise add to human knowledge but rather something much more limited: to train people so that they can pass exams, move through the system, and hopefully make a decent living.
The idea of becoming an educated man or woman has little meaning in China and in Hong Kong . Most people see education as a means to an end—the end being to put themselves into a position to earn money and acquire fame or power. Making money is the dominant concern, and economics is the machine that drives education.

The goal of life, again, is not the pursuit of truth. In fact, many people in China and in Hong Kong are surprised to hear that there can be worthwhile objectives beyond money, fame, or influence.

There are many other problems with the Chinese educational system that I have witnessed firsthand. I'll touch on a few here:

Students, by and large, are not trained to think independently. They are encouraged to follow the paths set out by their teachers, and their teachers' teachers before them, and most students are happy to go along. That approach, however, is unlikely to open up new directions in mathematics and science. For that reason, it will take a long time before China can assume a leading role in academia.

When I visit China and talk about the beauty of mathematics, many people are shocked. That's not one of their prime concerns, and they're surprised to hear anyone talk about something so abstract, and subjective, as "beauty," when it comes to mathematics.

Another unfortunate practice I've observed at some top Chinese universities is that the most eminent professors don't interact with undergraduates. The academic hierarchy in those schools holds that the professors who teach undergraduates are those considered least likely to advance far in their fields.

The Chinese Academy of Sciences was founded in 1949 and has long housed one of the country's premiere math institutes. But there has been a major problem associated with the Academy. There are about 750 science and math scholars who've been granted the title of "academician," and I believe the political power conferred by this designation is excessive, having an adverse influence on the country as a whole. A university's stature depends on the number of academicians on its faculty. Therefore, almost nobody dares to offend an academician. They are treated like royalty without having done much, necessarily, to earn their lofty titles. Politics comes into play to get people in the Academy, and once they're in, academicians can wield undue influence within a university and within the country as a whole.

Part of the problem stems from entrenched power and a culture that reveres older people to such an extent that scholars who are long past retirement age continue to dominate their fields, even though they are no longer carrying out active research or even keeping up on it. The Chinese system of academicians is subject to political pressures, bribery, and corruption. As a result, advancement within a given discipline has far less to do with first-rate scholarship or contributions to one's chosen field.

The American system is also subject to abuse at times, particularly when it comes to gaining admission to elite colleges. But overall, in America and throughout the West as well, there is much more of a meritocracy in higher education.

In the last fifteen years, I witnessed the change in attitude of universities in HK towards

the system of academicians. The administrators in HK are increasingly putting heavy weight on academicians of China, not because of their merit, but because of their influence in academic politics. The universities in HK started to praise and therefore push their own faculty to be elected as academicians. My personal view is that pursuing vain glory is at odds with our academic culture, if the goals of our universities remain the pursuit of truth, appreciation of the beauty of nature and its excellence.

The Ministry of Education of China may feel it is more efficient to organize the academic world if they just need to oversee fewer than 2000 academicians who are leaders of the academy, but the success of research and education community elsewhere show that this may not be best way to achieve excellence.

It's true, I do think higher education and basic research has been held back by the dominance of the old guard and anachronistic ways of doing things. But I also believe there's hope for the future. And I'm trying to show a better way—at least in mathematics research—at the six mathematical centers I've founded, and currently direct, in China and Hong Kong. These centers are trying to do things differently by establishing a true meritocracy, guided by an objective "peer review" process that barely exists elsewhere in China.

And we should be able to do that so long as I can maintain our funding, which is why I continue to raise money from private donors. These centers are mainly populated with younger mathematicians, and I'm helping them appreciate the rewards that can come from doing excellent work, divorced from any political concerns.

I've tried to help in other ways by starting, for instance, a High School Mathematics Award competition in 2008. My friends and I later started awards in Physics, Biology, and Chemistry. The goal in all cases is to enable students to get a taste of real independent research. The competitions are part of a broader effort to counteract years

of education in a rigid system in which Chinese students are trained to memorize things — and do whatever else their teacher says.

But true research is a different thing altogether. It involves solving problems of your own choosing—and even moving ahead of your teachers, in some cases.

Many students from China and Hong Kong have approached me about becoming a graduate student at Harvard or other top U.S. universities. In most cases, I found, they weren't trained well enough to be ready for such a demanding program.

In 2012, I set up a college exam competition in China in order help students there become better prepared. 50 mathematicians helped me to draw up a syllabus, which laid out what students needed to learn to be ready for graduate work at an Ivy League or equivalent school. I believe that has been helpful, as many of the top math students at Harvard today originally came from China.

That shows, to anyone who needed reassurance, that there is considerable hope for the future. While we started out with mathematics, something similar could obviously be done for other subjects as well. However, it is rather regrettable to note that compared with those from the first class universities in China, the competition results of Hong Kong students in recent years are no longer in the very top ranks as they used to be.

A general rationale for the ambitious Great Bay Area project is that Hong Kong's financial services expertise together with its well-established legal system complement Shenzhen's hi-tech development, and can produce great synergistic effect. But the trade war and the recent measures imposed by the US have hit several hi-tech giants in Shenzhen particularly hard, as these multinational companies do not yet own the fundamental technology at the root of their systems, nor that of producing high-level

chips and other crucial materials. As mentioned many times by Mr. Ren of Huawei, Mathematics is the kernel of all these technologies. Intellectual properties accrued in America over decades through the long-term investment and endeavors by its higher institutions and big companies, not by purchases online, or by cramming overnight. For example, quantum computation is a discipline requiring both frontier-level physics and mathematics; to cite an example, IBM had over one thousand staff members and scholars, and still it took them more than twenty years to reach a point where it started to look like they might be successful. Among the universities in Hong Kong, six have a solid establishment on the basic sciences, and this should be regarded as a strength of Hong Kong. It is very unfortunate and completely against high-tech development history that universities here seem intent on sacrificing the basic sciences in favor of investing in the so-called applied sciences. As we all know, the success of Silicon Valley would not have been possible without the research environment of first class universities, Stanford and Berkeley; likewise Boston's position as the most important bio-tech center in the world also has a lot of to do with the leading role in the field of medical biotech played by world renowned universities like MIT and Harvard.