

Science@HKU 港理

ISSUE
30

FACULTY OF SCIENCE NEWSLETTER

Research Comes to Life: The Power of Translational Research



SHKU
Science

FACULTY OF SCIENCE
THE UNIVERSITY OF HONG KONG
香港大學理學院

CONTENTS

- 1 Message from the Chief Editor
- 2 – 6 **Spotlights**
Research Comes to Life: The Power of Translational Research
- 7 – 10 Research Stories
- 10 New Staff
- 11 Insight
- 12 – 14 Teaching
- 15 – 16 Students' Corner
- 17 Accomplishments
- 18 News
- 19 Events
Alumni Corner
Acknowledgements

EDITORIAL BOARD

Chief Editor Dr Edmund Chun Ming TSE
 Members Dr Ho Yu AU-YEUNG
 Dr Chi Bun CHAN
 Ms Cindy CHAN
 Dr Ka Chun CHEUNG
 Dr Juan Diego GAITAN-ESPITIA
 Dr Ka Ho LAW
 Dr Kai Ming LEE
 Dr Man Hoi LEE
 Ms Casey TO

FACULTY OF SCIENCE

G/F, Chong Yuet Ming Physics Building,
 The University of Hong Kong,
 Pokfulam Road, Hong Kong
 Tel: 3917 2683
 Email: science@hku.hk

<https://www.scifac.hku.hk>
 @science.hku
 @hku_science
 @hku_science
 hkufacultyofscience

Science@HKU is not for sale. The Faculty reserves the right to publish and edit any material submitted for publication. Views expressed in *Science@HKU* by individual contributors do not necessarily represent those of the Faculty and/or the University.

Science alumni and friends can subscribe *Science@HKU* online and view previous issues through the homepage of Faculty website.



Research Comes to Life:

The Power of Translational Research

Science is a tool for improving the well-being and quality of human life. Besides discovering new theories, nowadays, scientists are keen on taking societal needs into account by applying findings from basic research and translating these complex theories into practice.

In the last issue, we gave an overview on the mission and vision of our Research Divisions – to fully utilising the power of science, it is time for scientists to step out of boundaries and establish close connections with society. In this issue, we will further elaborate on the subject by showcasing a selection of on-going research projects that are translated into practical application and are making an impact on our society.

Message from the Chief Editor

In times of crisis, the wise build bridges. Battling this prolonged pandemic takes wits and strategies. One such tactic requires diligent cooperation among society stakeholders, including academic institutions, industrial corporations, government entities, and the general public.

The Faculty of Science spares no effort in joining hands with corporate partners in bringing solutions against any societal problems. Beyond viral surveillance, diagnosis and treatment, the Faculty also engages in other application-driven projects.

This issue showcases the efforts invested by the Faculty to fortify our leading global roles in both scientific and translational research initiatives.

Together with international tech giants and engineering companies, the Faculty has pioneered OLED devices and novel antibiotics with patents acquired and licensed, which enhanced Hong Kong's translational competency and created a significant impact on society. The Conservation Forensics Lab has been established to collaborate with local and international government agencies to trace illegal wildlife trades. The 6688 Science Master Class, a new double degree programme, is introduced to incubate the next generation of dynamic scientists, who will be trained to translate scientific knowledge into practical application. We hope that these translational approaches would help address a number of pressing societal issues and eventually improve human life.

I hope you enjoy reading this issue as much as I do while learning about all the excitement in the past half-year. Be innovative, be proactive, and be the team player that makes a difference!

Yours sincerely,

Dr Edmund Chun Ming TSE
 Chief Editor
 Assistant Professor,
 Department of Chemistry

Researchers:

Professor Chi Ming CHE

Zhou Guangzhao Professor in
 Natural Sciences and Chair Professor

Research Division for Chemistry

OLED

– Organic light-emitting diode

The Research Division for Chemistry has a strong tradition of transition metal complex chemistry and has pioneered various classes of highly efficient metal complex emitters. The Division's strengths also include inorganic excited states and their photophysics and photochemistry. These areas bring seminal and sustained contributions to the development of robust and highly emissive organic light-emitting diode (OLED) materials.

OLEDs are amongst one of the most promising energy-efficient display technologies that can be found everywhere, including smartphones, 8K televisions, head-worn displays like augmented reality (AR) and virtual reality (VR) equipment. OLEDs work by passing electricity through incredibly thin layers of organic semiconductors. Excited states formed in these organic materials will radiatively decay to their initial, stable "non-excited" state, i.e. the ground state, and release energy in the form of light.

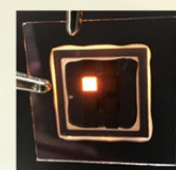
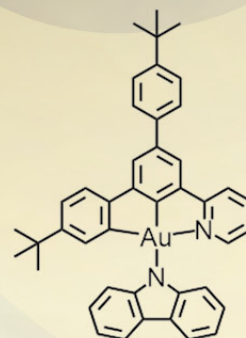
“We need to better equip ourselves through life-long learning, and at the same time be aware of the most up-to-date science and technology development in the world, and to understand the need of the industry,”

said **Professor Vivian Wing Wah YAM**

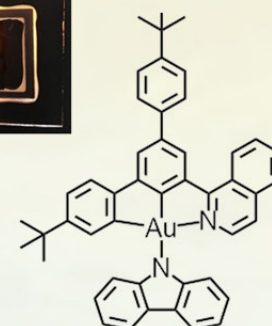
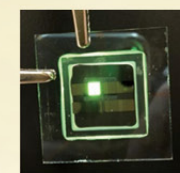
Contribution to highly emissive OLED display

Professor Chi Ming CHE is a world-recognised expert in phosphorescent metal complexes and the use of long-lived excited states for photocatalysis. His pioneering "one-chelating-ligand+one metal" design strategy has successfully generated various classes of high-performance platinum(II) emitters for OLEDs.

Professor Vivian YAM is a world-recognised expert in molecular design and spectroscopic studies of luminescent metal-based molecular functional materials, particularly in the manipulation and harnessing of excited states for light-enabled technologies and functions. She has pioneered new classes of luminescent metal complexes, especially gold(III) complexes that are photo-stable and capable of displaying unprecedented room-temperature phosphorescence properties. Her seminal work on organogold(III) phosphors in 1993 has paved the way for the first gold-based OLED in 2005. Subsequent works feature various classes of gold(III) emitters with bidentate, tridentate, and tetradentate ligands with unprecedented high performance and high operational stabilities, together with the generation of Hong Kong-owned intellectual property rights.



Gold(III) complexes and OLED prototypes developed by Professor Yam and her team



Learn more about the research projects of Professor Chi Ming CHE:
<https://bit.ly/3saG4MA>



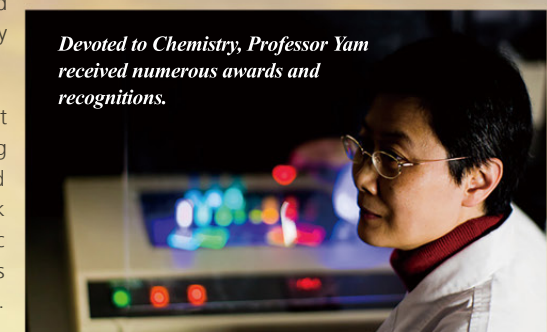
Learn more about the research projects of Research of Professor Vivian YAM:
<https://bit.ly/31cs9tL>

Phosphorescent OLED materials developed by Professor YAM and her team.

Professor Vivian Wing Wah YAM

Philip Wong Wilson Wong Professor in
 Chemistry and Energy and Chair Professor

Devoted to Chemistry, Professor Yam received numerous awards and recognitions.



Forming partnerships with industries

These innovative works have attracted considerable industrial interests to collaborate with Professor Yam's team at HKU and to sponsor her work to realise their commercial use in display technology. She has long-term collaboration and strategic partnerships with industries, especially the collaboration with TCL Corporation Ltd., one of China's largest enterprise groups in consumer electronics on the global scale, and its subsidiaries to develop new printable OLED materials and technology. There is an increasing number of display producers joining the OLED market, with market revenue projected to reach more than USD69 billion by 2027.

"The development of our own proprietary luminescent materials that are nationally and Hong Kong-owned is really timely," said Professor Yam. Currently, most of the commercially available phosphors are based on iridium(III) complexes, where foreign companies hold most of the key patents. Our luminescent gold(III) complexes with high originality hold great promises to overcome these business monopolies. Taking advantages of the rich gold reserve in China, being the second largest in the world, the development of luminescent gold(III) complexes can exploit China's natural resources and competitive edge to develop cheaper and high-performance metal phosphors with Hong Kong-owned intellectual property rights.

Working closely with the industry can definitely facilitate more collaborations and motivate more downstream translational activities. This will provide new avenues for the display and solid-state lighting companies in Hong Kong and the Mainland to obtain a fair share of the OLED market. "Our research works in the past are mostly curiosity-driven, but now we are going to do more application-inspired basic research as well as translational research, and hopefully, to enhance Hong Kong's translational competency and to produce a great impact on the society," said Professor Yam.



We are working closely with industry partners to drive innovation.



Video summary of the research:
<https://youtu.be/sUKx6852dfo>

Research Division for Ecology and Biodiversity

Reduction of illegal global wildlife trade through novel conservation forensics research



Researchers of Conservation Forensics Lab:
(from the right)

Director:

Dr Caroline DINGLE

Founding members:

Dr Timothy BONEBRAKE

Dr David BAKER

Professor David DUDGEON

Other member:

Dr Hannah MUMBY

Hong Kong has long been a central hub in international wildlife trade networks, be it legal or illegal trade. This is due in part to the high volume of trade transactions through its major port, along with its prime location as a transit hub between origin and destination countries. Every year, substantial worth of documented trade passes through Hong Kong's borders. While much wildlife trade is legal, the quantity of trade provides the opportunity to launder illegally sourced and traded species and products.

The Research Division for Ecology and Biodiversity's research on wildlife trade has involved decades of multidisciplinary work. Building upon HKU's history of monitoring illegal trade and the impacts on wild populations, the Conservation Forensics Lab was established in 2016 to investigate the wildlife trade. Having developed a range of molecular and isotopic forensics and data-analysis tools for countering wildlife crime, research undertaken at the Lab has provided data used as evidence to increase enforcement of national and international laws that protect endangered species and support illegal wildlife trade reduction.

Photo courtesy (wildlife animals) of Astrid ANDERSSON and Michelle Garforth VENTER



Hong Kong is the biggest importer and the second-biggest exporter of traditional medicine globally.

Data-based methods for tracing illegal evidence

Multiple laboratory and data-based methods are used to describe patterns, quantify the scale and identify species involved in the trade. By using genetic and biogeochemical approaches, species and their geographic origins can be identified, revealing whether a species is being traded legally or not. Biogeochemical studies could help determine whether an animal was captive-bred or wild-caught, a piece of evidence key to trace whether a species is being sold legally or not. Results from these studies have led to successful prosecutions as well as higher levels of protection for species impacted by trade.

Conservation actions stemming from these research projects have resulted in increased protection of turtles, pangolins, and fish under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and via the International Union for Conservation of Nature (IUCN).

The goal of forensic research is to provide evidence that can be used to aid enforcement and legal efforts to prosecute wildlife-related crimes.

Dr Caroline DINGLE

Director of Conservation Forensics Lab



Newly developed forensics techniques

Looking forward, Director of the Lab Dr Caroline DINGLE expected the newly developed forensics techniques would continue to provide evidence to support successful prosecution. "We are currently developing methods to apply stable isotope analysis (SIA) to determine whether an animal is captive or wild-caught. SIA has been used widely in ecology, but it is relatively new that this tool is being applied to wildlife forensics. While more work needs to be done to verify that this is a robust forensic tool, it is so far very promising."

In collaboration with HKU Faculty of Law, the Lab also contributes to the Species Victim Impact Statements (SVIS) Initiative. The aim of this Initiative is to develop statements that provide information on the impacts of wildlife trade on wild populations of species threatened by trade. These statements are made available to the prosecution and judicial teams involved in wildlife crime case.

"We are working to develop a database of reference samples for genetic and isotopic work. This database would be a crucial reference tool for local authorities seeking to comprehensively monitor wildlife trade in Hong Kong and assist in the international goal to more effectively prevent fraudulent trade in protected species," Dingle added.



Squirrel monkeys on sale – the legal trade in live primates is very lucrative.

Learn more about the Lab's research:



How legal wildlife trades do massive damage to biodiversity:
<https://bit.ly/38Q1Xt2>



Endangered species on supermarket shelves:
<https://bit.ly/38PtWJu>

Video summary for the research:
<https://youtu.be/PSFnStTf9I>



Species Victim Impact Statement (SVIS) Initiative:
www.svis.law.hku.hk



Yellow-crested Cockatoos (Cacatua sulphurea) for sale in Hong Kong's bird market.

Highlights of successful cases

Dr David BAKER

Action: gathered the first evidence of the illegal trading of European eels into Asia and Hong Kong

Impact: genetically identified glass eels (juveniles of the endangered European eel) intercepted by Hong Kong Customs, leading to a successful prosecution

Dr Timothy BONEBRAKE

Action: conducted a social network analysis of data collected from a range of online sources on Chinese seizures of pangolins

Impacts:

- supported the increased protection of pangolins under the CITES and IUCN
- These studies were influential in contributing to the successful proposals for the up-listing and increased protection of the Chinese pangolins from Appendix II to I

Professor David DUDGEON

Action: quantified the illegal turtle trade in markets

Impact: his work was influential in the successful proposal and subsequent increased protection of the big-headed turtle (family Platysternidae) from Appendix II to I



Painted wood turtle (Rhinoclemmys pulcherrima)

Tracing DNA evidence in kinship determination and criminal investigations by user-friendly statistical software

Researcher: **Professor Tony Wing Kam FUNG**, Chair of Statistics

DNA testing is the most powerful tool in parentage and kinship determinations and for mixed stain in criminal investigations. Novel statistical methods and user-friendly software developed by Professor Wing Kam FUNG and his team from the Research Division for Mathematical and Statistical Science, provided a simple means of assessing the weight of DNA evidence. This easy-to-use software built upon sophisticated statistical theory and methodology has been used by forensic and paternity laboratories worldwide in evaluating thousands of cases, with very positive feedback on its analysis of complex kinship and DNA mixtures.

The developed methodology and software are of fundamental importance in legal contexts. A particularly striking example of the impact of the tool was its success in identifying three badly burnt bodies in the Hot-Air Balloon Burst Tragedy in Egypt in 2013, the investigation of which was concluded in the Hong Kong Coroner's Court in 2016. Fung also solved the DNA mixture problem in the O J Simpson case, a murder case that involved the famous football player which caused a media sensation in the mid-'90s.

Translational research would involve considering the societal needs and how efficient and effective the applications can be translated from the complex theory. Whilst a lot of statistical research focuses on methodology, Professor Fung also looks into the applications and tries to apply complex theories to practical problems for societal needs. "The goal of my project is to develop sophisticated statistical methodology and to provide user-friendly software for practitioners such as forensic scientists. More communications would definitely help to cultivate a translational mindset," Professor Fung said.



Professor Fung spent 3 months to learn molecular biology and DNA forensics from scratch and by learning from forensic scientists in the Hong Kong Government Laboratory.



Learn more about the software:
<https://saasweb.hku.hk/EasyDNA/>

Research Division for Physics and Astronomy

A cultural, behavioural, and regulation campaign against light pollution: from Hong Kong to the world

Researcher: **Dr Jason Chun Shing PUN**, Principal Lecturer



Principal investigator Dr Jason PUN (right) and project manager Dr Chu Wing SO (left) developed the Hong Kong Night Sky Monitoring project to monitor the light pollution condition.

The appearance of the monitor.

Light pollution is a form of environmental degradation caused by inappropriate or excessive use of artificial outdoor lighting that not only wastes energy, money and valuable earth resources, but also has negative impacts on our ecological systems and possibly our health.

Dr Jason PUN from the Research Division for Physics and Astronomy and his team underpinned a long-term cultural, behavioural, and regulation movement against light pollution, that combines rigorous scientific research to promote public awareness of the damages caused by light

pollution to the natural environment. Their study supported the Hong Kong government's Charter on External Lighting, through which more than 4,800 organisations pledged to turn off lighting at night. The research technique used in Hong Kong has now been applied in 16 countries/ regions, spreading the message of dark sky preservation worldwide, influencing policy decisions and securing a range of environmental and health benefits.

The research findings are also applied for policy-making, as Dr Pun is serving as a member of the "Working Group on External Lighting", an official government body to review the effectiveness of the Charter and to study how to further regulate external lighting. This represents the strongest commitment ever from the government to reduce the negative impacts of light pollution.

After striving on the issue for 18 years, Dr Pun said he finally sees a significant change in how people think of light pollution. "I can see people's attitude changing over time. People are no longer asking whether we should reduce light pollution, but how fast and better we can adopt a smarter lighting in the city. I am happy to see this translational research exert a considerable influence on how we perceive and what we do against light pollution, and I am glad that the society has committed to stop abusing the use of outdoor lighting, and to limit its adverse effects to the environment."



A bilingual website was set up by the team to educate the public on light pollution:
<http://nightsky.physics.hku.hk>



An Outdoor Lighting Directory was created in 2017 to display public-contributed examples of good and poor lighting fixtures:
<http://bit.ly/2G3UvUf>

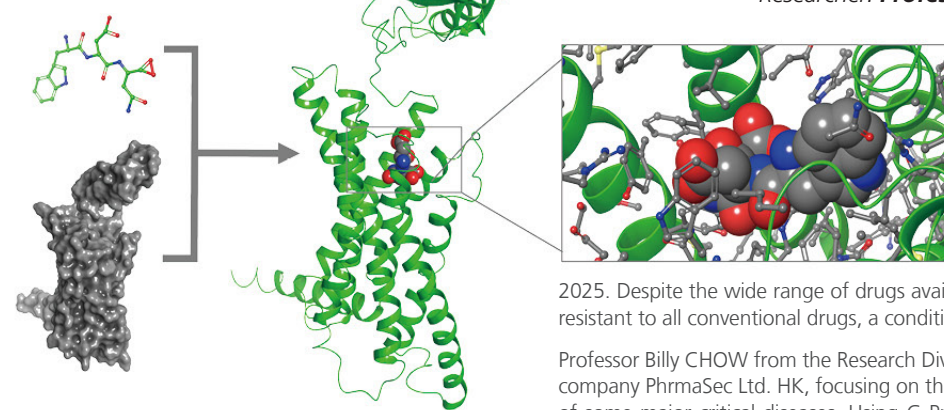


Developing a novel therapeutic molecule into an anti-hypertensive drug

Researcher: **Professor Billy Kwok Chong CHOW**, Chair of Endocrinology



KSD179019 is a novel small molecule which can be developed into an anti-hypertensive drug to address the continually expanding hypertensive population.



2025. Despite the wide range of drugs available for treating hypertension, at least 10% of patients are resistant to all conventional drugs, a condition known as resistant hypertension.

Professor Billy CHOW from the Research Division for Molecular and Cell Biology, has founded a start-up company PharmaSec Ltd. HK, focusing on the discovery of novel therapeutic molecules for the treatment of some major critical diseases. Using G Protein-Coupled Receptors (GPCRs) as targets, his team was able to discover a small molecule allosteric modulator of the human secretin receptor, developing the

novel small molecule "KSD179019" into an anti-hypertensive drug to address the continually expanding hypertensive population.

GPCRs are the targets of more than half of the approved drugs in the market. This tells us the importance of these cell surface receptors in normal physiology as well as the development of pathophysiological conditions in humans. Based on the resolved structure of specific GPCR, the team has developed an in-silico based technology to screen small compound modulators, allowing initial molecular dynamic simulations to simulate atomic interactions between the ligand and receptor in real-time. The data generated are subsequently translated into identifications of pharmacophore of the receptor and small compound modulators that interact with the receptor.

As the KSD179019 discovered by Professor Chow's laboratory targets a new mechanism, it has the potential to be used for the therapeutic treatment of patients resistant to conventional drugs. The main advantages of this drug are: it is inexpensive to synthesise, it is safe since it possesses minimal acute and chronic toxicity according to OECD guidelines, and it significantly lowers blood pressure for a much longer 60-hour window in the hypertensive rat model. With this scientific advancement, the start-up has filed a patent and obtained an exclusive license from HKU to develop and market this drug.

Professor Chow said there is no other time like today for researchers to be more responsible than ever to bring their innovation to the public. "If you are in basic biology research, then it is your utmost responsibility to translate your novel innovation for the betterment and health gain of the society that you live in," he remarked. "I find beauty in science. The real essence of science is to find a way to mould and translate them into something extraordinary to face the problems in the real world."



Research Division for Earth and Planetary Science

Coastal groundwater: Its implications for the environment, engineering, and water resources

Researcher: **Professor Jimmy Jiujiu JIAO**

Coastal cities are home to roughly 25% of the world's population and are rapidly growing. Hence coastal groundwater is vital because of its resource, environmental, and engineering implications. HKU's Hydrogeology Research Group (HRG), led by Professor JIAO, has researched the impact of land reclamation on groundwater. This work has provided a theoretical framework leading to globally adopted practical guidance.

The HRG's findings on offshore groundwater have been used to understand the connection between submarine groundwater discharge (SGD) and red tides, prompting the Hong Kong government to reduce groundwater-induced nutrient sources to better manage the red-tide problem.

The findings have also helped to identify cost-effective, reliable groundwater resources in Singapore and to reduce the adverse engineering and environmental impacts of land reclamation in Sri Lanka and China.

These findings and experiences are valuable to other coastal countries. Professor Jiao has been advising government departments and private organisations in Australia, Bahrain, Philippines, Malaysia and Singapore, to offer consultancy or expert opinions on their coastal land reclamation projects.

As lots of large national-scale projects are happening in China, Professor Jiao has recently been appointed as a member of the Expert Advisory Committee of Water Resources Assessment, China Geological Survey (CGS), Chinese Research Academy of Environmental Sciences (CRAES), and Ministry of Ecology and Environment, to provide expert opinions. He has also conducted contract research with the Shenzhen Government and offered expert opinions on urban groundwater problems for Shanghai.

As a scientist, Professor Jiao thinks that the primary purpose of research is to address scientific curiosity. "There has been a change in the research culture towards translational research. Generating some societal impacts is a nice bonus to us, however, I still appreciate the research freedom that allows individuals to choose research topics that are scientifically fundamental."



"Fossil time machine" reveals the historical range and diversity of corals in the Greater Bay Area for the last 5,000 years

By PhD graduate **Dr Jonathan CYBULSKI**

As corals grow naturally, pieces of them will break off and fall to seafloor becoming a part of the sediment. Over time, many different layers of these coral skeletons will stack on top of one another. The Research team from The Swire Institute of Marine Science cored through these sediments and collected the skeletons composing different layers that dated back over 5,000 years ago. Their goal – to investigate the historical presence of coral communities in the Greater Bay Area. The team created a sort of fossil "time machine", and generated the first palaeoecological baseline for coral communities in the area.

One of the aims of this project was to better understand what it may take to save Hong Kong corals. Results have already played a critical role in protecting and restoring corals locally by assisting a coral restoration project in Hoi Ha Wan Marine Park, which was pioneered by another research team from the same affiliation. Corals such as *Acropora* that previously thrived in Hoi Ha before human activities decreased their numbers, are being returned to their proper home. To date, over 95% of the reintroduced coral have survived.

CYBULSKI looked down the "fossil time machine" containing coral fossils for analysis. Photo courtesy of Dr Kiho KIM



*Coral skeletons highlighted the habitat complexity created by *Acropora* (on the right) compared to the less-complex massive corals that now dominate Hong Kong. Photo courtesy of Jonathan CYBULSKI*

古生態學研究有助鑑定哪個地區正面臨嚴重的生態威脅，以減低物種滅絕的風險。可是，如何搜集遺留在遠古的數據？原來答案早已藏於化石之中。珊瑚在生長期間，部分碎片會沉落至海床，最終成為沉積物。久而久之，珊瑚碎片會隨著時間層遞積累，因此採集不同的沉積層可揭示不同時期珊瑚群落的面貌；港大太古海洋科學研究所的團隊運用了上述層遞的原理於香港附近海域約 11 個地點收集珊瑚化石，當中包括早於 5 千多年前形成的珊瑚化石。團隊稱之「化石時光器」，為大灣區珊瑚群落建立了首個古生態基線，揭示了在人類活動對環境造成影響以前分佈於大灣區的珊瑚物種。

研究所的另一個團隊以上述數據作為基線參考，在海底灣海岸公園的海底放置人工珊瑚礁盤，並引入曾經分佈在海底灣海岸公園的珊瑚品種。截至目前為止，團隊放置的珊瑚種的存活率超過 95%，證明古生態學研究有助珊瑚復育工作。



Learn more:
<https://bit.ly/39Q2WsP>

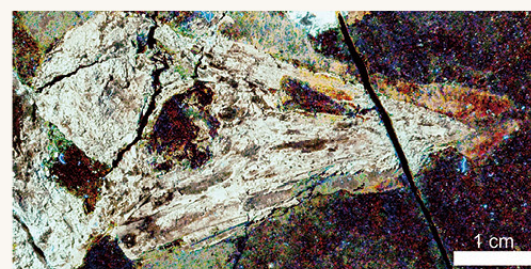
Earth and Planetary Science

Laser imaging illuminates bird beak evolution

By PhD student **Mr Case Vincent MILLER** (left) and his supervisor, Research Assistant Professor **Dr Michael PITTMAN** (right)

Confuciusornis was a crow-like fossil bird that lived around 120 million years ago; it was one of the first birds to evolve a beak. A team from the Research Division for Earth and Planetary Science used Laser-Stimulated Fluorescence (LSF), an imaging technique co-developed at HKU, to reveal the fingernail-like "soft beak" of *Confuciusornis*. The team found that the soft beak was easily-detachable, which suggested that this early beaked bird was suited to eating soft foods. The team reconstructed what the beak looked like in life, and used this to consolidate knowledge of the beak of *Confuciusornis* across all known specimens.

鳥兒原來不是一直都有「鳥嘴」！孔子鳥活在 1 億 2 千萬年前的白堊紀，牠的形態跟鳥鴉近似，是最早進化出鳥喙（鳥嘴）的其中一種鳥類。地球及行星科學研究部的團隊利用激光誘導熒光技術，揭示了孔子鳥具有像指甲般的「軟喙」（一種名為「嘴鞘」的結構），覆蓋了整個鳥喙，並發現其嘴鞘脫離了喙部的骨質部分，團隊於是提出早期鳥類的鳥喙較適合進食較軟的食物。團隊重建了喙部原來的形態，並以它來鞏固對其他孔子鳥喙部的認知。



*A specimen of the early beaked bird *Confuciusornis* imaged with the HKU co-developed imaging technique, Laser-Stimulated Fluorescence (LSF). Photo courtesy of Michael PITTMAN & Thomas G KAYE.*



Learn more:
<https://bit.ly/39OYPxq>



Video summary of the study:
<https://bit.ly/2LEf5cD>



Seabird establishment 5,000 years ago

transformed sub-Antarctic island ecosystems

Ecology and Biodiversity

By Associate Professor **Dr Moriaki YASUHARA**

A 14,000-year paleoecological reconstruction of the sub-Antarctic islands conducted by an international research team including Dr Moriaki YASUHARA, found that seabird establishment occurred during a period of regional cooling 5,000 years ago. Their populations, in turn, shifted the Falkland Island ecosystem through the deposit of high concentrations of guano that helped nourish tussac, produced peat and increased the incidence of fire. The research team suggested that as the Southern Ocean continues to warm in the coming decades, the Falkland Islands seabird communities may undergo abrupt turnover or collapse, which could happen on the order of decades.

研究顯示，在 5 千年前海鳥糞便改變了亞南極島嶼的生態系統。一項由生態學及生物多樣性研究部副教授安原盛明博士參與的國際研究，重構了亞南極群島長達 1 萬 4 千年的古生態環境，發現在 5 千年前，該地域經歷一段寒化時期，期間海鳥族群便開始在那裏棲息，大量的鳥糞滋養了沿岸草地的泥土、形成泥煤，令火災更頻繁，為生態系統帶來轉變。研究團隊指出，隨著南大洋在今後幾十年間逐漸變暖，福島的海鳥族群可能會經歷突變甚至崩潰。



Learn more:
<https://bit.ly/3o08juK>



*A rookery of Southern rockhopper penguins (*Eudyptes chrysocome*) nest between a rocky slope and a tussac grassland and bring in nutrients from the ocean directly to the grasses at the Kidney Island National Nature Reserve, Falkland Islands.*

*On a summer day, a Magellanic penguin (*Spheniscus magellanicus*) rests on a pedestal outside of their burrow in the peat of the tussac grassland, East Falkland Island, Falkland Islands.*



*A rookery of black-browed albatross (*Thalassarche melanophris*) nest at a windy, exposed tussac grassland on West Point Island, Falkland Islands.*

Courtesy of photo at Falkland Island: Dulcinea GROFF

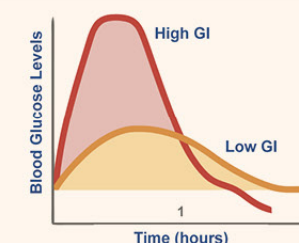
Molecular and Cell Biology

Dietetics research identified low GI diet as a potential Type 2 diabetes prevention strategy

By Assistant Professor **Dr Jimmy Chun Yu LOUIE**

A research team from the Research Division for Molecular and Cell Biology, identified low GI (Glycemic Index) diet as a potential Type 2 diabetes prevention strategy. The team performed a research comparing the overall fluctuations in blood glucose levels of a high GI diet and a low GI diet, and is the first to provide participants with all the foods in the experiment for a 10-day trial period, which is the longest ever among research of the same type. The team found that following the low GI diet, the overall fluctuations in blood glucose levels during the day was 15% lower than that of following the high GI diet.

分子及細胞生物學研究部的團隊發現，遵從低 GI 飲食有機會減低患上二型糖尿病的風險。研究團隊比較了在高升糖指數（高 GI）飲食和低升糖指數（低 GI）飲食下血糖水平的總體波動，在實驗期間，團隊每天監控參與者的整體血糖水平，並為參與者提供所有餐點，測試期長達 10 天，是同類型研究中最長。研究發現參與者在低 GI 飲食下，血糖水平的總體整天波動比高 GI 飲食低 15%。



The illustration of the blood glucose response after consuming high GI and low GI carbohydrate.

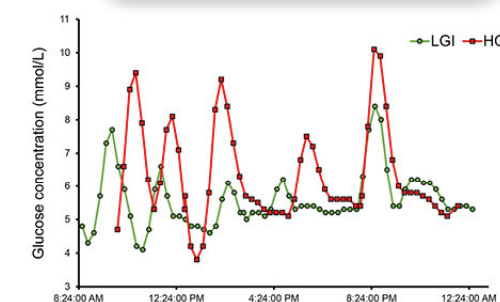


A sample 1-day menu for each diet is provided here:
<https://bit.ly/33TLmC7>

Learn more:
<https://bit.ly/32kaufy>



A photo of the key members of the research team. From the left: Dr Jimmy LOUIE, student researcher Miss Hannah Wing Han HON and graduate researcher Dr Tommy WONG



Sample daylong glycemic profile of a participant when following the low glycaemic index (LGI) and the high glycaemic index (HGI) diet.

Chemistry

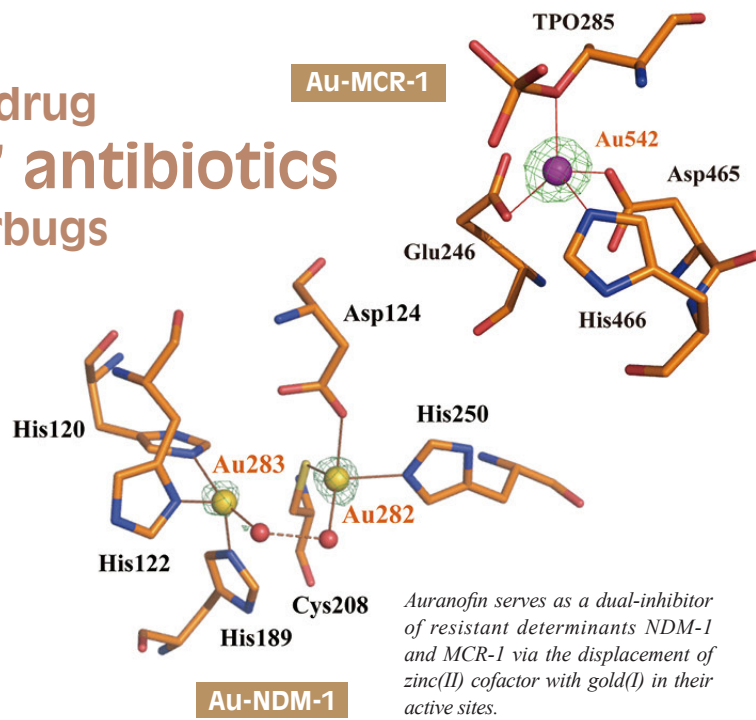
An antirheumatic gold drug could resurrect “last-resort” antibiotics to kill multi-drug resistant superbugs

By **Professor Hongzhe SUN**, Acting Director of Research Division for Chemistry & Norman and Cecilia Yip Professor in Bioinorganic Chemistry; Dr Pak-Leung HO, Director of the HKU Carol Yu Centre for Infection from the Department of Microbiology, Li Ka Shing Faculty of Medicine

Antibiotic resistance occurs when bacteria adjust in response to the misuse or overuse of medicines, and it has become one of the biggest public health challenges in this era. A research team from Chemistry, in collaboration with Department of Microbiology, Li Ka Shing Faculty of Medicine, discovered that by repurposing an antirheumatic gold(II) drug, auranofin, “last-resort” antibiotics, viz, carbapenem and colistin can be resensitised for the treatment of infections caused by multidrug-resistant superbugs including bloodstream infections, pneumonia and wound infections. The findings provide insights into the development of inorganic pharmaceuticals and new therapeutic approach for superbug infections.



Key members of the research team. From the left: Dr Runming WANG, Dr Hongyan LI and Professor Hongzhe SUN from Research Division for Chemistry; Dr Pak-Leung HO and Dr Richard Yi-Tsun KAO from Department of Microbiology, Li Ka Shing Faculty of Medicine



抗生素是一種可以消滅或防止細菌生長的藥物。但當抗生素使用不當或過量服用時，細菌會出現變異並產生耐藥性，令原本有效的抗生素變為無效。由化學研究部及李嘉誠醫學院率領的研究團隊，發現一種臨床使用的抗風濕含金藥物金諾芬 (auranofin)，能成功恢復對多重耐藥性超級細菌已經失效、號稱「最後防線」的抗生素——碳青霉烯 (carbapenem) 和多粘菌素 (colistin) 的活力，使其能夠成功治療由多重耐藥性超級細菌引起的血液、肺炎及傷口感染，並能延緩細菌耐藥性的產生，延長了現有抗生素的使用周期。



Learn more:
<https://bit.ly/3iBjOry>

Physics and Astronomy

Untangling the puzzle of Nobel Prize-winning theory Kosterlitz-Thouless (KT) phase

By Associate Professor **Dr Ziyang MENG**



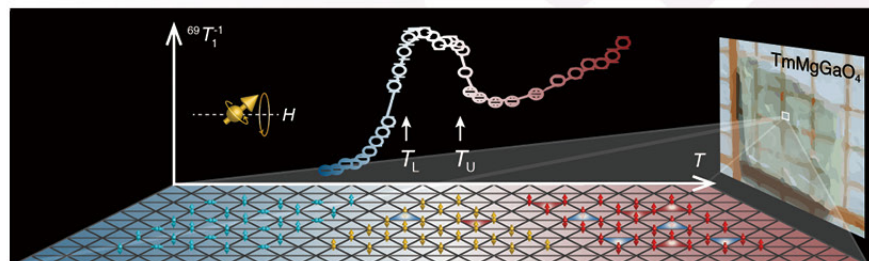
Dr Ziyang MENG from the Research Division for Physics and Astronomy teamed up with Dr Wei LI from Beihang University, Professor Yang QI from Fudan University, Professor Weiqiang YU from Renming University and Professor Jinsheng WEN from Nanjing University, untangled the puzzle of Nobel Prize-winning theory Kosterlitz-Thouless (KT) phase. They succeeded in discovering a topological KT phase and its transitions in the rare-earth magnet TmMgGaO_4 . The new paradigm combining computation, theory and experiment set-up by the joint team, will certainly lead to more profound and impactful discoveries in quantum materials, such as developing lossless transmission of signals for information technology.

孟子楊博士與國內的物理學者團隊包括北京航空航天大學的李偉博士、復旦大學的戚揚教授、中國人民大學的于偉強教授和南京大學的溫錦生教授，合作解開了 2016 年諾貝爾物理學獎得獎理論「拓撲相」部份未解之謎，成功發現了稀土磁體 TmMgGaO_4 中的 KT 相及其相變。研究小組建立了一個將計算、理論與實驗結合的新範式，將為量子材料的研究帶來更多具影響力的發現，當中包括發展無損傳輸信息技術等，可望為社會帶來福祉。

The research team achieved accurate model calculations of a topological KT phase for TMGO by performing computation on the Supercomputers Tianhe 1 and Tianhe 2.



Learn more:
<https://bit.ly/3sGBoyU>



Mathematical and Statistical Science

Bilinear optimal control of an advection-reaction-diffusion system

By **Professor Xiaoming YUAN**

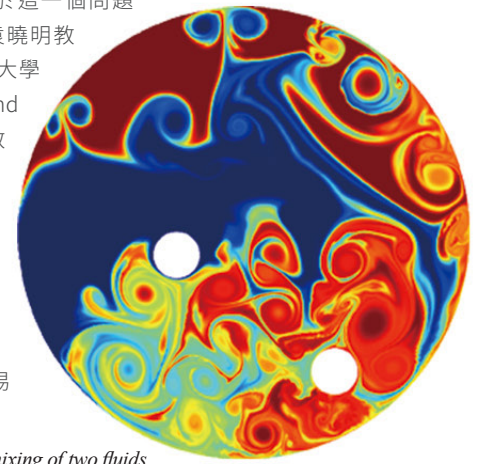


Optimal control problems constrained by partial differential equations (PDEs) capture important applications in various areas, but it is generally difficult to solve these mathematical models because of their complicated structures and very high dimensionality. A particular problem is the bilinear optimal control of an advection-reaction-diffusion system, where the control variable is the velocity field in the advection term. This problem was proposed in 1990s by Late Professor J L LIONS (1928–2001), who was a world-leading mathematician and widely regarded as the founder of the area of optimal control of PDEs. It has broad important applications in areas such as bioremediation, environmental remediation process, and mixing enhancement of different fluids, while there were very few progresses on this problem from either mathematical or computational perspective. Recently, Professor Xiaoming YUAN and his students from Research Division for Mathematical and Statistical Science collaborated with Professor Roland GLOWINSKI from University of Houston, who is a worldwide renowned applied Mathematician and a former student of Lions, on this challenging problem. For the first time, they proved the existence of optimal controls and derived the first-order optimality conditions in the general setting, and they proposed an efficient and easily implementable numerical algorithm.



The paper is available on
<https://arxiv.org/abs/2101.02629>

偏微分方程中的「最優控制問題」涉及許多不同的領域，並且都有重要的應用，可是由於這些問題屬於結構極其複雜的高維問題，因此求解十分困難。其中一類重要的最優控制問題是「對流—反應—擴散系統」的雙線性最優控制，當中以對流項中的速度場為控制變量。這個問題由已故著名數學家、偏微分方程最優控制領域的奠基人 J L LIONS 教授 (1928–2001) 在 20 世紀 90 年代提出。這類雙線性最優控制問題在生物修復、環境修復過程和不同流體的混合強化等領域有着廣泛而重要的應用。但無論從數學還是計算的角度來看，關於這個問題的研究仍然不足。最近，袁曉明教授及其學生與來自休斯頓大學的著名應用數學家 Roland GLOWINSKI 教授 (Lions 教授的學生) 合作，就這一具有挑戰性的問題展開了研究。他們首次證明了一般情況下該問題的最優控制的存在性，並推導了一階 (first-order) 最優性條件。他們也提出了一種高效且易實現的數值算法。



The mixing of two fluids.

Dr Chun Yin HUI

Associate Professor of Department of Mathematics

Research interests: algebraic number theory, arithmetic geometry and algebra

“Prior to joining HKU, I had been working at Tsinghua University for three years, so it is my great pleasure to return to my hometown and join the HKU Science family! I am broadly interested in algebra and number theory, and my current research focuses on how the symmetries behind numbers interact with geometric structures. I have been fascinated by the elegance and transcendence of mathematics since high school, and I am fortunate enough to turn this passion into a profession.”



Dr Lequan YU

Assistant Professor of Department of Statistics and Actuarial Science

Research interests: medical image analysis, machine learning, computer vision, AI in healthcare

“I feel excited to join the HKU Science family! My research mainly lies at the intersection of artificial intelligence and medical image analysis. I am dedicated to designing reliable machine learning models for biomedical image analysis and reconstruction. My long-term career vision is to advance disease diagnosis and therapy with machine intelligence.”

Dr Michael ZHANG

Assistant Professor of Department of Statistics and Actuarial Science

Research interests: statistical machine learning, scalable inference and Bayesian non-parametrics

Dr Michael Zhang obtained his MS and PhD in Statistics at The University of Texas at Austin, and later joined the Princeton University as a post-doctoral researcher. His teaching expertise lies in Big Data Analytics, and has taken up the role of disseminating practical knowledge and skills of some advanced analytics and statistical modeling for solving big data problems at HKU.



New Staff



Professor Shuang ZHANG

Chair Professor of Department of Physics

Research interests: metamaterials and nanophotonics

“It is with great excitement to join the Science Faculty at HKU and work alongside some of the most talented and vibrant physicists. My research focuses on metamaterials and nanophotonics, specifically, on

how to design artificial photonic structures to manipulate the propagation of light in a way that goes beyond what can be done with traditional optics.”

Professor Zhang was a recipient of the International Union of Pure and Applied Physics (IUPAP) Young Scientist Prize in Optics, the Royal Society Wolfson Research Merit Award, and also a Fellow of The Optical Society (OSA) in 2016. Prior to joining HKU, he had worked at the University of Birmingham for 10 years.

Aiming to fly higher to achieve global excellence

“I will consolidate the strengths and status of the Division as an international stronghold for biodiversity research over the next 5 to 10 years. Hopefully we will be recognised as one of the leading biodiversity research centres not only in Asia, but in the Pacific Rim and beyond.”



Professor Juha MERILÄ

Director of Research Division for Ecology and Biodiversity
Chair Professor of School of Biological Sciences

- 2020 Received Danish National Research Foundation Chair grant (~HK\$12M)
- 2017, 2006–2011 Academy Professor (Distinguished Professor) of Academy of Finland
- 2012 Binzhi forum Professor of Institute of Zoology, Chinese Academy of Sciences
- 2005 Elected to Finnish Academy of Science and Letters

Ecology examines life, while biodiversity is essential for sustaining it. HKU Research Division for Ecology and Biodiversity (DEB) is well-positioned to continue advances in both of the above areas, by bringing new approaches and novel techniques to standing ecological and evolutionary questions that play an important role in the conservation and management of endangered species globally.

DEB oversees a range of projects on fundamental research in ecology and evolution, as well as applied work on environmental change, which needs a leader who masters in both academic and applied research to take the Division to the next level. As an evolutionary biologist, Professor Juha MERILÄ best suits his role as the Director of the Division, for he has a long history of revolving around problems related to animal adaptation of new and changing environmental landscapes, as well as finding ways to surmount the challenges.

Being a long-time academic researcher, as well as a practitioner of applied research, Professor Merilä focuses on conservation of biodiversity, fishery management and also, organismal adaptation to climate change — he has come on board just in time to bring out the best in the Division.

His early years were spent in a naval base with access to a beautiful archipelago, at some point, he picked up bird watching as a hobby, which is where his interest in animal ecology stems from. The backbone of his academic research focuses on fundamental science but he has made frequent diversions on the more applied side, “I do hope that at least some of my research will make contributions to change the world for better, and if not directly, then by inspiring others to pick up topics to study which do make differences,” he said.

DEB is a very international working environment in terms of the members’ diverse cultural and educational backgrounds. One very active area of research in the Division involves studies on various effects and consequences of climate change on organisms, populations and ecosystems. The Division is

also very strong in the realms of marine and conservation biology, including restoration of degraded ecosystems and wildlife trade.

As to the latter, researchers at the Division have provided technical expertise and support to local and international agencies to enhance their ability to detect, enforce and prosecute illegal wildlife trade. “For example, the research has allowed increased enforcement of national and international law protecting endangered species and supported illegal wildlife trade reduction. As Hong Kong is a global hub for wildlife crime, this research has led to significant reductions in illegal trade,” said Professor Merilä. Besides, evolutionary biology research is also one of the strengths of the Division, many of the recent hires at DEB have their research related to evolutionary biology research focusing on genetic underpinnings of organismal responses to climate change and evolutionary genetics of wild populations in general.

The quality of research in the DEB is already very high, and many cross-disciplinary collaborations are already in place. As the Director of the Division, he will improve these high standards and strengthen them with new hires, new grants and whatever measures he can think of. “I also see my role as a facilitator and mentor for the entire Division; a person who should flatten the road for others — shield them from anything that takes their time and focus away from conducting cutting edge research,” he added. Therefore, he has set out a longer-term vision for DEB — positioning as one of the world’s leading biodiversity research centres. With this ambitious plan and relentless commitment of our researchers, hopefully it will not take long for DEB to fly and soar to new heights again.



Professor Juha MERILÄ spent his early years largely outdoors, which is where his interest in animal ecology stems from.



Interview video:
<https://youtu.be/99rQdxrgV58>



Research of Professor MERILÄ:
<https://bit.ly/3mMdY8A>

6688 SCIENCE MASTER CLASS

Learn from the Best Minds Be Inspired by our Science Masters

The Faculty of Science is introducing a new double degree programme, the 6688 Science Master Class in academic year 2021-22, allowing talented students to complete 2 degrees – a Bachelor of Science (BSc) and a Master of Research (MRes) from HKU in a fast track. This elite programme caters specifically to the needs of science-inclined students, with Science Masters (renowned scientists in the Faculty) helping students achieve their scholastic potential in science.

One of the best ways to learn is to be inspired from those who excel. This programme allows research-aspirant students to immerse themselves in an authentic research environment and learn from researchers from diverse backgrounds, incubating the next generation of dynamic scientists who are able to translate scientific knowledge into practical applications with far- and wide-reaching impacts.

Developing a scientific mindset in an early stage

Science begins by asking questions and then seeking answers, yet mastering questioning skills is never an easy task. “This is something that one cannot learn from reference texts and books,” Professor Alice Wong, Associate Dean of Science (Teaching & Learning) remarked. “I have been teaching at HKU for years, and I found that there are many outstanding students in Hong Kong who have a passion for doing research. All they need is an opportunity to be cultivated in an early stage. The Science Masters will be able to share their experiences, their attitude, their way of looking at things and approaching a problem, their determination to solve a problem and to strive for excellence, as well as their vision in Science, and it is going to be a very inspiring journey.”

What the programme covers

Fast-track for completing 2 degrees

Bachelor of Science + Master of Research

Remarks: Students in the programme have to maintain a high CGPA in order to remain in this double degree programme or else they have to switch to the 6901 BSc programme

Learning from Science Masters



Grand Masters through special tutorials



Masters as academic advisers

Catering the needs of elite students



disciplinary-based intensive study for research-aspirant students



ample opportunities available in our flagship Young Scientist Scheme (YSS) including

- Summer Research Fellowship
- Overseas Research Fellowship
- Exchange Study
- Entrance Scholarship
- be included in the Cambridge-track*

* - only available to Majors in Natural Sciences disciplines
- candidates will then follow the track if admitted to Cambridge successfully

Research-oriented



Research postgraduate courses and research projects to enhance the students’ frontier scientific knowledge and research skills

Programme introduction:
<https://bit.ly/3eQA9sh>



Revisiting the admissions talk:
<https://bit.ly/3eYM3Am>

"I will take my students to laboratory and let them feel how I apply and elaborate Science. I want them to see what it is like to be a researcher in real life because nothing compares to first-hand experience."



Professor Chi Ming CHE

Zhou Guangzhao Professor in Natural Sciences
Head and Chair Professor of Chemistry

Professor Che has made inspiring contributions in inorganic chemistry, medicinal chemistry and photochemistry, his pioneering study on synthetic chemistry shapes the culture of local research community.

Awards and achievements

- Member of the Chinese Academy of Sciences
- The first Hongkonger to receive a First-class Prize of the State Natural Science Award
- Founding Member of the Hong Kong Academy of Sciences
- Recipient of numerous awards in international academic arena including Foreign Associate of the US National Academy of Sciences

Get to know Our Grandmasters



What makes a Scientist?



Hear what our Science Masters say!

<https://bit.ly/3dUsmc5>

"With a young mind you should start to develop your sense about scientific research in an early stage."

Professor Ngai Ming MOK

Edmund and Peggy Tse Professor in Mathematics
Director of Institute of Mathematical Research
Chair Professor of Mathematics

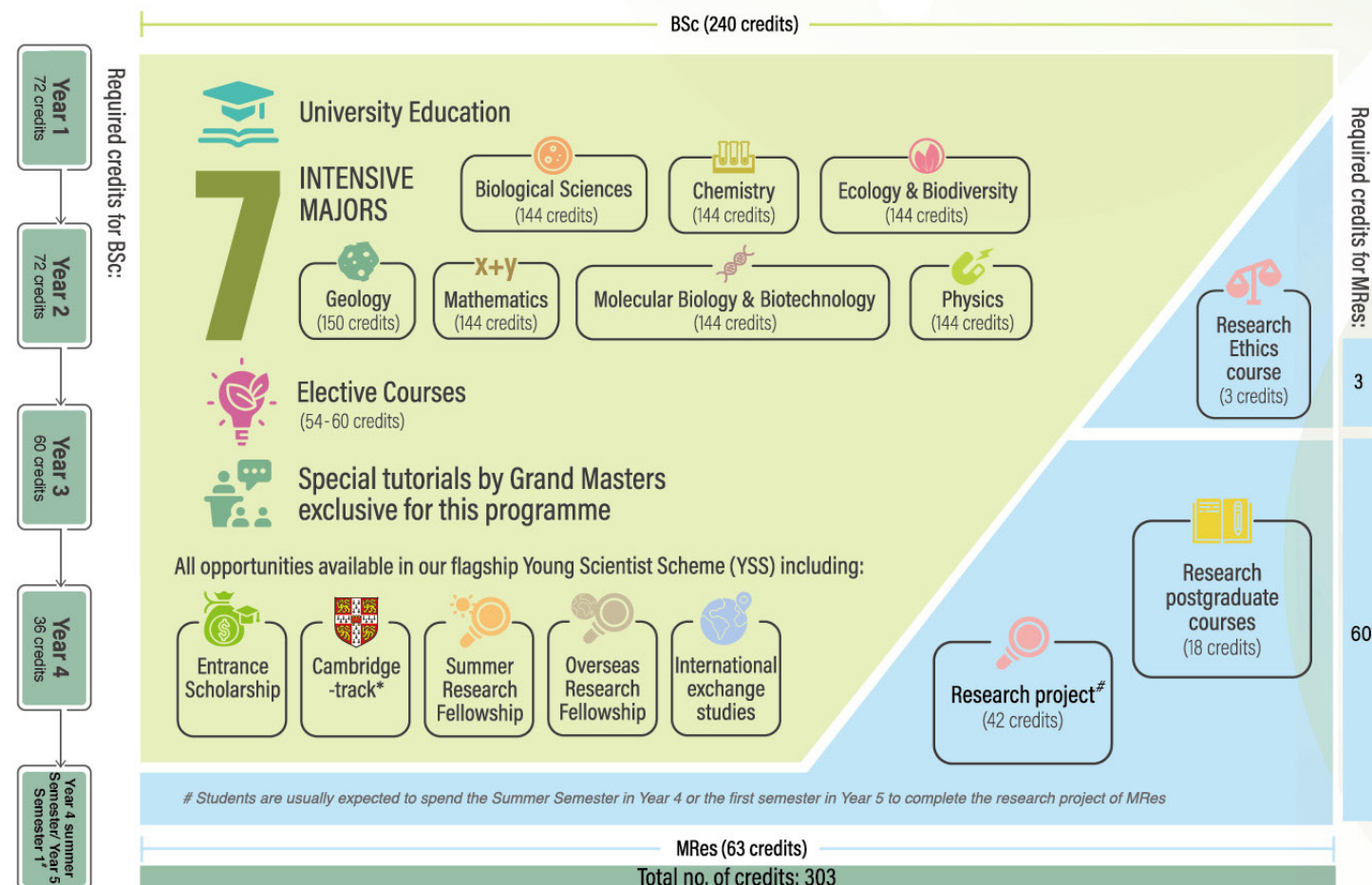
Professor Mok is a top-notch mathematician who has resolved many classic problems in diverse fields of mathematics including several complex variables, complex differential geometry, algebraic geometry and arithmetic geometry.

Awards and achievements

- Member of the Chinese Academy of Sciences
- Fellow of the American Mathematical Society
- Member of the Hong Kong Academy of Sciences
- Recipient of the State Natural Science Award



What you will learn



"We should have the ability to attack the same problem over and over again, from different angles or perspectives."



Professor Michael NG

Director of Research Division for Mathematical and Statistical Science
Chair Professor of Mathematics

Professor Ng's research interests lie in artificial intelligence, data science and scientific computing, which are crucial for shaping the future of human life. Setting his vision far and wide, he is the pilot for the development of research in Mathematical and Statistical Science in the Faculty.

Awards and achievements

- Recipient of the Feng Kang Prize of Scientific Computing



"It will be a very inspiring journey, in which students will be learning to ask a great question that leads to the answer."

Professor Alice Sze Tsai WONG

Associate Dean of Science (Teaching & Learning)
Programme Director of 6688 Science Master Class
Professor of School of Biological Sciences

Professor Wong is a knowledgeable biologist who leads a team of scientists studying cell adhesion and signal transduction in cancer. Her work provides important insights into the nature of ovarian carcinogenesis and informs the best practices of identifying new targets in cancer diagnosis and therapy.

Awards and achievements

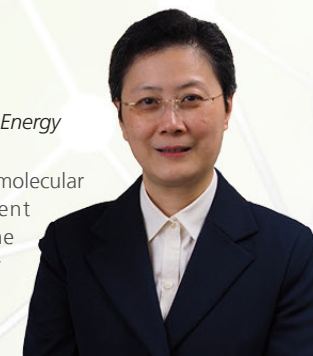
- Recipient of the Croucher Foundation Senior Research Fellowship

"We shall bring out the passion in students and foster their joy of learning, because once they delight in it, they will immerse in the joy of research, and be able to learn faster and better."

Professor Vivian Wing Wah YAM

Philip Wong Wilson Wong Professor in Chemistry and Energy
Chair Professor of Chemistry

Professor Yam is a world-recognised expert in the molecular design and spectroscopic studies of luminescent molecular functional materials, particularly in the manipulation and harnessing of excited states for light-enabled technologies and functions.



Awards and achievements

- Laureate of L'ORÉAL-UNESCO For Women in Science Award
- The Porter Medal 2020
- Member of the Chinese Academy of Sciences
- Foreign Associate of the US National Academy of Sciences
- Fellow of The World Academy of Sciences (TWAS)
- Foreign Member of Academia Europaea
- Founding Member of the Hong Kong Academy of Sciences
- Chief Editor for Chemistry in *Natural Sciences*

"Exposure to scientific research in the early stage of university years will allow insight into more difficult frontiers of modern science and help one to determine an area of interest."

Professor Wang YAO

Chair Professor of Physics

Professor Yao is a condensed matter physicist. His current research interest lies in 2D materials, and has played a decisive role in creating an important new research direction – valley optoelectronics, which aims to exploit valley, a quantum degree of freedom of electron, in future optoelectronic devices.

Awards and achievements

- Fellow of the American Physical Society
- Founding Member of the Hong Kong Young Academy of Sciences
- Named by Clarivate Analytics in the list of "Highly Cited Researchers" among the world's eminent researchers in 2018-2020



"A good scientist should have a questioning attitude to any ideas and hypothesis."

Professor Guochun ZHAO

Chair Professor of Earth Sciences

Professor Zhao has a clear mind in the face of challenges on his research of metamorphic petrology, precambrian geology and supercontinents. His perseverance makes him the holder of many prestigious honours.

Awards and achievements

- Member of the Chinese Academy of Sciences
- Recipient of the National Natural Science Award (First-class)
- Recipient of the State Natural Science Award (Second-class)
- Fellow of The World Academy of Sciences (TWAS)
- Named by Clarivate Analytics as "Highly Cited Researcher"



“If you really want to start something, know why you're doing it.”



Curing the incurable: One startup's mission to help one million

For most of us, the new year brought about new resolutions that we can hopefully achieve by the end of the year, but for **Harrison LI**, a fresh BSc graduate of Food and Nutritional Science, there is an ambitious goal on the horizon: eliminate eczema for one million people by 2026.

Having embarked on this mission since 2013, Harrison founded WeDerm a year ago as part of The Eczema Eradication Project. WeDerm is an award-winning social enterprise aimed at addressing the medical gap for eczema treatment to help those suffering from this chronic autoimmune disease.

Harrison himself has been through his own share of struggles in trying every conventional and unconventional ways, but to no avail. The typical treatment for eczema has been steroid cream, which only serves as a temporary fix, leading to a vicious cycle of increasing drug intensity and lifelong reliance. It was not until ten years later, when he discovered the potentials of an integrated strategy involving nutrition and lifestyle in the management of eczema. Eager to share his first-hand experience and newfound knowledge, he created a website and authored a book to provide a one-stop information base for other eczema sufferers. It led him to his current work at WeDerm, which aims to establish a peer community for support amongst eczema sufferers. Its treatment plan involves one-to-one coaching with health professionals and workshops where people of similar experiences get to meet and learn from one another. Since its founding, WeDerm has helped over a hundred people through their pilot workshops.

Creating real impact

Instead of just running the occasional social media campaign and one-off webinars or lectures, he wanted to make a sizable difference in the long run. This led to the 2026 goal to help one million people with eczema, eliminating the disease in a way that allowed following up with patients and tracking progress. He notes that purely putting out information does not necessarily create change, he said, “Because you never know if readers go home and implement what they've read.” The desire to create something systematic and scalable prompted the founding of this start-up, and ensures that real impact can be achieved for years to come, this led to the idea of running workshops face-to-face to convince the readers to make a change.

With face-to-face interactions, patients would feel more comfortable discussing personal struggles with eczema and its related symptoms. “I have had conversations with patients about undergoing TSW – topical steroid withdrawal – where they experience flare-ups and bleed all over, are forced to be bedridden, and have to take time off work or studies all due to stopping the regular use of steroids after years. Some don't even dare to look at themselves in the mirror.” This is also something Harrison personally relates to, hence the group sessions he designed such as the workshops were intended to bring those with similar experiences together so as to build a peer community.

However, the pandemic has brought about unforeseen challenges to some projects. With everything shifting to virtual platforms, the sense of intimacy and community became much harder to develop. “Now that it's virtual, that intimacy is very hard to imitate, especially when everyone's cameras are closed off.”

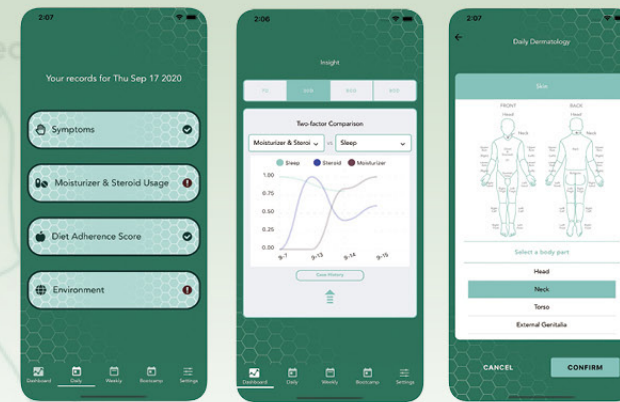
Details of The Eczema Eradication Project:
<https://teepglobal.org/>



Harrison uses his own story to inspire the patients who are fighting against eczema.



The team received recognition by winning awards, and is motivated to make a difference.

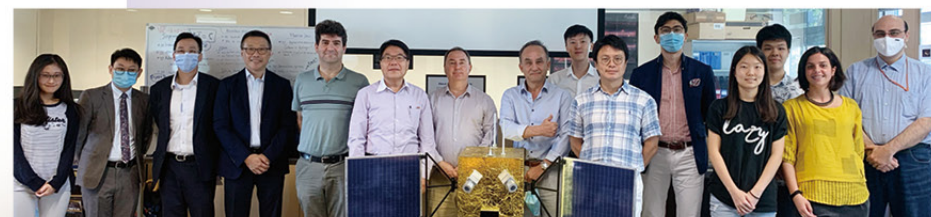


Hong Kong's 1st mobile symptom tracker for eczema, EczeTrack, was designed to help the user track daily habits like a diary.



Mr Simba Xiang ZOU, a second-year BSc student majoring in Physics (Intensive), has been fascinated by the discipline since his childhood. From fundamental building blocks of the universe to the magnificent gigantic stars and immense galaxies, Simba was attracted by this age-old subject that dates back to the times of ancient Greece. This explains his strong interest and motivation to study physics at university.

After being accepted by the Faculty's Summer Research Fellowship (SRF) Scheme, which supports science undergraduates to conduct research under the supervision of an academic, Simba was assigned to work at the Laboratory for Space Research (LSR) in Cyberport last summer. Here he spent over two months working on a topic related to planetary nebulae, the glowing ghostly relics of dying stars. During the period, he was given access to a globally significant and unique database called “HASH” (Hong Kong/ AAO/ Strasbourg H-alpha) a Planetary nebula research platform that contains sets of multi-wavelength imaging data and optical spectroscopy of all known Galactic PN, and his job was to perform manual checking on the reliability of some specific subset of those data for PN with identified central stars.



During the Summer Research Fellowship, Simba was surrounded by experts who gave him the best learning experience.

It took Simba a while to get into the research mode, comprehend jargons, acquaint and master the necessary research skills, but soon he managed to find a way to catch up.

Summer Research Fellowship (SRF) & Overseas Research Fellowship (ORF) schemes for HKU science students:
<https://bit.ly/3bkd4uT>

Mobile app for tracking eczema

Foreseeing the current situation is likely to drag on for the rest of 2021, therefore, by September 2020, Harrison and his team had already invested part of their budget, and hours to research all of the eczema mobile applications worldwide, and designed Hong Kong's 1st mobile symptom tracker for eczema, EczeTrack.

EczeTrack was designed to help the user track daily habits like a diary, and to coach them by recording clinical outcomes like change in symptom severity and quality of life. The app is currently still in an early stage of development, and the team is trying to create a better user experience. As telemedicine is an integral part of the future of healthcare and the impact of technology is already happening, Harrison said WeDerm must go on, and it will operate in hybrid, because human touch is irreplaceable.

When asked to dish out advice for those aspiring to run a start-up social enterprise, one crucial takeaway from the WeDerm founder is to know why you want to do it. Harrison recommends joining competitions as a great way to hammer out your idea into something concrete and practical. Recognising the popularity of such case competitions for their excitement and embellishment on the CV, he emphasises that, “If you really want to start something, know why you're doing it.” Once you have that drive to create change, case competitions become more than just winning a trophy.



wederm.hk

Undergraduate research experiences open door to research career for physics student



Simba has got a chance to be the second author of a journal paper.

other experienced researchers were there to offer their helping hands. “It was like entering a marvellous academic community!” Simba said.

During his summer fellowship, he assisted Professor Parker in correcting the central star coordinates of a list of planetary nebulae published in other journal papers, of which he conducted a large portion of data analysis. He also analysed two newly established planetary nebulae catalogues, where some interesting conclusions about the aforementioned errors spotted are drawn. His research findings will form the basis of a future refereed journal paper where he will be a co-author.

Facing up real obstacles

Simba believes that the SRF scheme does not only provide a valuable opportunity for enthusiastic students to have an early taste in conducting research, but it also equips them with the ability to self-study, that he believes plays a key role in pursuing a research career.

“For a year-two student, it is hard for me to start a research topic of my own due to limited disciplinary knowledge. However, the SRF scheme inspires me to learn more about astronomy, astrophysics and quantum physics, which I believe I will be able to find my research path very soon. It is also great to explore my research interest and possible topics, which may in turn affect my choices of courses later on during my undergraduate study. I would say it strengthened my interest and determination in pursuing academic research as my life career.”



Interview video of Simba:
<https://bit.ly/3actpSJ>

The fantastic scenery outside LSR

External awards and honours

Professor Min SUN and **Professor Guochun ZHAO** from the Research Division for Earth and Planetary Science, along with **Professor Wang YAO** from the Research Division for Physics and Astronomy have been named by Clarivate Analytics in its list of "2020 Highly Cited Researchers". Their works have been highly cited by fellow academics and are hence making a significant impact in ongoing research in their respective fields of study.

Professor Min SUN

Professor Wang YAO

Professor Guochun ZHAO

Professor Guosheng YIN



Professor Alice Sze Tsai WONG

A research team led by **Professor Alice Sze Tsai WONG** from the Research Division for Molecular and Cell Biology, including her collaborators Dr Shanshan LI, Dr Ka Man IP, Dr Kei Shuen TANG and Professor Ho Cheung SHUM, won a Silver Medal the Special Edition 2021 Inventions Geneva Evaluation Days hosted by The International Exhibition of Inventions Geneva (IEIG). The team developed a microfluidic tool that captures metastatic cancer cells, which can differentiate metastatic and non-metastatic cells by biochemical and biophysical characteristics of individual cells, aiming for diagnostic and drug screening purposes. It works best with ovarian cancer, colorectal, gastric and prostate cancers.

A research conducted by **Professor Jian WANG** from the Research Division of Physics and Astronomy and his collaborators, has been selected as one of the 50 Milestone papers in the last 50 years of *Physical Review B*, a top physics journal published by the American Physical Society. The paper published in 2001 focused on the determination of ballistic conductance through device interfaces. Link to the research: <https://bit.ly/3s3BxuO>

Professor Guochun ZHAO, Chair Professor of Department of Earth Sciences, was elected as a Fellow of The World Academy of Sciences (TWAS) in recognition of his outstanding contributions to earth sciences and science promotions in developing countries.

Professor Guosheng YIN, Patrick S C Poon Professor in Statistics and Actuarial Science and Head of Department of Statistics and Actuarial Science, was elected as a Fellow of the Institute of Mathematical Statistics (IMS) in 2021.

Dr Janet Kit Yan CHAN, Lecturer of School of Biological Sciences and **Dr Thiyagarajan VENGATESEN**, Associate Professor from the same affiliation, were honoured the University Outstanding Teaching Award 2020 for their contributions to curriculum development, mentorship, teaching and learning within and outside the discipline.

Dr Ho Yu AU-YEUNG, Associate Professor from Department of Chemistry, **Dr Timothy BONEBRAKE**, Deputy Director and Associate Professor of School of Biological Sciences and **Dr Ryan MCKENZIE**, Assistant Professor from Department of Earth Sciences were awarded the University Outstanding Young Researcher Award 2020 for their outstanding research accomplishments of international recognition, involvement in high-impact applied research work and ability to attract research grants.

Professor David DUDGEON, Emeritus Professor from School of Biological Sciences was awarded the University Outstanding Research Student Supervisor Award 2020 for his excellent guidance in helping his students in the pursuit of research excellence.

Dr Louise ASHTON, Assistant Professor from School of Biological Sciences was awarded Faculty's Research Output Prize 2019-20 for honouring her exceptional work in the research project "Termites mitigate the effects of drought in tropical rainforest", *Science*, 2019, Vol. 363, Issue 6423, pp. 174-177.

The University Knowledge Exchange Excellence Award 2020 went to a team of ecologists from Conservation Forensics Laboratory and the School of Biological Sciences including Senior Lecturer **Dr Caroline DINGLE**, Associate Professor **Dr David BAKER**, Deputy Director and Associate Professor **Dr Timothy BONEBRAKE** and Emeritus **Professor David DUDGEON** in recognition of their outstanding accomplishments in their KE project entitled "Reduction of Illegal Global Wildlife Trade through Novel Conservation Forensics Research".

Internal awards

A team of physicists, engineers and chemists from across local institutions, led by Chair Professor Wang YAO of Research Division for Physics & Astronomy, working on the research of fundamentals and emerging technologies of two-dimensional (2D) materials, was **awarded a funding of over HK\$80 million from the Areas of Excellence (AoE) Scheme 2020/21 (Ninth Round)** under the University Grants Committee (UGC). This will facilitate the exploration of fundamental physics in the new realm of two-dimensional atomic crystals and their van der Waals heterostructures with the abundant quantum degrees of freedom (e.g. spin, valley); and to explore quantum engineering of materials and devices in the unprecedented atomically thin 2D geometries, with the aim to revolutionise electronics, optoelectronics and photonics.



Read more:
<https://bit.ly/3mLv7B>

Another AoE project that HKU physicist takes part in is a cross-institutional one on meta-materials and meta-devices led by The Polytechnic University of Hong Kong. Professor Shuang ZHANG of Research Division for Physics & Astronomy is one of the Co-Principal Investigators of this successful grant application.

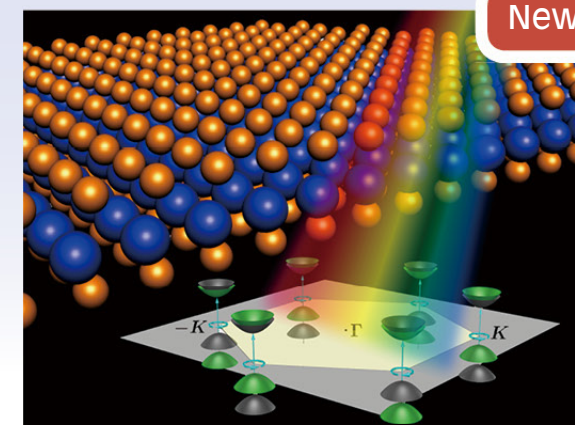


Image courtesy of Wang YAO and The Royal Society of Chemistry from *Chem. Soc. Rev.*, 2015, 44, 2643

Eight projects of the Faculty **receive a funding of over HK\$38 million from the The Collaborative Research Fund (CRF) 2020/21** of the University Grants Committee in January 2021. Among the awarded projects, four are from the Research Division for Chemistry, three from Molecular & Cell Biology, and one from Physics & Astronomy.



Read more:
<https://bit.ly/3d0cKDE>

HKU Science excels in QS World University Rankings by Subject 2021

QS WORLD UNIVERSITY RANKINGS by subject

According to the QS World University Rankings by Subject 2021, **HKU Science continues to excel in a wide array of science disciplines**. The rankings symbolise the relentless effort of all Faculty members, and we will not be complacent but devote to achieve teaching and research excellence, creating knowledge and impacts.

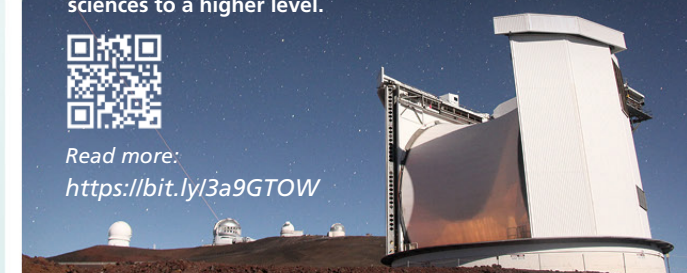
Ranking summary:

Biological Sciences: #75	Materials Science: #61
Chemistry: #52	Mathematics: #53
Earth & Marine Sciences: #49	Natural Sciences: #52
Environmental Sciences: #44	Physics & Astronomy: #66
Geology: #50	Statistics & Operational Research #48
Life Sciences & Medicine: #55	

HKU becomes an associate partner of East Asian Observatory strategically enhancing its research in astrophysics, space and planetary sciences to a higher level.



Read more:
<https://bit.ly/3a9GTOW>



The University of Hong Kong (HKU) joins hands with the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) to establish the Joint Laboratory of Marine Ecology and Environmental Sciences (JLMEES), fostering collaboration in the fields of marine and environmental sciences between Hong Kong and Mainland China, and to build a sustainable marine environment. The two institutes signed the Memorandum of Understanding (MoU) on November 24, 2020.



Read more:
<https://bit.ly/3wR7MRA>



~ Obituary ~

"By asking questions, one can be inspired to think."
Emeritus Professor Brian Morton



It is with deep sadness that we mourn for the passing away of Doctor of Science and Emeritus Professor Brian MORTON on March 28, 2021 in his sleep, at the age of 78. We honour the memory of Professor Morton in many aspects, be it his relentless commitment in founding the Swire Marine Laboratory (later renamed as Swire Institute of Marine Science) three decades ago, or his significant contributions in teaching and research in marine biology as well as in pioneering the marine environmental conservation in Hong Kong.



The full obituary of Professor Morton can be viewed at:
<https://bit.ly/3sz1D9V>

Information Session for DSE Students –

YOUR FIRST LECTURE

@

HKU SCIENCE

What is the university life at HKU like?

Join us at our pre-induction talks and mock lectures in diverse science disciplines.

Get a taste of being a HKUer with us!

2021
May
27

Date: May 27, 2021 (Thursday)

Time: 12nn – 5:45pm

Programmes:

- Pre-induction talks on 6901 BSc, 6688 Science Master Class, 6729 BSc(ActuarSc), 6224 BASc(AppliedAI)
- Mock lectures by HKU Science academics

Target audience: **HKDSE students who are interested in pursuing Science at HKU**

Details:

<https://bit.ly/3fZuxN6>


Mock lecture schedule

Time	Talk 1	Talk 2
12:00 – 12:45pm	6901 BSc + YSS pre-induction talk	6224 BASc(AppliedAI) pre-induction talk
1:00 – 1:45pm	6688 Science Master Class pre-induction talk	6729 BSc(ActuarSc) pre-induction talk
2:00 – 2:45pm	Mock lecture on Biological Sciences	Mock lecture on Physics
3:00 – 3:45pm	Mock lecture on Mathematics	Mock lecture on Chemistry
4:00 – 4:45pm	Mock lecture on Statistics & Actuarial Science	Mock lecture on Earth Sciences
5:00 – 5:45pm	Mock lecture on Environmental Science	

Mock lectures at a glance

Theme	Topic
Biological Sciences	Animal Behaviour
Chemistry	Go with the Electron Flow
Earth Sciences	Interesting Facts about Our Earth
Environmental Science	Emerging environmental challenges: noise and light pollution
Mathematics	Counting to Infinity
Physics	Nuclear Binding Energy and Nuclear Power
Statistics & Actuarial Science	Introduction to Statistical Learning

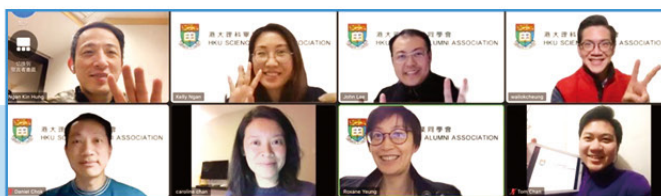
Alumni Corner

2020
September
25

New Cabinet of HKUSAA

The HKU Science Alumni Association (HKUSAA) has formed a new cabinet of executive committee for 2020/2021 in September 2020, at which Ms Kelly NGAN was elected the President. Former President John LEE continues his support by serving as Honorary Treasurer, Caroline CHAN and Tom CHAN as Honorary Secretary and Vice-President respectively, while Dr Raymond CHEUNG, Daniel CHOK, Peter MAK, Samuel NGAN and Roxane YEUNG would serve as executive members.

Eyecare ZOOM Workshop

2021
January
9

The pandemic cannot stop us from uniting with each other. HKUSAA has formulated a year-plan with a series of activities to stay connected with members. Joining hands with Orbis, the Association hosted an Eyecare ZOOM Workshop to introduce common visual problems. Not only tips on daily eye care were available in the workshop, this virtual gathering also brought our alumni together to reforge connections.

Learn more about the activities and online workshops of HKUSAA at its Facebook page:



Acknowledgements

We would like to express gratitude to our donors for their recent support, which is paramount for us to grow and scale new heights (in alphabetical order).

Individual donors

Ms Winnie Oi Yee CHAN
Mr Wing Wah CHAN
Mrs Chun Wah CHAN SO
Professor Chi Ming CHE
Professor David Lee PHILLIPS
Mr Zhouyuan ZHONG

Corporate donors

The Croucher Foundation Limited
Ocean Park Conservation Foundation, HK
SGS Hong Kong Limited
Sun Hung Kai Real Estate Agency Limited
Wiley-VCH GMBH