Virtual Science Talks

for secondary 3 to 6 students

The series of talks aim to provide the participants with enjoyable experience of science learning, as well as the interactive encounters for the participants to learn about undergraduate science education at HKUST.

The talk series will be held in March and April, during Tuesday or Friday afternoon. Each of the one-hour Zoom event is comprised of 40 minutes of science talk, followed by about 10 minutes of student sharing as well as 10 minutes of admission talk.

Throughout the event, you can interact with the speakers, and have enquiries answered and the doubts demystified. In recognition of your participation, OEA bonous points (for JUPAS students attending two or more talks) and a set of souvenirs will be rewarded as a token of appreciation.

Broadcast on Zoom

School of 理學院 Science

香港科技大學 THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

School of 理學院 Science

HKUST School of Science – Virtual Science Talks 2021

A total of 12 Virtual Science Talks will be conducted on Zoom in March and April, as highlighted below:

March 2021						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April 2021						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

The talks encompass diverse range of topics, with emphasis on the applications of science in our daily life and frontier scientific developments.

Date and time	Topic	Speaker	Language
2 Mar 2021 (Tue) 4:30-5:30pm	Computational Mathematics in Real Life	**Prof. Tim LEUNG** Department of Mathematics	Cantonese
5 Mar 2021 (Fri) 4:30-5:30pm	Reading and Writing the Genetic Code: Diagnostics, GMOs, and Designer Babies	**Prof. Angela WU** Division of Life Science	English
9 Mar 2021 (Tue) 4:30-5:30pm	Science behind Disinfectant Products against COVID-19	**Prof. Jason CHAN** Department of Chemistry	Cantonese
12 Mar 2021 (Fri) 4:30-5:30pm	Learning Machine Learning	**Dr. Chi Wai YU** Department of Mathematics	Cantonese
16 Mar 2021 (Tue) 4:30-5:30pm	What Languages do Bacteria Speak?	**Prof. Stanley LAU** Department of Ocean Science	Cantonese
19 Mar 2021 (Fri) 4:30-5:30pm	Bacteria and Viruses' Impact on Human Health	**Dr. Peter CHEUNG** Department of Chemistry	Cantonese
23 Mar 2021 (Tue) 4:30-5:30pm	Physics in Movies	**Dr. Yee Fai NG** Department of Physics	Cantonese
26 Mar 2021 (Fri) 4:30-5:30pm	Exploring the Secrets of Dark Matter	**Prof. Tao LIU** Department of Physics	English
30 Mar 2021 (Tue) 4:30-5:30pm	Is the Creation of Two Sexes for the Better or for the Worse?	**Dr. Melody LEUNG** Division of Life Science	Cantonese
9 Apr 2021 (Fri) 4:30-5:30pm	Two Interpretations of Probability	**Dr. Albert KU** Department of Mathematics	Cantonese
13 Apr 2021 (Tue) 4:30-5:30pm	Biochemical Basis of Qi	**Prof. Robert KO** Division of Life Science	Cantonese
16 Apr 2021 (Fri) 4:30-5:30pm	Microplastics and Mudflats Conservation	**Dr. Cindy LAM** Department of Ocean Science	Cantonese

Each of the one-hour Zoom event is comprised of 40 minutes of science talk, followed by about 10 minutes of student sharing as well as 10 minutes of admission talk.

How to Apply

Interested participants can register online at: https://qrgo.page.link/hNvGY

Registration should be done at least two weeks in advance of the event date. First-come-first-served. Since the audience capacity of Zoom Meeting caps at 300, early registration is recommended. A confirmation email with details will be sent to participants about one week ahead of the event date.

Recognition of Participation

In recognition of students' participation, OEA bonus points will be awarded to S.6 students (for 2021 intake), S.5 students (for 2022 intake), S.4 students (for 2023 intake) and S.3 students (for 2024 intake), if they complete two or more of the talks in this Mar to Apr 2021 series, and keep one or more of the following programs as their JUPAS Band A choices:

- ✓ Science (Group A) Program (JS5102)
- ✓ Science (Group A) with an Extended Major in Artificial Intelligence (JS5181)
- ✓ Science (Group B) Program (JS5103)
- ✓ International Research Enrichment Program (JS5101)
- ✓ Biotechnology and Business Program (JS5811)
- ✓ Mathematics and Economics Program (JS5813)

Every participants, regardless of the number of talk(s) attended, will also receive one set of souvenir as a token of appreciation.

Enquiries

If you have any question regarding to the events, please feel free to contact Mr. Rayven Chan at 2358 6083 or ugscience@ust.hk.

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Discover More Than Science – Making Sense of the World

Synopsis of HKUST Virtual Science Talks (March to April 2021)

The faculty members from the five academic units of the HKUST School of Science offer diverse range of topics with emphasis on the frontier scientific developments as well as the applications of science in our daily life. The target audiences are mostly secondary 3 to 6 students, with a few exceptions indicating that secondary 4 or above is recommended.

Department of Mathematics

Computational Mathematics in Real Life
計算數學在生活中的應用

Speaker: **Prof. Shingyu LEUNG**
Department of Mathematics
Language: Cantonese

Adding to experimentation and theory, computational science has been widely considered as the third mode of science. By providing numerical solutions using the computer, it provides simulation results that can hardly be obtained by any theory or experiment. In this talk, we will present simple examples from various research fields in Mathematics including dynamic interface modeling, multiphase flow simulations, digital image processing and movie making.

除了實驗和理論外，計算科學已被廣泛認為是第三種科學模式。 計算科學通過使用計算機提供數值解，提供了任何理論或實驗都很難獲得的仿真結果。 在這次講座中，我們將探討來自多個數學研究領域的簡單示例，包括動態介面建模、多相流模擬、電腦圖像處理和電影製作。

Two Interpretations of Probability
概率的兩種詮釋

Speaker: **Dr. Albert KU**
Department of Mathematics
Language: Cantonese

Probability is a measure of the likeliness that a certain event will occur. It is not hard to see why the probability of getting a head when a coin is tossed is 50%. But do you know what does the assertion like “the probability that a particular heart transplant is successful is 60%” really mean? It turns out that mathematicians have two radically different ways to interpret probability. What you learn in secondary school about probability is just part of the whole

picture. In this talk, I will introduce the lesser-known part – Bayesian probability. We will also show that it has found application in a wide range of fields such as scientific computing, medicine and so on.

概率，又稱機會率，是用來量度不確定事情發生的機會。例如隨意拋一個硬幣，不難想像得到「公」的概率應該是 50%，但我們又怎樣理解「某次心臟移植手術成功的機會是 60%」這句說話呢？原來為了定義概率，數學家們提出了兩種截然不同的詮釋，我們在中學所學到關於概率的知識其實只涉及其中一種。這次講座我會向你介紹比較少人認識的那種詮釋〔貝氏概率〕。另外，我亦會分享它在不同範疇如科學計算和醫學上的應用。

Learning Machine Learning
學習。機器學習

Speaker: **Dr. Chi Wai YU**
Department of Mathematics
Language: Cantonese

In this epoch of data spillover, the application of data science is expanding in all walks of life. For instance, data science can be applied to Fintech, block chain technology and bitcoin mining, while online retailers rely on the analysis of customer data in designing personalized promotional strategies. Big data analysis can also be used on the medical field in finding the best cure and treatment methods. Thus, the demand for data scientists in the modern society continues to surge. How to become a data scientist?

Computer programming, machine learning, and theories for data science are essential. In this talk, I will briefly discuss what a machine learning is, so that students can preliminarily understand it.

在今日數據滿瀉的年代，數據科學在各行各業的應用範圍愈趨廣泛，例如在金融科技上，數據科學可應用於區塊鏈和比特貨幣挖礦等；網上零售業則可透過分析客戶數據，設計更個性化的宣傳策略；連醫療上也可透過大數據分析來協助找尋最有可能的治療方法。故此，現今社會對數據科學家的需求亦有所驟增。

如何成為數據科學家? 懂得編寫程式、機械學習和數據理論是必不可少的。在這個演講中，我將簡要地討論什麼是機械學習，使同學對它有初步的認識。

Department of Physics

Exploring the Secrets of Dark Matter
探索暗物質的奧秘

Speaker: **Prof. Tao LIU**
Department of Physics
Language: English

In the Universe there exists one kind of mysterious matter unknown to us – dark matter. Dark matter moves around us and can cross the Earth without any difficulty. Its amount is huge, much larger than that of ordinary matter which comprises of most astrophysical objects familiar to us, such as stars. However, dark matter cannot be seen by our naked eyes. What is it? Why are its properties so strange? We will introduce how scientists get to know the existence of dark matter, how they search for it, and how they explore its secrets.
(For secondary 4 or above)

浩瀚的宇宙中存在著一種神秘的未知物質——暗物質。它隱藏在我們身邊，可以不費吹灰之力穿越地球。它數量巨大，遠遠多於我們熟知的組成星球和星系的常規物質，但是我們用肉眼卻看不到它。它是什麼？它為何如此神秘？我們將介紹科學家們是如何知道暗物質的存在，又是如何尋找它，並探索它的奧秘的。
（適合中四或以上的學生）

Physics in Movies
電影中的物理

Speaker: **Dr. Yee Fai NG**
Department of Physics
Language: Cantonese

Movies are for entertainment. Scenes in movies are sometimes described in a grossly exaggerated manner violating the laws of physics. By analyzing the situations portrayed in some movies featuring action, sci-fi, and fantasy, we seek to illustrate the correct or incorrect concepts of physics.

電影能娛樂大眾。一些電影中的場景異常誇張，違反了不少物理定律。透過分析不同的動作電影和科幻電影，我們會為大家介紹電影中涉及到的正確或錯誤的物理概念。

Department of Ocean Science

Microplastics and Mudflats Conservation
微塑膠粒與泥灘保育的關係

Speaker: **Dr. Cindy LAM**
Department of Ocean Science
Language: Cantonese

Microplastics are wide spread in oceans and sediments. They come from various sources, including from larger plastic debris that degrades into smaller pieces and microbeads from health care products. Owing to its small size and chemistry nature, microplastics adsorb organic pollutants and have the potential to be ingested by an array of marine biota. Apart from fishes, microplastics have been found accumulating in the bodies of a number of mudflat organisms such as mangrove crabs, oysters and clams. In this talk, I will give you a brief idea on the adverse impacts of human activities to mudflat ecology and biodiversity.

微塑膠粒無處不在。它們主要從較大型的塑膠碎片中分解出來，或來自個人護理產品。由於微塑膠粒體積細小和其獨特的化學特性，它們容易被有機化學污染物黏附和容易被海洋生物攝入。除了魚類，其他泥灘生物如：紅樹林蟹、牡蠣和蛤蜊也被發現積聚了微塑膠粒。在這次講座中，我會為大家簡單介紹人類活動如何影響泥灘生態及生物多樣性。

What Languages do Bacteria Speak?
細菌的語言

Speaker: **Prof. Stanley LAU**
Department of Ocean Science
Language: Cantonese

Bacteria are unicellular organisms with simple structure. But these simple creatures can communicate with each other and exhibit coordinated behavior that allow them to act like complex multicellular organisms. Harnessing the bacterial communication system allows us to develop new technology to treat sewage, to generate electricity or even to cure diseases.

細菌屬單細胞生物，擁有簡單的結構。但這些細菌可以互相溝通，並且相互協調，表現成複雜的多細胞生物。細菌之間的互動有助發展新的科技，如處理污水、發電、甚至治療疾病。因此，認識細菌的語言有助我們未來的發展。

Department of Chemistry

Science behind Disinfectant Products against COVID-19
解讀防疫消毒用品的科學原理

Speaker: **Prof. Jason CHAN**
Department of Chemistry
Language: Cantonese

Face masks and disinfectants have become our essential items since the outbreak of the novel coronavirus pandemic. With so many different types of disinfectants on the market, how can we make the best choices using chemistry knowledge? In this lecture, we will discuss the chemistry behind different types of disinfectants and their mechanisms of action, their effectiveness and scientific soundness. Through this discussion, we will also learn to become wiser consumers by applying the scientific method in our everyday choices.

在新型冠狀病毒肺炎疫情下，口罩和消毒用品已變成了我們日常的一部分。現時市場上消毒用品的種類繁多，我們如何利用化學知識作出最佳選擇呢？這講座中我們會討論各種消毒用品背後的化學原理、它們的效能和科學依據。希望透過這些討論可以培養我們的科學素養，使我們在日常生活中成為更精明的消費者。

Bacteria and Viruses' Impact on Human Health 細菌和病毒對人類的影響

Speaker: **Dr. Peter CHEUNG**
Department of Chemistry
Language: Cantonese

There are many pathogens around us in the environment that can infect us and cause us to become sick. Two main pathogens are bacteria and viruses. While bacteria are cells that can sustain life itself, virus contains only the genetic material and small number of proteins that can invade and reprogram our cells to make more copies of the virus. Bacteria and viruses can change their genetic material quickly through mutations that can allow them to escape our immune response and develop resistance to antibiotics and antiviral drugs. Hence, they cause major global health problems. How can we use the tool box of science and engineering to prevent and cure bacterial and viruses infectious diseases?
(For secondary 4 or above)

環境中有許多病原體可以感染我們並導致我們生病。兩種主要病原體是細菌和病毒。細菌是能夠維持生命的細胞，另一方面，病毒只含有遺傳物質和少量蛋白質，可以侵入和重新編程我們的細胞來製造更多的病毒拷貝。細菌和病毒可以通過突變迅速改變其遺傳物質，這些突變可以使它們逃脫我們的免疫反應並對抗生素和抗病毒藥物產生抗藥性。因此，它們引起嚴重的健康問題。我們如何使用科學和工程工具箱來預防和治療細菌和病毒傳染病？
（適合中四或以上的學生）

Division of Life Science

Biochemical Basis of Qi
氣的生物化學基礎

Speaker: **Prof. Robert KO**
Division of Life Science
Language: Cantonese

As far as the Chinese medicine theory goes, Qi is the driving force of life activities. As such, life no longer prevails in the absence of Qi. To understand the abstract concept of Qi, we investigate the pharmacological activities of Fructus Schisandrae, a commonly used Chinese herb for invigorating Qi of five visceral organs, in an effort to establish the biochemical basis of Qi-invigoration in Chinese medicine. In this talk, I will serve you some interesting findings in our 20 years of research in HKUST.

中醫理論認為「氣」乃是推動生命活動的動力。所謂「氣絕身亡」便說明這個緊密的關係。我們透過研究可補「五臟之氣」的五味子的藥理作用，用現代醫學語言來理解「氣」的抽象概念，繼而建立中醫補氣的生物化學基礎。在這次講座中，我會和大家分享我們在科大二十多年來一些有趣的研究發現。

Reading and Writing the Genetic Code: Diagnostics, GMOs, and Designer Babies
閱讀和編寫基因碼：診斷、基因改造生物，及設計嬰兒

Speaker: **Prof. Angela WU**
Division of Life Science
Language: English

We have been able to read bits and pieces of the genetic code for decades, using traditional DNA sequencing and designed probes; writing the genetic code has proved far more challenging. With recent advances in high-throughput DNA sequencing and genome editing technologies, however, we are rapidly approaching an era where reading and writing DNA will be as easy as reading and writing a document in your word processor. These breakthrough technologies have enabled rapid and accurate diagnostics for diseases, improving prevention and treatment; they have created GMO crops that grow more rapidly and robustly, leading to reduction in world hunger. But could these promising technologies also have a dark side? What are the potential consequences of a technology that can create designer babies, or one that can predict more than your predisposition to disease? In this talk we will discuss the technologies and their possible ethical ramifications in society.

在過去的數十年間，人類已可以運用一些傳統基因測序方法閱讀小部分基因碼，而直到最近，編寫基因碼卻仍極具挑戰性。近期的先進科學發明，包括高通量基因測序技術及基因組編制技術令我們更容易去閱讀及編寫基因——也許很快有一天，讀寫 DNA 就好比日常的文書處理一樣容易。這些突破性的發展令我們可以更快、更準確地診斷疾病，從而改善預防及治療的方法。基因改造的農作物可加快生長速度，減低糧食短缺的問題。但這些技

術會有黑暗的一面嗎？這種技術使得設計嬰兒不只是科幻，它還能預測你未來會患哪些疾病，但使用如此強大的技術會有甚麼潛在的後果呢？本講座會與你一起探討基因技術，以及社會的道德爭論。

Is the Creation of Two Sexes for the Better or for the Worse?
兩個性別是好是壞？

Speaker: **Dr. Melody LEUNG**
Division of Life Science
Language: Cantonese

God created man and woman and intended for human beings to undergo sexual reproduction, and God also made many organisms that do not need a mating partner to reproduce. Why do we need to have two genders? We generally believe that female form is the default template for the mammalian fetuses of both sexes, and recent researches demonstrate that mammals could reproduce uni-sexually and created an all-female colony. So, is it necessary to have two sexes? What are the advantages and disadvantages of having two sexes? What would it be like if human societies become genderless?

上帝創造了男性和女性，讓人類通過有性繁殖的方式繁衍；但上帝亦同時創造了一些生物是以無性繁殖的方式孕育下一代。為何人類需要有兩個性別？我們一般相信哺乳類胚胎的原型是女性胚胎，近期的研究也顯示哺乳類能以單性繁殖，形成只有女性的族群。究竟人類的兩個性別是否必須？擁有兩個性別有甚麼利弊？如果人類社會只剩下單性又會怎樣？