科學英才精進計劃

A Science Enrichment Programme for Secondary 3-4 Students

第二階段 – 專題工作坊

Phase 2 - Scientific Workshop

香港中文大學
THE CHINESE UNIVERSITY OF HONG KONG

優質教育基金
Quality Education Fund

歡迎

您進入「S3-4科學英才精進計劃」之第二階段，此階段包含專題工作坊和科學培訓課程兩部份。本專題工作坊共涵蓋六個範疇，包括統計、化學、生物化學、數學、生物及物理，同學可按自己的喜好選擇合適的範疇。在每節工作坊中，導師將透過實驗、理論和遊戲，與同學們一同探討常見的科學問題，為及後的科學培訓課程打好基礎。

希望本專題工作坊能使您對不同的科學範疇有更深入的了解，並在探究科學的過程中享受箇中樂趣。

Welcome

to Phase 2 of 'A Science Enrichment Programme for Secondary 3-4 Students', comprising a series of scientific workshops and intensive courses. These scientific workshops cover six subjects, including Statistics, Chemistry, Biochemistry, Mathematics, Biology and Physics. Students can choose the appropriate subject which suit them best. In each workshop, instructors will explore some common scientific issues with the students through hands-on experiments, theories and games, which help students develop a solid foundation for the upcoming intensive courses.

It is our sincere hope that these scientific workshops will give you a better understanding of different science subjects and bring you enjoyment in the process of exploring science.

統計 STATISTICS

金融海嘯，投資有“橋”

Financial Tsunami, Investment Strategy

當前的金融海嘯及信貸市場的崩潰令財富管理變得甚具挑戰性。這個工作坊旨在讓學生在一個簡化的金融環境下通過遊戲和活動來體會如何能運用概率和基本的投資概念如分散投資風險及對沖等來制訂高素質及明智的決策。工作坊亦會探討一些與債卷市場、股票市場及利率等有關的有趣現象，並討論債卷價格、債卷期限、股息、風險溢價及分散投資等概念。

The current financial tsunami and the meltdown of the global credit markets have posed enormous challenge for the management and investment of wealth. Through games and activities, this workshop provides students with opportunities to experience a simplified version of the financial market and to learn how to incorporate ideas of probability and useful investment concepts such as diversification and hedging to make high-quality and smart decisions. Some interesting phenomena regarding the bond market, the stock market and interest rates will be investigated. Related concepts such as bond prices, maturation date, dividend, risk premium, and diversification will also be discussed.

導師 Instructor :
張紹洪教授 Prof. Cheung Siu Hung, Department of statistics, CUHK
潘偉賢教授 Prof. Poon Wai Yin, Associate Dean (Education), Faculty of Science, CUHK

物理 PHYSICS

伽利略望遠鏡
The Galileoscope

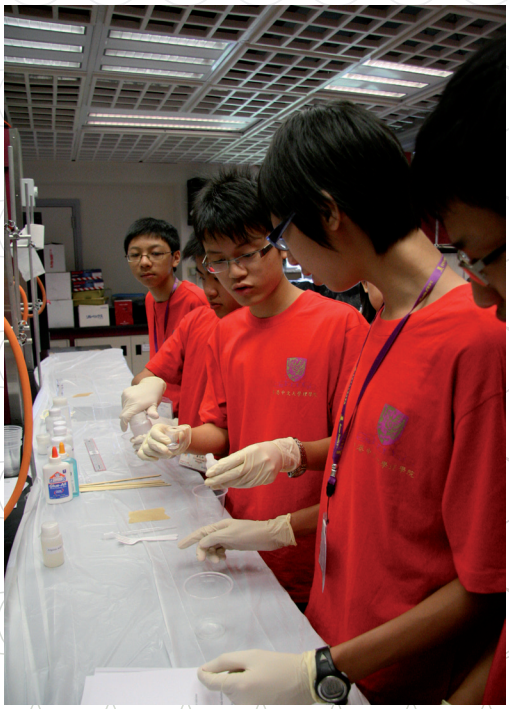
今年是國際天文年，以紀念400年前伽利略對天文作出的貢獻。全球有無數相關的推廣活動舉行，「伽利略望遠鏡」就是其中一個全球性的基礎活動。同學將使用組合包自行組合一支折射式望遠鏡。伽利略望遠鏡可以組成伽利略式結構或開普勒式結構，同學可以自行比較兩種結構的分別及運用物理知識解釋其不同之處。另外亦會使用「巴德膜」為伽利略望遠鏡製作一個太陽濾光器，並進行太陽觀察。

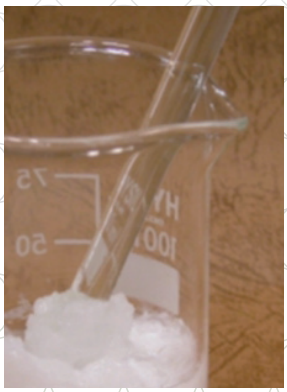
This year is the International Year of Astronomy, celebrating the contributions Galileo made 400 years ago. There are numerous related activities around the world. “The Galileoscope” is one of the global cornerstone projects. Students are asked to assemble a refracting telescope from a kit set. The galileoscope can be assembled in either a Galilean configuration or a Keplerian configuration so that students can compare the two designs and use their physics knowledge to explain the difference. We will also make a solar filter for the gailieoscope by using a “Baader film”, and do a solar observation.

導師 Instructor :
湯兆昇博士 Dr. Tong Shiu Sing, Department of Physics, CUHK
陳俊霖先生 Mr. Chan Chun Lam, Alumni of Depatment of Physics, CUHK

科學工作坊 Scientific Workshop

化學 CHEMISTRY






塑膠之誕生
Plastic is Born!

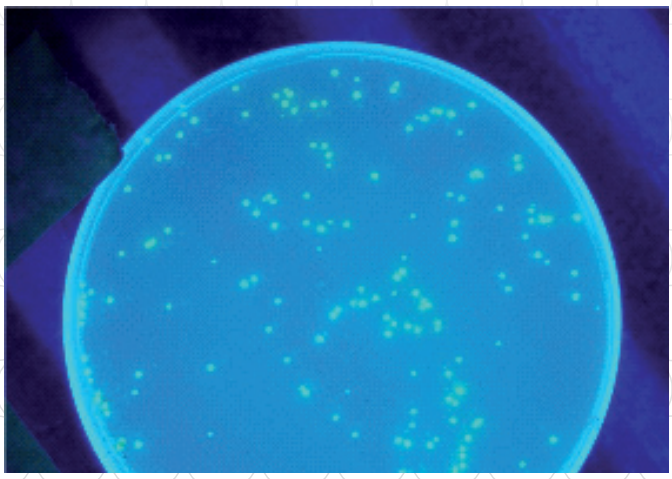
塑膠及聚合物製品隨處可見，聚合物科學的發展使我們的生活有極大的改變。現今已發展了許多種類的聚合物，它們都有著非常不同的特性，可以廣泛地應用於家居用品、醫療、通訊和紡織品等多方面。本工作坊將教授同學有關塑膠及聚合物的知識，內容包括簡短科學講座及科學實驗。同學將透過親手進行多個相關的實驗，從中學習有關聚合物之基本化學知識及其製造過程，並可體驗怎樣從改變製作過程中之一些條件而得出有著不同特性之聚合物，藉此學到物料的分子結構及其特性中的相互關係。

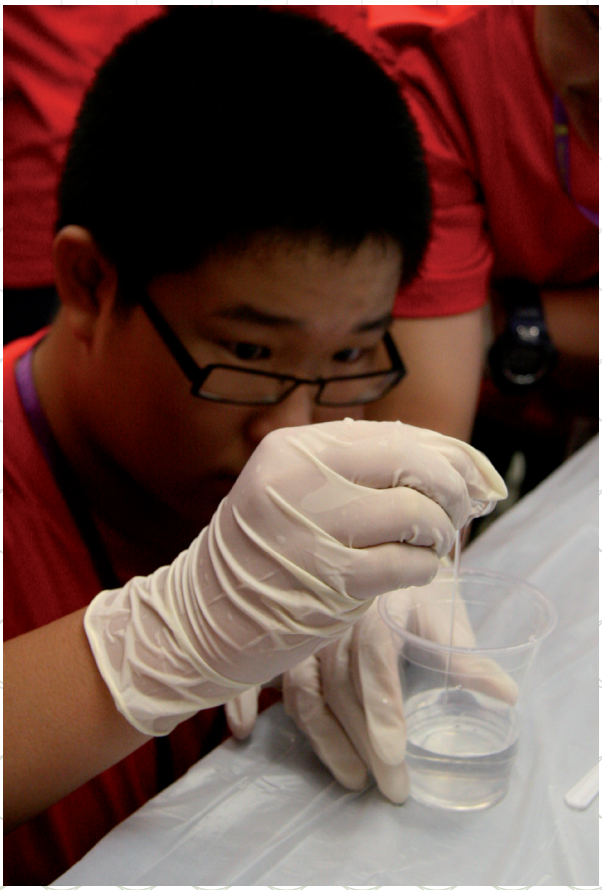
Plastics and polymers can be found in everywhere. The development of polymer science has changed our life significantly. Different kinds of polymers have very different properties, and serve in a wide variant of applications from household products to medicine, communications, and textiles.

Students in this session will attend a short introductory lecture about plastics and polymers, and perform a variety of related “hands-on” scientific experiments. They will learn about some basic chemistry principles of polymers. They will also experience how to make polymers by using different polymerization techniques, and recognize how to control the properties of the products by varying the experimental conditions. After finishing this session, they will have a better understanding on the relations between molecular structures and the properties of materials.

導師 Instructor :
陳永發博士 Dr. Chan Wing Fat,
Department of Chemistry, CUHK
麥建華博士 Dr. Mak Kendrew KW,
Department of Chemistry, CUHK

生物化學 BIOCHEMISTRY





在大腸杆菌中表達水母綠色螢光蛋白

Expression of Jellyfish's Green Fluorescent Protein (GFP) in Escherichia coli

本工作坊旨在讓同學了解基因工程及生物科技之應用，當中同學會進行一個細菌轉型作用之實驗。透過熱激，大腸杆菌會被轉型至能產生水母綠色螢光蛋白(GFP)。利用抗生素篩選，帶有GFP基因之大腸杆菌會在平板上產生菌落，該菌落在紫外線照射下會發出螢光。

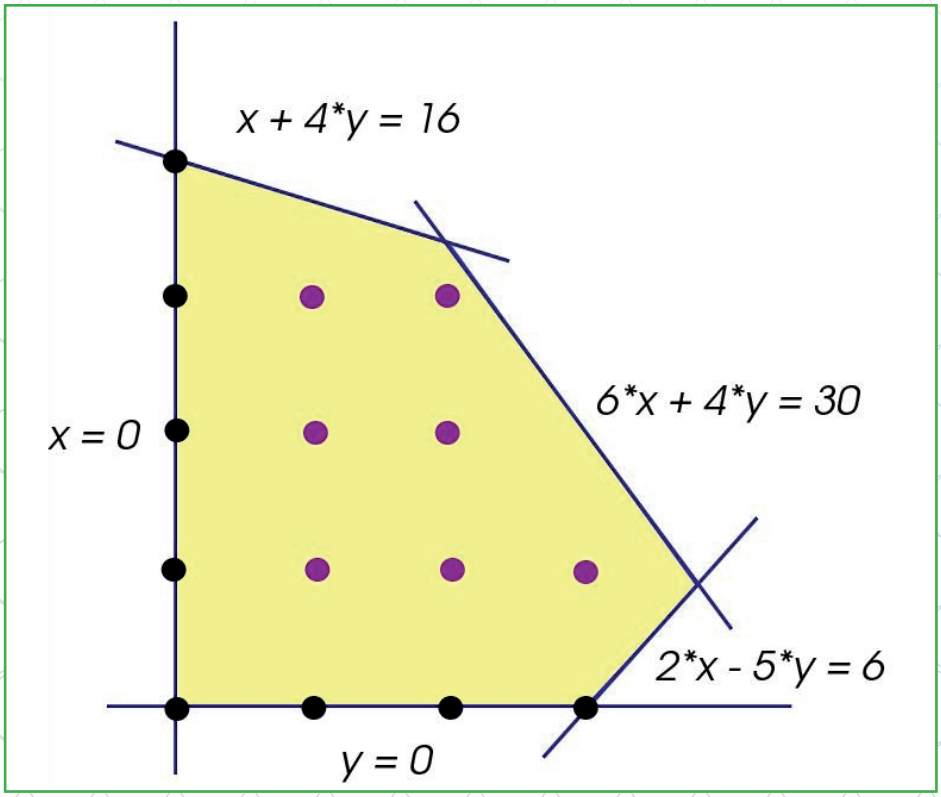
In this workshop, students will experience the applications and processes in genetic engineering and biotechnology. In particular, students will perform a bacterial transformation. E. coli is heat-shocked to uptake a gene from jellyfish for the production of green fluorescent protein (GFP). After plating out on agar plates with antibiotics, bacterial cells carrying the GFP gene will form colonies which 'glow' under UV irradiation.

導師 Instructor :
汪紹佳教授 Prof. Kong Siu Kai, Department of Biochemistry, CUHK
曾偉基教授 Prof. Tsang Wai Kei, Department of Biochemistry, CUHK

數學 MATHEMATICS

單純形法的實例應用

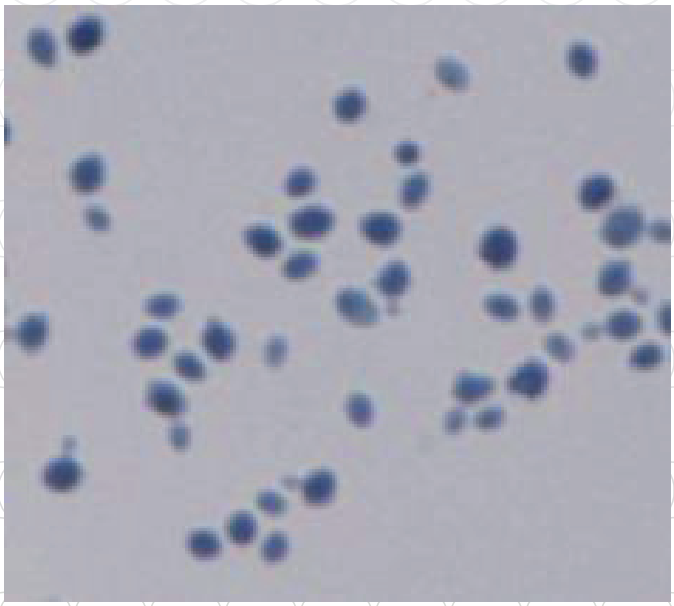
Application of Simplex Method in linear Programming

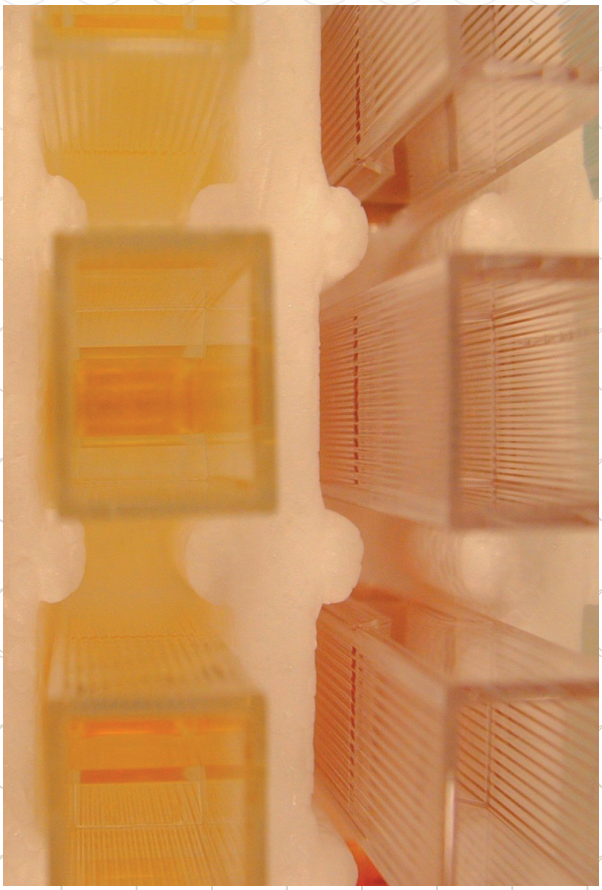


線性規劃問題，是指在一組有限個線性不等式約束下求線性目標函數的極大值或極小值問題。線性規劃在處理微觀經濟學以及企業管理的相關問題中得到了廣泛的運用，例如策略規劃，產品生產，運輸，技術及其他多項實際課題。單純形法是線性規劃中一個易用、高效的算法，由George B. Dantzig于1947年發表。本工作坊將對單純形法中的各重要問題做出介紹，進而使用EXCEL工具演示該算法的應用，并輔以趣味例題加以闡釋。有筆記本電腦的同學請自備電腦（沒有的同學無需強求）。

A linear programming problem is one in which we are trying to find the maximum or minimum value of the objection function, subject to a finite number of linear inequality constraints. Linear programming is extensively used in microeconomics and company management for planning, production, transportation, technology and other real-life problems. For solving linear programming problems, George B. Dantzig in 1947 introduced an easy-to-use and efficient algorithm, known as the simplex method. In this workshop, we shall discuss some important issues of the simplex method and demonstrate it using EXCEL as a tool. Please bring your laptop if you have one.

導師 Instructor :
陳漢夫教授 Prof. Chan Hon Fu, Associate Dean (Research), Faculty of science, CUHK
張亮夫博士 Dr. Cheung Leung Fu, Department of Mathematics, CUHK
黃澤夫博士 Dr. Wong Chak Fu, Department of Mathematics, CUHK





生物實驗探秘
Exploring Experimental Biology

在本工作坊同學將親身體驗兩種生物學研究上常用的方法：光學顯微鏡學和定量檢測。在其中一節，同學需將顯微鏡調較校準，然後測量酵母菌的大小，及用解剖顯微鏡觀察水蚤。在另一節中，同學將學習如何使用簡單的生化測試及標準曲線，找出市面上飲料的含糖量。

In this workshop, students will experience two commonly adopted methodologies in biological research, namely light microscopy and quantitative assay. In one section, students will perform a microscope calibration followed by the size measurement of yeast and microscopic observation on daphnia. In another section, students will learn how to figure out the sugar content of commercial drinks by using a simple biochemical test and the standard curve.

Instructor導師：
Dr. Chung Kwok Cheong鍾國昌博士, Department of Biology, CUHK
Dr. Chow Cheung Ming 周祥明博士, Department of Biology, CUHK

生物 BIOLOGY