

Astro Teacher Programme 2025

www.phy.cuhk.edu.hk/events/AstroTeacher

Organized by: Department of Physics, The Chinese University of Hong Kong

1. Background and Objectives

The programme aims to provide secondary school science teachers with an immersive learning experience at world-class research facilities, such as Caltech, CERN, the University of Arizona, and Kitt Peak National Observatory. Teachers gain in-depth knowledge, particularly in Astronomy, Astrophysics, Cosmology, and Particle Physics, and bring back ideas to enhance STEM education in Hong Kong through a blend of lectures, lab visits, and workshops. Participating teachers are tasked to collaborate in developing STEM activities for their students, such as student projects based on frontline research data and tools. Secondary school teachers and front-line researchers will forge a strong alliance, to strive for continual improvement and innovation in STEM education in Hong Kong.

Following the successful pilot run in the summer of 2024, with overwhelmingly positive responses from twenty-six secondary school teachers participating in the first-ever CERN Teacher Programme (Hong Kong), we will organize a similar programme for 2025. The theme of the 2025 programme will be Astronomy, Astrophysics, and Cosmology.

There have been many fundamental breakthroughs in Astronomy, Astrophysics, and Cosmology in the past two decades, such as the detection of Cosmic Neutrinos (Nobel Prize 2002) and Cosmic Microwave Background Anisotropies (Nobel Prize 2006), the discovery of dark energy

(Nobel Prize 2011), gravitational wave (Nobel Prize 2017), exoplanets (Nobel Prize 2019), and supermassive black holes (Nobel Prize 2020). These breakthroughs have important implications for our fundamental understanding of the universe. It is certainly a good idea for students to know about these developments at an introductory level, not just to stimulate their curiosity, but also to let them see the deep connection between the physics they learn and these discoveries. An effective first step to strengthen STEM education is to enrich teachers' knowledge about these recent discoveries. The main objectives of the project are to:

- Promote fundamental physics to secondary school students and teachers.
- Enhance STEM education in the secondary school sector.
- Develop a support network among secondary school teachers and frontline researchers to achieve continual improvement in science education.
- Help teachers and students experience and understand the importance of teamwork, data analysis, large collaborations in current scientific and technological development, and the close relations between scientific fields that may seem unrelated.

2. Programme schedule and structure

	Activity	Length of the activity	Description and target groups
Preliminary stage	Introduction to Astronomy, Astrophysics, and Cosmology	3 hours (To be held before the overseas trip)	Include lectures and hands-on activities suitable for secondary school physics teachers and their students

Stage 1	Overseas Teacher Programme 22-27/7	Five days of lectures, lab visits, workshops, and interactions with researchers at world-class research facilities	Secondary school physics teachers
Stage 2	Post-trip presentations	3 hours (To be held after the overseas trip)	Secondary school teachers will present their ideas/plans for STEM activities.

Table 1 A Three-stage Teacher Programme.

We have designed a three-stage teacher programme (see Table 1). The preliminary stage consists of a three-hour introductory workshop designed for secondary school Physics teachers and their students. Experts and active researchers in astronomy, astrophysics, and cosmology will conduct lectures and workshops for secondary school teachers free of charge. Participants can learn more about the fundamental concepts in these topics to prepare them for the overseas visit programme. To enrich the participants' experience, experiments and demos will be set up for hands-on learning.

In stage 1 (July 22 – 27), secondary school physics teachers will travel overseas to visit world-class research facilities. These include two of the world's top universities in Astronomy and Astrophysics research, Caltech and the University of Arizona (UA), as well as [Mount Wilson Observatory](#), where Edwin Hubble discovered the expansion of the universe using the 100-inch Hooker Telescope, [Richard F. Caris Mirror Lab](#), where the majority of the new generation of giant optical telescopes are constructed, [Kitt Peak National Observatory](#), which operates more than a dozen optical telescopes and two radio telescopes, including a 12-m dish that is part of the [Event Horizon Telescope](#) that took the first photos of supermassive black holes, and UA's [Applied Research Building](#), which houses the state-of-the-art equipment and technologies to advance research in optics, manufacturing, space exploration, and more (see Table 2). The visit programme includes lectures, visits to research labs (e.g., observational cosmology lab, research observatories, etc.), discussion with frontline researchers, and hands-on workshops (e.g., astronomical observation using the [100-inch Hooker Telescope](#) at Mount Wilson Observatory and a [0.5-m telescope](#) at Kitt Peak National Observatory, etc.).

Date	Time	Activities (L: lecture, V: visit, W: workshop)	Persons in charge
Tuesday 22/7	17:00 – 17:30	Welcome reception	Chi Kwan Chan (UA), Sonja Choi (UA), Ming- chung Chu (CUHK), Po Kin Leung (CUHK)
	17:30 – 18:00	Quick tour around UA	
	18:00 – 19:00	Programme objectives (L)	
Wednesday 23/7	09:00 – 10:00	Optical Astronomy (L)	Staff members (NORILab)
	10:00 – 10:30	Coffee break	
	10:30 – 12:30	Optical telescopes (L)	Roger Angel (founder of UA Mirror Lab) (UA)
	12:30 – 13:45	Lunch break	
	13:45 – 15:00	Steward Observatory (V)	Tom Fleming (UA)
	15:00 – 15:30	Coffee break	

	15:30 – 17:00	Mirror Lab (V), Supercomputing center (V), Applied Research Building (V)	Staff members (UA)
Thursday 24/7	09:00 – 10:30	Radio Astronomy (L)	Amy Lowitz and Remo Tilanus (UA)
	10:30 – 11:00	Coffee break	
	11:00 – 12:30	Event Horizon Telescope (L)	Chi Kwan Chan (UA)
	12:30 – 13:45	Lunch break	
	13:45 – 17:00	Tour of Kitt Peak National Observatory (V)	Chi Kwan Chan (UA), Sonja Choi (UA)
	17:00 – 18:30	Dinner at Kitt Peak	TBA
	18:30 – 22:00	Astronomical observation at Kitt Peak (W)	Chi Kwan Chan (UA), Sonja Choi (UA)
Friday 25/7	09:00 – 15:00	Travel from Tucson, Arizona to Pasadena, California	Ming-chung Chu (CUHK), Po Kin Leung (CUHK)
	15:00 – 17:00	Tour of Caltech campus (V)	Ming-chung Chu (CUHK), Kenny Lau (Caltech)
	17:00 – 18:00	My life as a researcher (L)	Students and alumni from Hong Kong
Saturday 26/7	9:00 – 10:30	Infra-red universe (L)	Howard Hui (Caltech)
	10:30 – 11:00	Coffee break	
	11:00 – 12:30	Observational Cosmology (L)	Kenny Lau (Caltech)
	12:30 – 13:45	Lunch break	
	13:45 – 15:00	Observational cosmology labs (V)	Howard Hui (Caltech), Kenny Lau (Caltech)
	15:00 – 17:00	Coffee break and travel to Mount Wilson Observatory	
	17:00 – 22:00	Tour and astronomical observation at Mount Wilson Observatory (W)	Mount Wilson Observatory Education Program
Sunday 27/7	09:00 – 10:30	Astronomy in the classroom (L)	Po Kin Leung (CUHK)
	10:30 – 11:00	Coffee break	
	11:00 – 12:00	Final Q&A	Ming-chung Chu (CUHK), Po Kin Leung (CUHK), Kenny Lau (Caltech)
	12:00 – 13:00	Certificates & Wrap-up	

Table 2 Tentative schedule of activities of the Astronomy Teacher Programme 2025.

Stage 2 will consist of presentations by these teacher teams on their STEM activity plans. Interactions among high school physics teachers, university researchers, and students will be invaluable in shaping these education activities. Programme participants are requested to share their experience of the trip and present their ideas/plans for STEM activities in August after the overseas trip.

2. Application:

Interested secondary school physics teachers should obtain the nomination from their school principals and submit an online application at <https://www.phy.cuhk.edu.hk/events/AstroTeacher>. To ensure the diversity of the participants, each school is allowed to submit at most two nominations. The application should include basic information about the teacher, their teaching experience, their interest in Astronomy, Astrophysics, and Cosmology, and how they plan to integrate what they learn in the programme into their teaching.

Selection Criteria:

Criteria include the teacher's subject expertise, track record for science education, commitment to implementing program knowledge in the classroom, and potential contributions to the project's objectives.

Expenses:

CUHK does not charge any fee for the programme. However, participating teachers will pay for their own air tickets, lodging, food, ground transportation, and their share of the group viewing fees at some of the observatories and labs. The total expected budget per person is around HKD22,000.

3. Programme Committee

Dr. Tom Cheng, Prof. Ming-chung Chu, Dr. Po Kin Leung, and Dr. Kenny Long Sang Yip

4. Advisory Committee

Professor Chi-kwan Chan (University of Arizona), Professor Man Ho Chan (Hong Kong Education University), Mr. Willy Choi (Hong Kong Education Bureau), Professor Pun Hon Ng (CUHK Education Faculty), and Dr. Jeff Wiener (CERN)