

DEPARTMENT OF  
PHYSICS

物理系



香港中文大學理學院  
FACULTY OF SCIENCE  
THE CHINESE UNIVERSITY OF HONG KONG



JS 4601 SCIENCE (Major in Physics)

JS 4690 ENRICHMENT STREAM IN THEORETICAL PHYSICS

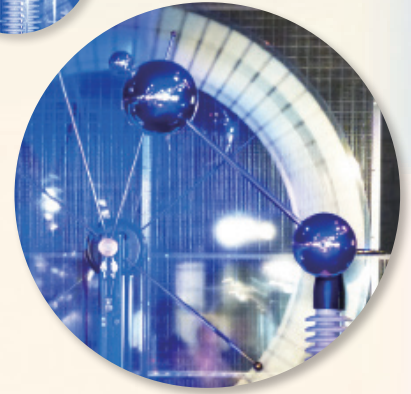
 <http://www.phy.cuhk.edu.hk/>

 [ugadm@phy.cuhk.edu.hk](mailto:ugadm@phy.cuhk.edu.hk)

 3943 6154

For 2023 Entry

# Physics at CUHK



CUHK Physics has a good and long-standing reputation in training solid physics students. As one of the oldest departments in CUHK, we have been nurturing over 2000 physics students and more than 50% of our graduates in recent years continue to pursue higher degrees in Physics or related subjects. Many of them are professors, scientists, educators, engineers, executives, and entrepreneurs in Hong Kong and around the world.

## Our students and alumni

- ◆ Awarded prestigious local and oversea scholarships and fellowships every year. Placed as the top-notch students in Hong Kong.
- ◆ Awarded many University, College, and Faculty scholarships every year.
- ◆ Admitted to the top-tier PhD programs around the world with full financial support. Many of them went to the best schools in the United States, the United Kingdom, Canada, and other European countries.
- ◆ Participated in large-scale international research projects in high energy physics, astrophysics, condensed matter physics, etc, which include gravitational wave, black hole, dark matter and energy, and quantum phenomena.
- ◆ Published research papers in high-impact journals.
- ◆ Won many local and oversea competitions in data and computation science, robotics, etc.

# P hysics Programmes



Physics [Declare Physics as major programme after admission into CUHK Science]

- ◆ A solid grasp of fundamental concepts, supplemented with analytic, computational, and experimental skills as well as research experience.
- ◆ A balanced mix of lectures, tutorials, problem-solving sessions, seminars, group discussions, projects, and research opportunities.
- ◆ Compulsory courses provide an all-round foundation, supplemented by a pool of elective courses.

Enrichment Stream in Theoretical Physics [Direct admission into CUHK Physics via JUPAS]

- ◆ For elite students who are talented in physics and mathematics.
- ◆ Emphasis on forming a critical mass of students who are interested in solving theoretical physics.
- ◆ Tailored small-group discussion classes, supplemented various activities and projects.
- ◆ Guaranteed research opportunities starting at early stage for building up the necessary research skills and experience. Exposure to frontier theoretical research in Hong Kong and oversea.
- ◆ Mentorship with a theoretical physicist as the academic advisor on study and research. Help to explore students' research potential and bridge the gap from undergraduate physics to postgraduate studies.

# Physics Curriculum



We offer a rigorous curriculum in physics education. The curriculum is divided as the Core and Streams.

The Core is compulsory, and it includes

- ◆ Classical mechanics
- ◆ Quantum mechanics
- ◆ Electromagnetic theory
- ◆ Thermal and statistical physics
- ◆ Mathematical skills
- ◆ Experimental skills
- ◆ Computational skills

for building a strong and comprehensive foundation.

Other than the Core, the Streams are optional, and they are:

- ◆ Astrophysics and particle physics
- ◆ Computational and data physics
- ◆ Quantum science and technology
- ◆ Enrichment stream in theoretical physics (JS4690)

Students select Streams in their elective courses to attain a certain depth in concepts and skills in several areas, which are useful in future studies and workplace.



# Experiential Learning Opportunities

We put much effort in developing effective experiential learning activities, which form an integral part of a high-quality education. Many of these activities are unique among physics programs in Hong Kong. Examples of such extra-curricular learning opportunities include:

- ◆ Summer Undergraduate Research Exchange (SURE), which provides opportunities to students to conduct in-depth research in an overseas institution with financial support.
- ◆ Summer Teacher Apprenticeship (STAR), which provides opportunities to students to teach in a local secondary school with financial support.
- ◆ Overseas Program for Undergraduate students (OPUS), which provides opportunities to students a 6-month period to study and conduct research in University of California, Berkeley, or Fudan University with financial support.
- ◆ Internship Programs with Hong Kong Observatory, Science Museum, Space Museum, science publishers, financial sectors, and engineering firms for students to gain experience in various industries.
- ◆ Summer Study Tour, which provides opportunities for students to work in small groups to conduct a physics related field work or experiment in an overseas site.
- ◆ Summer Undergraduate Research Internship Program (SURIP), which provides opportunities for students to participate in in-house research programs.
- ◆ Co-op program, which provides opportunities to students to spend 6 to 8 months in a local company as a regular employee.
- ◆ Many University and College exchange programs for students to study in overseas universities.

These efforts, together with the final year research projects, involve students into academic research activities that can lead to publication of research papers in international journals. We also support students to report their research results in local and international conferences.



# OPUS

## (Overseas Program for Undergraduate Students)

I am beyond grateful to be able to visit the University of California, Berkeley during the spring semester and summer of 2022. It is my highest pleasure to learn Quantum Field Theory (for undergraduates) taught by Prof. Hitoshi Murayama, Nonlinear and Quantum Optics taught by Prof. Dan Stamper-Kurn, and General relativity taught by Particle Physicist Prof. Lawrence Hall. Spontaneous discussions with traditional blackboard and chalks is what I miss the most in Berkeley. Berkeley physics students are both curious and smart, learning with peers has not been this fun before. Besides taking classes, another highlight of my trip was I got to attend the Oppenheimer lecture about Quantum Gravity given by Prof. Leonard Susskind from Stanford. I also was lucky enough to work with the Berkeley group of CUORE to develop sensor control and DAQ software for use with underground cryogenic experiments (operating with transition edge sensor light detectors). I usually work in the post-doc office with Brad, Chiara, and Vivek. We still remain really good friends! Talking about friends, Pam has been my greatest supporter ever since I met her when I was living in the dormitory. It has been an exciting and incredible journey in Berkeley for me!



– CHAN Ying

2022 OPUS: University of California, Berkeley

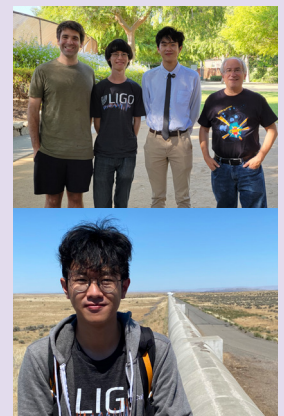
# SURE

## (Summer Undergraduate Research Exchange Program)

I had spent 10 weeks at LIGO Laboratory of California Institute of Technology researching gravitational lensing of gravitational waves. I was required to write a proposal, interim reports and a final report during the summer, and the whole research was supervised by PhD students, post-docs and professors there. Since I was doing real research, I was (and still am) able to access LIGO data and computer clusters. Besides, I also had the opportunity to visit LIGO Hanford site in the middle of the programme, which was undoubtedly an extraordinary experience for a physics enthusiast to physically visit such engineering marvel.

The best thing about this trip is something that no physics textbook can teach me. I was given the opportunity to talk and be friends with other professors and the locals, which exposed me to the culture of a foreign land. People were nice and friendly, even though we came from entirely different backgrounds. I felt like only by living there one can genuinely understand the cultures, and it surely affected my decision on where I should get my PhD.

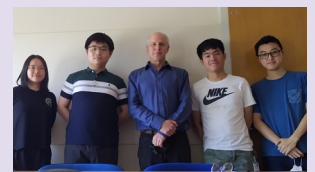
Lastly, I would like to thank CUHK and Caltech for giving me such a wonderful summer. I have no regrets about joining the SURE programme, and I hope I will be able to return to California soon. I am still a LIGO member now, and I am continuing my research in CUHK's own gravitational wave team.



– CHONG Hang Yan

2022 SURE: LIGO Caltech

It is truly amazing to have the opportunity to participate in CERN Summer Student Programme through the SURE programme. I had the chance to attend lectures given by the top researchers, participate in workshops and work on a research project. I have learnt more about other fields of physics such as accelerator physics and medical physics through these activities. Besides, it is eye-opening to visit some of the facilities at CERN and understand how they work. Through SURE, not only have I gained more understanding of Physics, but I also meet people from various places and backgrounds. I learnt how to communicate and work with them. I even made some new friends. This programme is a great opportunity for me to get a sense of and participate in research in a professional setting. The knowledge and skills gained are definitely invaluable. I highly recommend students participate in the SURE and CERN Summer Student programme.



– NG Hoi Lun

2022 SURE: CERN

# STAR (Summer Teacher AppRenticeship)

Joining the STAR program hence spending three months at LCK college is one of the most gorgeous experiences that I had.

At LCK college, I have been assigned to F4 and F5 physics. Although I was not capable to teach well, luckily, the teachers at LCK have put a lot of faith in me. Before each lesson, I would do preparation, such as reading the class material and finishing the class exercise once. The last thing I want during the class is I lead students to feel bored. For avoiding this, I even prepare some jokes for them and it worked! I so enjoy seeing the students could feel fun during physics class.

The teachers and students at LCK college are nice. It is happy that I can spend three months with them at LCK college.



**- CHAN Matthew**  
2022 STAR: LCK College

I am delighted to join Sun Kei Secondary School through the STAR program this summer. Throughout program, I have learned a lot about various teaching methods, what a teacher's life is like, and what it takes to be one. My job included class observation, preparation of DSE physics teaching materials, teaching remedial classes, exam invigilation and teaching IJSO (International Junior Science Olympiad) classes. I also helped with outdoor activities, such as Disney's World of Physics which teaches students about physics inside Disneyland. In class, I liked the interactive atmosphere a lot. The students' feedback helped me revisit my teaching skills and it was rewarding to see them improve. I met many inspirational and supportive teachers here and I can feel their passion in education. This fruitful experience has consolidated my thoughts on becoming a teacher. In the future, I hope I could share this passion that I witnessed.



**- Cheung Pak Long**  
2022 STAR: Christin and Missionary Alliance Sun Kei Secondary School

# SURIP (Summer Undergraduate Research Internship Program)

We all love our summer vacation. But this summer, I luckily had the opportunity to participate in SURIP. My research was computational biophysics to verify a simulation technique on hydrogels. Under the supervision of Prof. Wang Yi and Dr. Tianjie Lie, my undergraduate partner and I were able to conduct research in a free but targeted environment.

This gave us a great taste on what research was like and it completely exceeded the experience of learning in classroom. Throughout the summer, I came across many unexpected obstacles which had no textbook solutions and these constantly challenged me. Fortunately, our supervisors were always there to help.

Most importantly, it felt like my hard work was actually paid off. It was not just a GPA score to prove my study but REAL results! At the end, all the students presented what they had done over the summer and it was a wonderful moment for all to share our results!



**- KU Bon Kwan**  
2022 Summer Undergraduate Research Internship Programme

SURIP provided me the opportunity to gain research experience and work with postgraduate students. I learnt both experimental and data analytic skills from it.

My project was to growth high quality RbV3Sb5 and studied the quantum oscillation of it. We aimed to find optimum portion of Rubidium in RbV3Sb5 and screen for high quality samples for measurement. I learnt using different instruments for crystal growth and characterizing of the crystals. Finally, we selected the best sample and measure its resistivity under magnetic field at different temperatures, I also learnt how to perform data analysis.

I have changed my perception in physics research and widened my horizon after the internship. I am very thankful in joining this research program.

**- POON Tsz Fung**  
2022 Summer Undergraduate Research Internship Programme

# Internship & Placement Programs



I am glad to participate in the one-year placement program at Hong Kong Observatory (HKO). I worked in the Radiation Monitoring and Assessment Branch and my main duty was the development of microclimate stations in urban areas of Hong Kong. Throughout the year, I have expanded my knowledge in both programming and electronics. I was assigned to tasks in different areas, including using Python to perform weather data analysis, maintenance of microclimate stations, and developing a new set of printed circuit board for microclimate stations. Furthermore, I was given the opportunity to visit different metrological stations. One of the unforgettable visits was to the Tate's Cairn Weather Radar Station. The radar specialist mechanic showed us the operation of the radar station. Apart from

the knowledge I had learned from work, I experienced the real-life working environment in HKO. The communication and time management skills at work were something I couldn't learn at university. This vulnerable experience helped me explore a suitable career path. It was a well-worth one year spent in HKO.

– **LEE Hoi Pun**

**2022 One Year Placement in Hong Kong Observatory**

I worked as a student intern at Hong Kong Observatory (HKO). Throughout the internship, I was assigned different tasks, including plotting graphs of forecast model output, data analysis for machine learning project, setting up forecast model, etc. For the most part, each task was a brand new challenge for me because the topics, the methodology and the programming language involved were new to me. For studying the forecast model, I needed to learn Fortran and C++ codes. For plotting, I needed to learn NCL and polished my Python coding skill. For installing programs, I needed to go through the basics of Linux OS and debug many installations mistakes. These challenges consolidated my computer skill and made me more proficient at programming. Beside the technical skills, I also have developed problem solving skills because there were many unexpected issues in the forecast model that I had to solve. I had to tackle the problem from different angles, consult my supervisor and even the creator of the model who lives in the US. These experiences also flourished my communication and time management skills.

– **WONG Kwan Chun**

**2022 One Year Placement in Hong Kong Observatory**

## What Our Students Say

Physics has an impression that it is difficult to understand. I was worried about it before I started studying physics at CUHK. As 4 years have passed, and I have graduated. I can tell you that I have no regrets. Physics is still a tough subject to study. However, at CUHK, all the professors and teaching staffs are very friendly and helpful. They patiently guided us through the process of learning physics. Back in year 1, I was not very good at mathematics. But now, I am able to cope with some of the toughest topics in physics, such as relativity and classical mechanics. Besides, CUHK physics also provides us with different opportunities in research. In year 2, I participated in the Summer Undergraduate Research Internship Program. And I gained my first exposure to astrophysical research, which made me to pursue my career in astrophysics. Most importantly, I've made some wonderful friends with common interests here. I still recall the time we worked and played together. Meeting them has brought me the most joy in my university life. All in all, I really love the days as a physics student at CUHK.



– **Lee Hiu Laam**

**(ESTP, graduated in 2022, study MSc (UCL) in UK)**