

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

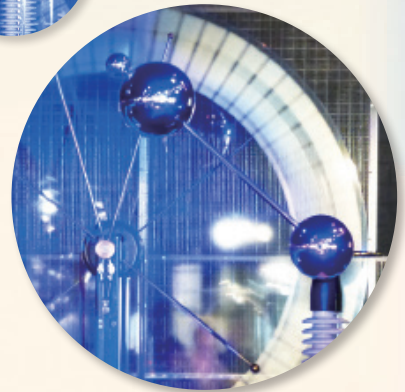
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For 2024 Entry

# 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.



# Physics 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.





This summer, I spent 12 weeks as an intern at RIBF RIKEN, doing research on experimental nuclear physics. RIKEN is Japan's largest scientific research organization and the oldest institute for fundamental science in Asia, and I was glad to be a part of this prestigious institution. During my stay, I participated in the projects that examined the reactions when accelerated particles collide with specific elements. These experiments were extremely hard to be conducted in Hong Kong, and they required meticulous care of various radiation exposure, especially gamma rays. Prior to conducting these experiments, I even underwent comprehensive training about radiation safety and self-taught 3D drawing techniques to investigate detectors' precision, which were truly precious learning experiences.

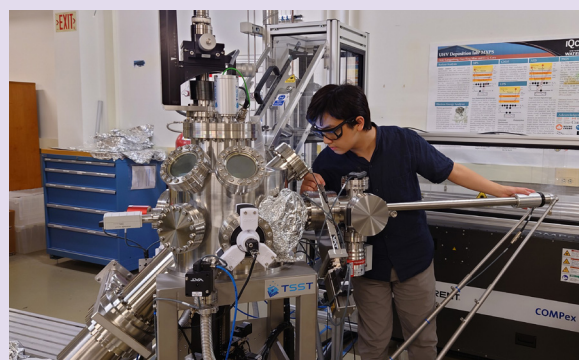
Besides, I had the opportunity to work with forefront researchers from all over the world, such as the US, Germany, Ukraine and surely Japan, I learnt enormous when discussing my project and attending seminars with them. It was also memorable to live 3 months in Tokyo on my own, experience how the life of a "real" experimentalist is, and strive my best for a work-life balance. While the physics-related tasks were undeniably challenging, doing research at RIKEN was undoubtedly one of the best summers I've ever had.



**– SIU Hoi Hin  
2023 SURE: RIBF RIKEN**

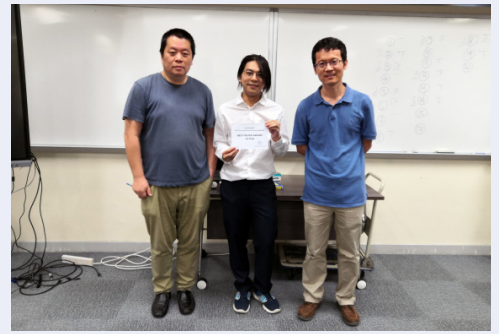
During the summer, I went to the University of Waterloo in Canada and joined Prof. Miao Guo Xing's group. Our research focused on developing a topological superconductor platform that has the potential to realize stable quantum computation. Working alongside his group members, I was able to gain hands-on experience with advanced instruments such as the Pulsed Laser Deposition (PLD) system, X-ray diffractometer (XRD), scanning tunnelling microscope (STM), and more. These instruments are essential in modern experimental physics and have helped me develop the necessary experimental skills.

In addition to gaining practical experience, I also gained a deeper theoretical understanding of unconventional superconductors and topological superconductors. It was an invaluable experience to work alongside professional physics researchers, whose ideas inspired me and piqued my interest in condensed matter physics. Furthermore, communicating with foreign researchers broadened my horizons. Therefore, I highly recommend students who are interested in experimental and theoretical physics to participate in this SURE program.



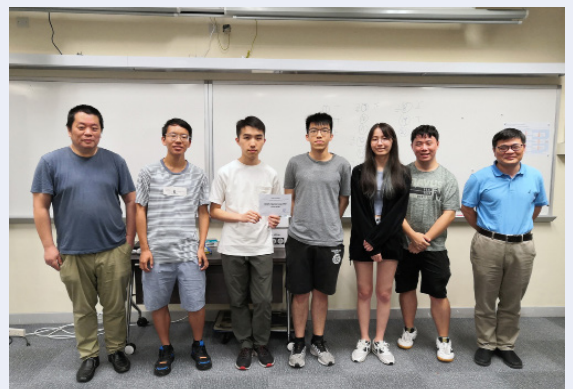
**– LAI Lok Kan  
2023 SURE: University of Waterloo**

During this summer internship, I had the opportunity to do condensed matter physics research related to superconductivity. One of the most valuable experiences was to learn how to collaborate effectively with others. I was part of a team working on a project that required different expertise in sample preparation and electrical measurement, and I learned how to communicate my ideas clearly with others to solve problems. At the same time, I also gained a deeper appreciation for the importance of scientific research in advancing our understanding of the world around us. Overall, this internship has reinforced my passion for physics and my desire to pursue a career in scientific research. I am grateful for the opportunity to have worked with such inspiring researchers and to have gained valuable experience that will serve me well in my future endeavors.



**– WONG Shek Wang**  
**2023 Summer Undergraduate Research Internship Program**

In this summer, we worked on an experimental project to build a Fourier transform spectrometer. We have gained extensive understanding in optics and acquired much hands-on experience in practical laboratory, computer interface as well as data analysis skills. We think the most important part of this internship is to strengthen our problem-solving skills. We often encountered situations that failed to produce good results, and we had to understand the problems behind them completely so that we could find the solutions. In fact, we realized there were always multiple ways to tackle the same problem. The work therefore was filled with many decision-making processes, unexpected outcomes, and frustrations. Yet, when the light

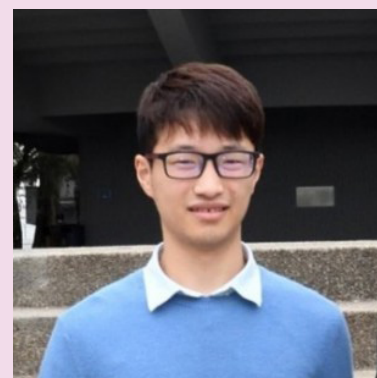


at the end of the tunnel was finally revealed, a truly great satisfaction always convinced us that all the hard work was worthwhile. Other than the hard skills, it was also good training on team communication, as one must understand what others are working on so that we can work effectively. In overall, it was a rewarding experience that had further fueled our passion for continuing in this field of physics.

**– TAM Ka Lok, HUI Ka Fuk, LU Shue Cheong, and CHEUNG Yu Tung**  
**2023 Summer Undergraduate Research Internship Programme**

# What Our Students Say

Physics has always been one of the greatest and most rewarding challenges in my life. It covers almost all fundamental branches in science, which helps me understand the basic elements that make up our world and how they work together. Throughout the study, not only my physics and mathematical knowledge was enriched, my problem-solving and analytical skills were also greatly enhanced. These skills are invaluable and made me adapt to many different environments, whether to pursue a research career or to start a new business. For me, I found the study was extremely helpful to my future career path. There are also many good teachers in CUHK physics department who are willing to answer and help me all the time, providing guidance on both scientific knowledge and other nonacademic areas. If you are curious about knowledge, choose physics, study hard, and you will be rewarded.



**– TONG Ka Wai, Peter**  
**Broad-based Admission, graduated in 2023**  
**Founder of a startup Company: Depths**

From the moment I was first exposed to Physics, I felt a deep calling to study it at university. However, I worried about keeping up with the pace and advanced topics that lay ahead. Fortunately, the professors and lecturers at this university understand the diverse range of student abilities and backgrounds. They have tailored the courses to be accessible and comprehensible, and are always patient and willing to explain concepts repeatedly, even beyond class hours. The teaching assistants, who have studied similar courses, provide a relatable perspective to address our questions. They have equipped me with the knowledge needed for future studies and careers. Moreover, the department actively encourages research participation, allowing us to apply classroom knowledge and gain invaluable experience. In my first year, I participated in the Summer Research Internship, focusing on dark matter halos, which further fueled my passion for physics and exposed me to frontier topics. I also had the chance to go to CERN and work on an accelerator-related project in my third year via the SURE programme. This is absolutely a once-in-a-lifetime opportunity. I truly enjoy participating in these research activities which are both enriching and joyful. Studying at CUHK has been an absolute delight and I will forever cherish my time here.



**– NG Hoi Lun, Boris**  
**Enrichment Stream in Theoretical Physics, graduated in 2023**  
**MPhil student in CUHK**