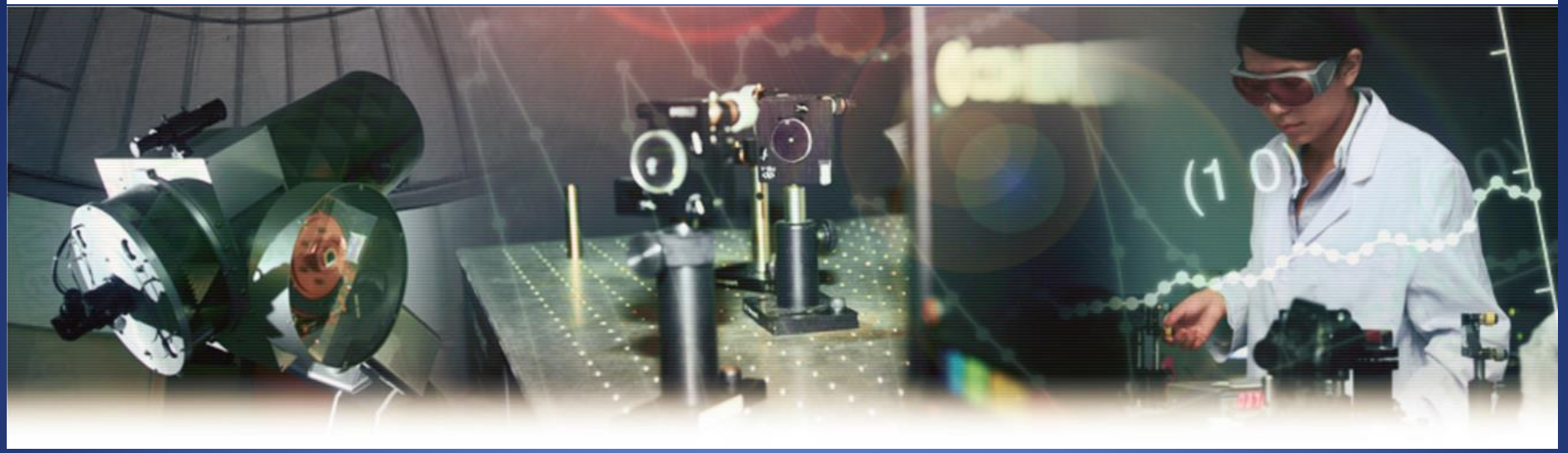
Department of Physics
The University of Hong Kong



Research and Learning Opportunities for HKU Physics Students

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Research and Learning Opportunities for Students

- Undergraduate research or experiential learning opportunities:
  - PHYS3999: Directed Studies/ PHYS4999: Physics Project (Slide 4)
  - Faculty of Science Summer Research Fellowship (Slide 5)
  - Faculty of Science Overseas Research Fellowship (Slide 6)
  - Physics Summer Undergraduate Overseas Research Program (Slides 7 – 9)
  - PHYS4966 Physics Internship (Slides 12 – 16)
  - Overseas Experiential learning activities (Slides 22 – 26)

- HKU postgraduate application: (Slides 28 – 31):
  http://www.physics.hku.hk/prospective-students/rpg-admission/
- Oversea postgraduate application: (Slides 33 – 34)

Capstone Experience

- All HKU students need capstone to graduate
- Students **had to fulfill the 24 credits advanced level core course requirement in the major before taking the capstone course**
- The **earliest** that students are allowed to take capstone course is their **year 3** study
- Capstone offered by Physics Department:
  - PHYS4999 Physics Project (12 credits; full year)
  - PHYS3999 Directed Studies in Physics (6 credits; one semester)
  - PHYS4966 Physics Internship (6 credits; offered in summer only; AND the 24-credit prerequisite requirement had to be fulfilled before the start of the internship)

PHYS3999 Physics Project/ PHYS4999 Directed Studies in Physics

- **Satisfy Capstone requirement for graduation**
- Project list announced around March every year
- Can include up to 10 projects by order of preference
- Strongly recommend to contact the teachers who offer your top-desired projects to learn more about the requirements
- Results of the announcements released in July
- Can consider to improve the quality and the outcome of the FYP or Directed Studies by combining it with a Summer Research Fellowship offered by the Faculty of Science

Faculty of Science
Summer Research Fellowship

- Students work with teachers in any Department/School in the Faculty on a specific research project
- Target: HKU BSc and BSc (ActuarSc) students who had taken or will take SCNC3111
- Duration: 8 weeks
- Stipend: $16,000
- Need to provide the name of proposed supervisor and a research proposal in application
- Refer to the Faculty of Science webpage for more details: https://www.scifac.hku.hk/current/ug/el/research/srf-orf

Faculty of Science
Overseas Research Fellowship

- Students work with professors in an overseas research institution or university on a specific research project
- Target: HKU BSc and BSc (ActuarSc) students who had taken or will take SCNC3111
- Duration: 8 weeks
- Stipend: $16,000 plus 80% of airfare (up to $12,000)
- Need to provide the name of proposed supervisor and a research proposal in application
- Refer to the Faculty of Science webpage for more details: https://www.scifac.hku.hk/current/ug/el/research/srf-orf
- Department will provide help on this!

Physics Summer Undergraduate Overseas Research Program (details TBC)

- Early March: Department matches the nominee with a potential supervisor in proposed area of research; nominee needs to contact this supervisor to finalize project title and research scope
- March: **Nominee has to also apply for Overseas Research Fellowship of the Faculty of Science**
- Summer: Students work under an supervisor in overseas institution to gain research experience
- Internship typically lasts for 8 weeks (starting around early to mid June)
- June - July: Register for the course PHYS4966 in April:
  - Assume 24 advanced credits passed after May exam
  - Not overloading beyond 72 credits after including PHY4966
  - You can choose to register for PHYS4966 or not.

Physics Summer Undergraduate Overseas Research Program (details TBC)

- Late August: to complete the internship, need to do the following
  - Complete and submit the student evaluation form
  - Forward the Supervisor evaluation form to the external research supervisor
  - **Written Report** (no less than 1,000 words; inclusive figures, photographs, and references).
  - Can include, but not limited to, details of work you performed, how you applied what you learned in your major, new skills you have accumulated, and valuable learning experience.
  - PHOTOS, PHOTOS, PHOTOS!
- Early September: Oral presentation
  - 15 minutes (10 min + 5 min Q&A)
  - Need to attend the entire session

Physics Undergraduate Overseas Research Destinations (past 2 years)

Supervisor	Field	Work
Prof Owen Miller (Yale)	Computational nanophysics	"Minimum Mode Volume of Dielectric Resonators **(Year long internship)**
Dr Hsiung-Lin Tu (Academia Sinica)	Theoretical chemical physics	Spatial-temporal differentiation of tension fluctuations in maturating axons of d hippocampal neurons **(Dept)**
Prof Jeff Tseng (Univ of Oxford)	Particle physics (expt)	experimental particle physics on SNO+ **(Li & Fung)**
Prof Yi-Fu Cai (USTC)	Theoretical astrophysics	A Reconstruction Formalism of f(T) Gravity to Probe the Dynamics of the Late-time Acceleration in the Universe **(Dept)**
Dr Shunji Nishimura (RIKEN)	Particle physics (expt)	Experimental nuclear physics **(ORF)**

General tips for students seeking research opportunity within HKU

- Start early!
- **STRONGLY recommend** to discuss with potential supervisor before your application to SRF / FYP / Directed Studies.
- Before you meet with the teacher:
  - Send email to potential supervisor to set up appointment
  - Check out the departmental webpage for current research projects of each supervisor
  - Prepare a brief CV to list your academic history and your special skills (e.g., computer programming, electronics, etc)
  - (*if time allows and if you are really interested*) Read recent research publications by that supervisor (or maybe just the abstract)

Ask yourself ……

- Do you want to gain some real-life work experience?
- Do you want to see how skills you learn in HKU (may not be just materials learned in lectures) can be applied in the real world?
- Do you want to know someone who can potentially serve as your reference in your future applications?
- Do you want to gain unique experience in different settings?
- Do you want to know more about yourself? (e.g., do I work better in a group setting, what are my best skills, …)

If the answers to all of the above are YES, then you should consider **a summer internship!**

Physics Summer Internship

- **Satisfy Capstone requirement for graduation**
- **HKU Physics arranged internship: No financial support**
- Early to mid January: Internship opportunities announced
- Early to mid February: Application deadline; Need to prioritize your desired internship placement
- Open to HKU BSc and BSc-BEd students who major in Astro, Maths/Physics, and Physics (in HK or in exchange)
- (Slight) preference given to Year 3 students who had not competed capstone requirements
- Late February / early March: **One-on-one interview in HKU** (attended by 2-3 teachers)
  - Why do you apply?
  - What are your strength / weakness as an intern?
  - How do you see this internship opportunity fit into your future plan?

Physics Summer Internship

- Mid March to April (optional): follow up interviews by internship supervisors of the nominees by HKU
- April: Offers issued
- Summer: Students work under a supervisor in an external organization to gain real life work experience
- Internship typically lasts for 6 to 8 weeks
  - Start date typically around early to mid June
  - Can negotiate with internship supervisor on the exact time of work (e.g., to cater for other experiential learning opportunities)
- June - July: Register for the course PHYS4966 in April:
  - Assume 24 advanced credits passed after May exam
  - Not overloading beyond 72 credits after including PHY4966
  - You can choose to register for PHYS4966 or not.

Physics Summer Internship

- Late August: to complete the internship, need to do the following
  - Complete and submit Internship evaluation form
  - Forward the Supervisor evaluation form to internship supervisor
  - **Written Report** (no less than 1,000 words; inclusive figures, photographs, and references).
  - Can include, but not limited to, details of work you performed, how you applied what you learned in your major, new skills you have accumulated, and valuable learning experience.
  - PHOTOS, PHOTOS, PHOTOS!
- Early September: Oral presentation
  - 15 minutes (10 min + 5 min Q&A)
  - Need to attend the entire session

Physics Summer Internship

- Example works from the past

Organization	Place	Work
Hong Kong Science Museum	1	• Work with exhibition team to develop items to be included for future exhibits • Assist with activities organized by the Museum
Hong Kong Space Museum	1	• Develop experiments to be used for “Culture Day” for primary students • Assist with the 10th Youth Astronaut Training Camp
Ho Koon Nature Education cum Astronomical Centre	2	• Develop constellation model (apply electronics, arduino programming, welding, wood work) • Astrophotography • Assist with events: total lunar eclipse, school student classes, elderly over night sky camp

Physics Summer Internship

- Example works from the past

Organization	Place	Work
St Francis of Assisi's College	1	• Assistants in classroom teaching • Designing teaching materials (vocabulary cards and worksheets) • Assisting with preparation of documents • Assisting school activities (F1 Orientation week)
Cheung Sha Wan Catholic Secondary School	1	• Accelerated teaching of DSE syllabus • Training for International Junior Science Olympiad • Assisting school activities (October Information Day science displays)
Yu Chun Keung No 2 Secondary School	1	• Revision of DSE physics materials • Develop teaching materials • Assisting school activities (Science Experimental Week, workshop for primary students)


www.cp.org.hk


登月五十年


少年太空


Chen-Ning Franklin Yang
Principle Of Propeller
The Elements


S-215


2E
互相尊重
Mutual Resp

Physics Summer Internship

- You can also **conduct an internship not arranged by the Physics Department** and apply for enrolment to the course PHYS4966
- Need to secure approval from the Department before around July.
- Need to submit supporting documents for consideration, such as:
  - Details description of the work nature
  - Support letters from potential internship supervisors
  - Contract of internship
- **You may receive $$$ compensation for the internship**
- Students would still need to submit the evaluation forms, written report and participate in the oral presentation

Physics Summer Internship not arranged by Department (examples)

Organization	Work
HKSAR Environment Protection Department	• Validation, evaluation and developments of the EPD air quality model
Hong Kong Observatory	• Evaluation and developments of the climate prediction modules developed by HKO
MakerBay	• Serves as a teacher / leader in a summer maker community STEM class for children
Hong Kong Aerospace Society	• Instructor to hold activities and teach students for the flight experience classes • Leaders in international summer educational camp in Mongolia
Fugro Technical Services	• Assistant in the paint and water quality laboratory to test samples sent to the lab

Overseas Experiential Learning Activities (~1-2 weeks)

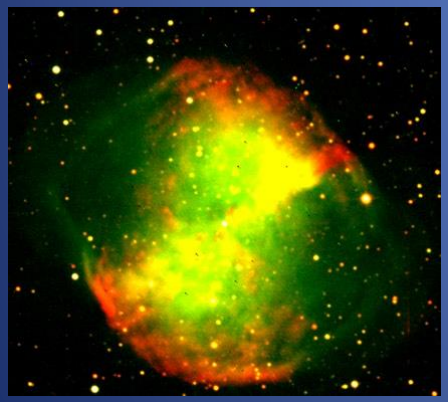
- **Non capstone activity**
- Open to HKU BSc and BSc-BEd students who major in Astro, Maths/Physics, and Physics (in HK or in exchange)
- (**Slight**) preference of Year 3 students, over Year 2, over Year 1
- **Students who will participate in the local and overseas summer programs can also apply (would need to receive approval from the external supervisor before participating)**
- Financial support: 80% of the total cost, or a maximum-level (HKD10,000 for Europe/US trip, HKD4,800 for Asia/China trip), whichever is the lesser
- Remaining cost will be borne by the student

Overseas Experiential Learning Activities (~1-2 weeks)

Summer School on Observational Astronomy (Summer 2019)

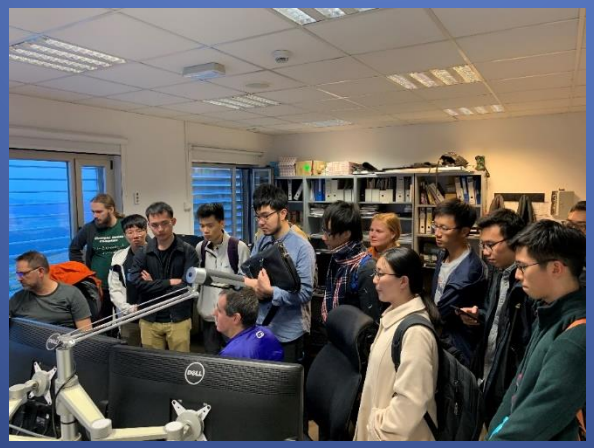
Lectures and hands-on projects

CEFCA (Teruel, Spain)



Centro de Estudios de Física del Cosmos de Aragón
CEFCA

12 HKU undergraduates who have taken advanced Astronomy courses



Overseas Experiential Learning Activities (~1-2 weeks)

Summer School on Nuclear Physics at RIKEN (2016, 2017, 2018, 2019)

Together with Peking University & Seoul National University

Nishina School at RIKEN
(Tokyo, Japan)

5 HKU undergraduates who took nuclear physics course and training

Other Research Opportunities

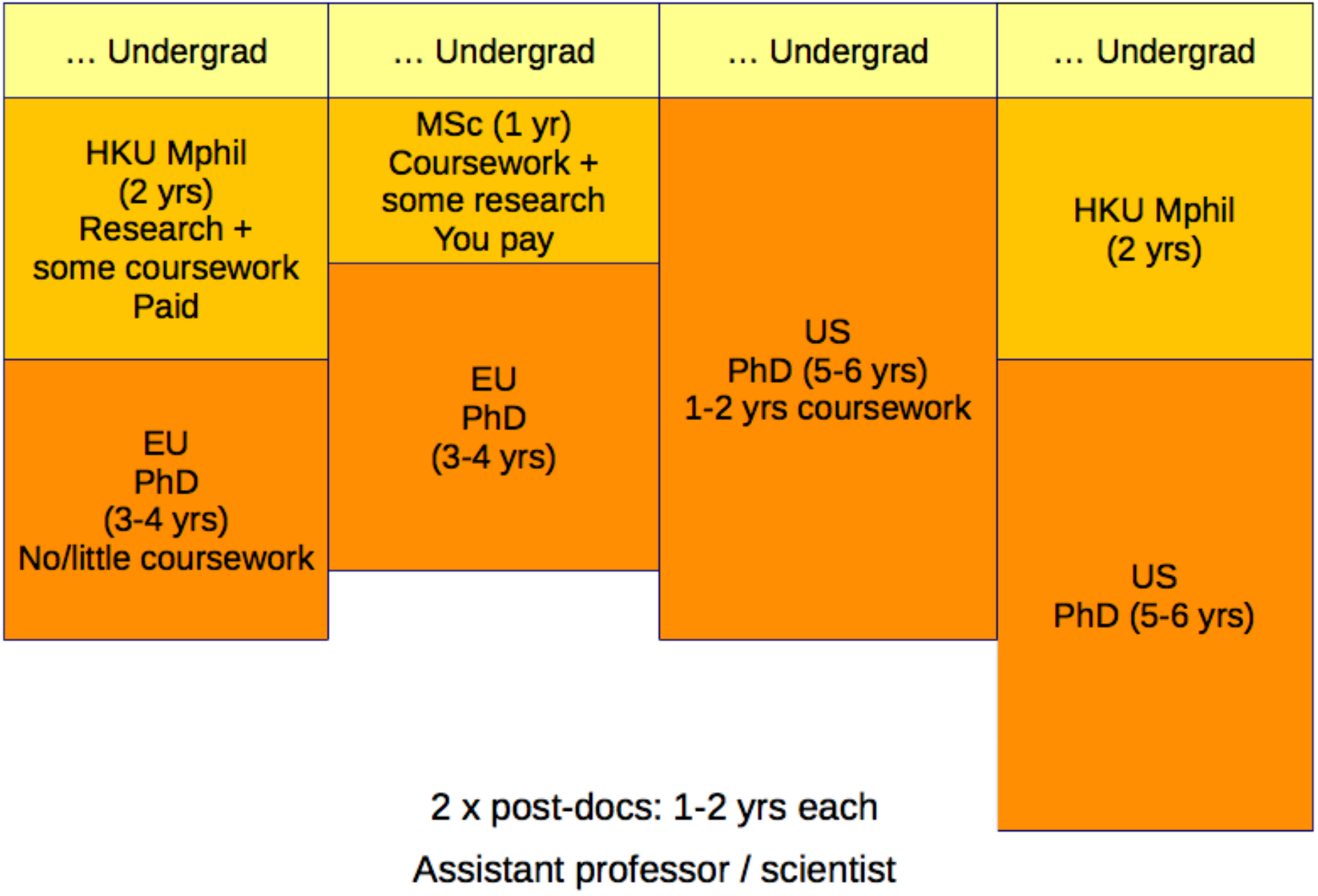
- Occasionally, there could be other undergraduate research opportunities with individual teachers in the Department
- Usually no announcement, ask the teacher to find out

Application for postgraduate studies at local universities

Ask yourself ……

- Are you competent academically? (CGPA >~ 3.0, except very special cases)
- Are you capable of doing research? *Or, better, yet,*
- Are you motivated to do research? (Or, anyway to ask, do you enjoy doing additional readings on top of the lecture notes, at least for some courses?
- Do you enjoy the lifestyle of being a research student? (That includes having less income than your fellow classmates a few years after graduation.)
- Are you prepared to spend a few more years having a single-focus to pursue a PhD degree?

If the answers to all of the above are YES, then you should consider to apply!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HKU Mphil
(2 yrs)
Research +
some coursework
Paid
MSc (1 yr)
Coursework +
some research
You pay
HKU Mphil
(2 yrs)
EU
PhD
(3-4 yrs)
No/little coursework
EU
PhD
(3-4 yrs)
US
PhD (5-6 yrs)
1-2 yrs coursework
US
PhD (5-6 yrs)
2 x post-docs: 1-2 yrs each
Assistant professor / scientist

Applying to HKU Physics

- **Main Round**: Sep 1 – Dec 1
- 1st clearing round: Dec 2– Apr 30
- 2nd clearing round: May 1 – Aug 31
- Unless you have very strong special reasons, **highly recommended to apply for the main round**.
- The waiting list left over from the Main Round will be considered along side with the applicants of the subsequent clearing rounds.
- Postgraduate projects available: https://www.physics.hku.hk/prospective-students/rpg-admission/rpg-projects

Applying to HKU Physics

- For HKU Physics, you need to indicate your preference for primary supervisor (3 choices); for many other universities, you may just need to indicate your preferred field of research
- Need a personal statement and 3 recommendation letters, on top of other documents (GRE, transcripts, etc)
- (for HKU), applications will be screened according to the primary supervisor indicated, going down from 1st to 2nd choice, 2nd to 3rd, etc, if quota already filled by that supervisor
- An overall ranking of applicants will be compiled after considerations of many factors, including quality of applicants (GPA, GRE/TOFEL/IELTS, recommendation letters, etc), quota for supervisor, departmental developments, etc.

Applying to HKU Physics

- **Strongly recommended** to discuss with potential supervisor (particularly those you rank as 1st or 2nd choice primary supervisor) before your application
- Before you meet with the teacher:
  - Send email to potential supervisor to set up appointment
  - Check out the departmental webpage for current research projects of each supervisor
  - Prepare a brief CV to list your academic history and your special skills (e.g., computer programming, electronics, etc)
  - (*if time allows and if you are really interested*) Read recent research publications by that supervisor (or maybe just the abstract)

Applying to HKU Physics

- **My opinion:** Teachers usually prefer well-prepared and self-motivating students who demonstrate capability and interest to learn new things that are needed to pursue research.
- Teachers also greatly value previous research experience.
- For Year-3 students, it is never too early to start this process (say around mid- to end- of 2nd semester). You may want to consider whether it is possible to combine a summer research project with your Final Year Project with your postgraduate research project.

Recommendation letters

- Most graduate school applications would require up to 3 recommendation letters
- Cultivate relation with people who may potentially draft letters for you (e.g., department advisors)
- **Confidential** – you usually cannot read the content
- Expect the writers to express **honest** opinion about you
- 'Good' recommenders: your research supervisors, department advisors who know you for a few years
- Last resort recommenders: your course instructors who do not know much about you beyond your grades
- NOTE: Some scholarships would require special recommenders OUTSIDE your school curriculum

Timeline for a current Year 3 student

- May – Sep: make up your mind to apply or not
- Sep: Start preparation of documents required for applications
- Oct:
  - Application deadline for the earliest European programs
  - GRE Physics (required or recommended by many US schools, though NOT all of them; clash with midterms ☹)
- Nov: Application deadline for most European schools
- Dec - Jan : Application deadline for most US and Canadian schools
- Feb: Possible interview trips for European schools
- Feb - Apr: Offer release, (possible) overseas school visit

Disclaimer: details vary for each year & school – check it yourself !

Tips for Undergraduate Students
(by Daniel Lam, PhD student at Leiden Observatory)

- Get a taste of research as soon as possible (SRF, ORF, FYP, directed studies).
- A thorough understanding of course materials is more important than a good grade.
- Be prepared to learn skills other than physics (electronics, chemistry, statistics, computer programming)
- Discuss your plan with your family.
- Get known by 3 professors who could write recommendation letters for you

Good luck!