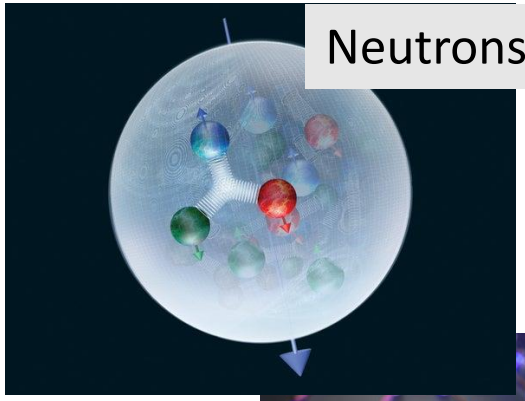
FACULTY OF SCIENCE
THE UNIVERSITY OF HONG KONG
香港大學理學院

Major in Physics
Major in Physics (Intensive)

Minor in Physics
Minor in Astronomy

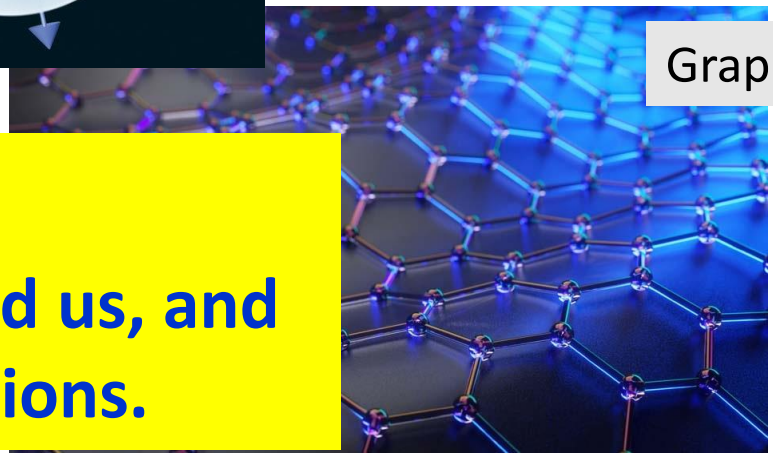
Galaxies

Neutrons



Sun-Earth system

Graphene

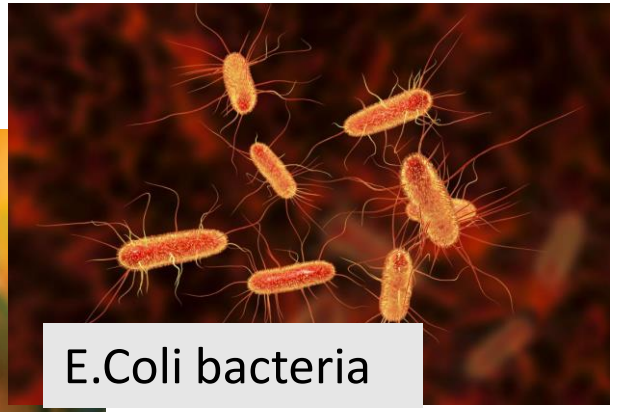


Why Physics?

A diverse universe around us, and we have many questions.

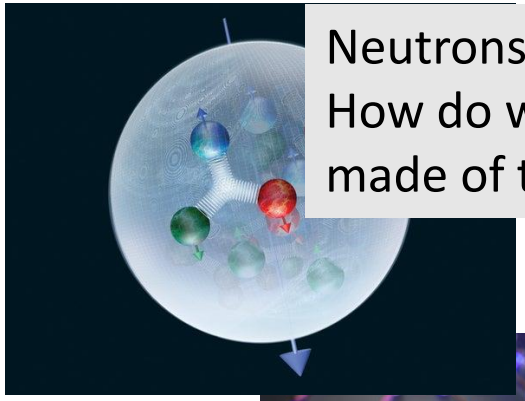
Ocean wave

Hummingbird



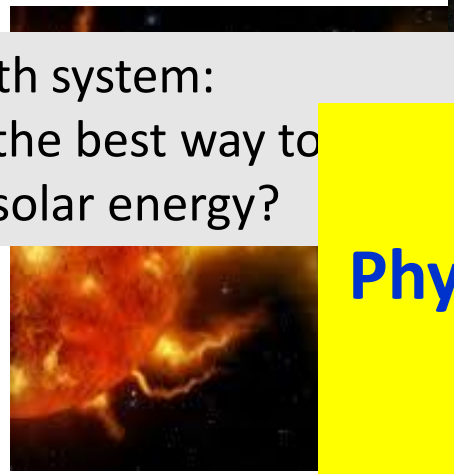
E.Coli bacteria

Galaxies:
What caused galaxies to have different shapes?

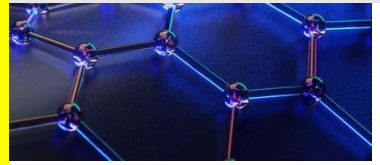


Neutrons:
How do we know they are made of three quarks?

Sun-Earth system:
What's the best way to extract solar energy?



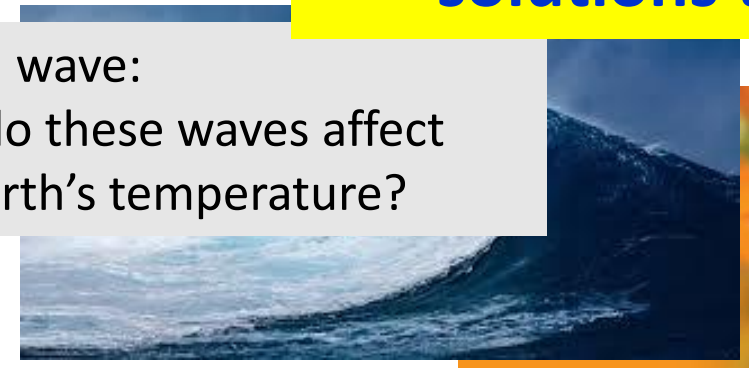
Graphene:
Why does it have such electric and mechanical properties?

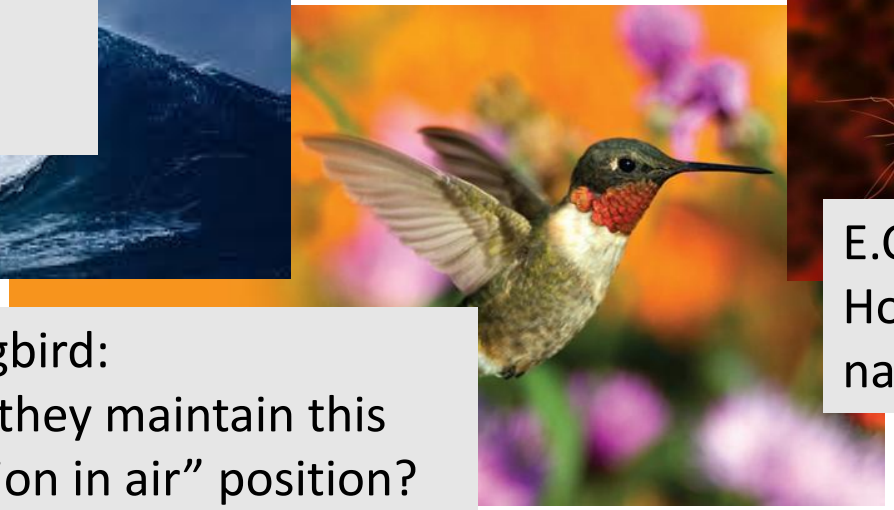


Why Physics?

Physics is a powerful way to understand the natural world, hence giving solutions to human's challenges.

Ocean wave:
How do these waves affect the Earth's temperature?

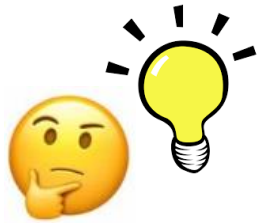


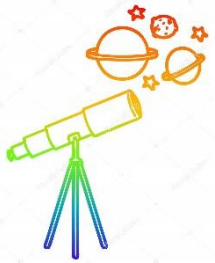


E.Coli bacteria:
How can these bacteria navigate around?

Hummingbird:
How can they maintain this "suspension in air" position?

Students gain a valuable skill set after a university physics training.





- Understanding the world (How things work?)
- Quantitative thinking
- Discovering relationships
- Hands on experience with wide range of equipment
- Problem identification and solving
- Designing research plans
- Communication skills (oral presentation, writing reports, …)

We offer two physics-related Majors and two physics-related Minors.

- **Physics Major (96 credits; 16 courses)**
  - **Large flexibility** in curriculum, lead to diverse career paths
- **Physics Major (Intensive) (144 credits; 24 courses)**
  - **Comprehensive training** in physics, targeted for students who want to pursue Master or PhD in physics or other science/technical disciplines
- **Astronomy Minor (36 credits; 6 courses)**
  - Suitable for all students (BSc or non-BSc) interested in the subject
  - Minimum physics and mathematics background needed
- **Physics Minor (42 credits; 7 courses)**
  - Skills learnt in could be useful in many science and non-science fields (e.g., chemistry, economics and finance)

The Physics Major provides core training with maximum flexibility.

(96 credits; 2 Sci core + 6 intro + 8 advance courses)

- **Aim**: Educating all-rounded physics students which best fit their interest and expertise
- Large flexibility in curriculum, lead to diverse career paths
- **Student-centered curriculum**
  - ❖ Learn the "**physics skill set**" first:
    - ✓ *Mathematics, problem-solving, model-building, computing*
  - ❖ Follow with **core courses** for physics undergraduates:
    - ✓ Introductory (Years 1 and 2): usage of calculus and vectors; stress daily connections
    - ✓ Advanced (Years 3 and 4): formal training in physics with more abstraction and advanced maths

The Physics Major (Intensive) prepares for research career in science/technology.

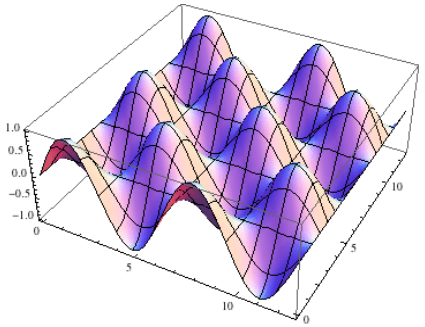
(144 credits; 2 Sci core + 10 intro + 12 advance courses)

- **Aim**: Educating physics students with a solid foundation on the subject in both breath and depth
- **Targeted for students who want to pursue further studies in physics and other science/technical disciplines**
- **Two majors: Physics & Physics (Intensive)** available for students
  - Can select **either** the regular Major or the Intensive option
  - **No penalty** for students who cannot complete the Intensive option
  - All required courses for the regular Major are included in the Intensive option

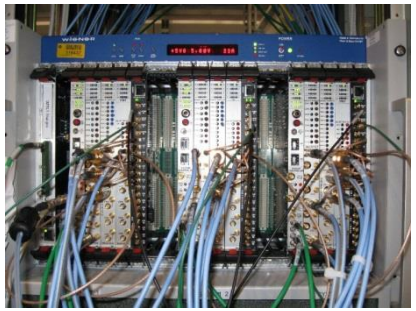
Four (*optional*) themes for Physics or Physics(Intensive) majors

- ***Optional*** **for students (may choose 0, 1 or 2 themes)**

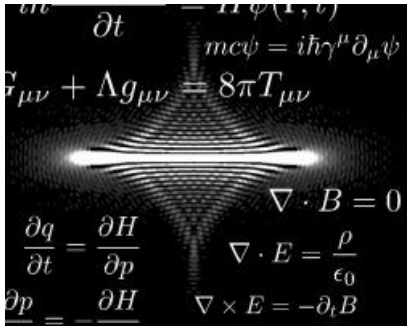
Astrophysics



Computational Physics



Experimental Physics



Theoretical Physics

- Help students to **build expertise** in specific areas
- Capstone project related to the theme
- Enhanced training to prepare for postgraduate studies
- Student **strength endorsed** by the Department with certificate of completion

Capstone requirement: Integration and application of knowledge gained from the entire curriculum

1. **Physics Project (PHYS4999): 12 credits**
2. **Directed Studies in Physics (PHYS3999): 6 credits**
3. **Physics Department Summer Internship program (PHYS4966): 6 credits**

Requirement: 8 weeks in academic and non-academic institutions overseas or locally during summer

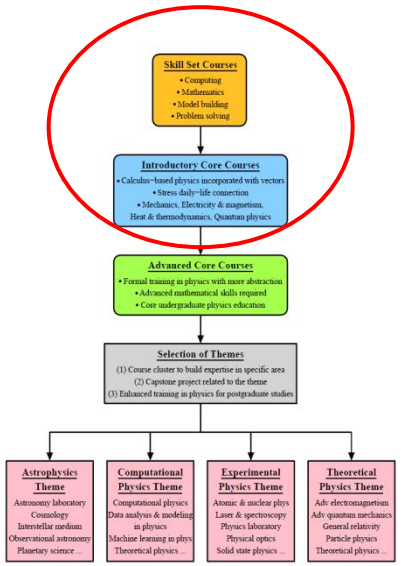
Local research: Spending summer to work with HKU professors

Overseas research: UC Berkeley, Caltech, Cambridge, Harvard, Oxford, Stanford, RIEKN, CERN, …

Local organizations: HK Observatory, HK Space Museum, HK Science Museum, Ho Koon Nature Education cum Astronomical Centre, …

Education: Cheung Sha Wan Catholic Secondary School, St Francis of Asissi College, Yu Chun Keung No 2 Memorial College, …

Curriculum structure Physics Major
Years 1 and 2



PHYS 1150 Problem Solving*
PHYS 2150 Method in Physics I*
PHYS 2155 Method in Physics II*
PHYS 2160 Intro Compu Physics*

Skill Set Courses
- Computing
- Mathematics
- Model building
- Problem solving

PHYS 2055 Intro Relativity*

PHYS 2250 Intro Mechanics
PHYS 2261 Intro Thermal
PHYS 2255 Intro E&M
PHYS 2260 Intro Quantum

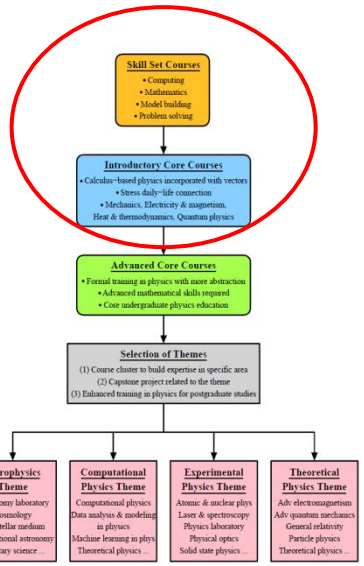
Introductory Core Courses
- Calculus−based physics incorporated with vectors
- Stress daily−life connection
- Mechanics, Electricity & magnetism,

Heat & thermodynamics, Quantum physics

Required

* Select 2 out of 5

Curriculum structure Physics (Intensive) Major Years 1 and 2



PHYS 1150 Problem Solving
PHYS 2150 Method in Physics I
PHYS 2155 Method in Physics II

Skill Set Courses

- Computing
- Mathematics
- Model building
- Problem solving

PHYS 2055 Intro Relativity
PHYS 2250 Intro Mechanics
PHYS 2261 Intro Thermal
PHYS 2255 Intro E&M
PHYS 2260 Intro Quantum

Introductory Core Courses

- Calculus−based physics incorporated with vectors
- Stress daily−life connection
- Mechanics, Electricity & magnetism,

Heat & thermodynamics, Quantum physics

Required

* Select 2 out of 6

COMP 1117 Computer Programming
MATH 1013 University Mathematics II
PHYS 1650 Nature of the Universe
PHYS 2160 Intro Computational Physics
PHYS 2650 Modern Astronomy
STAT 1600 Statistics: Data & Concepts

Curriculum structure Physics or Physics (Intensive) Major Years 3 and 4

Required

Advanced Core Courses

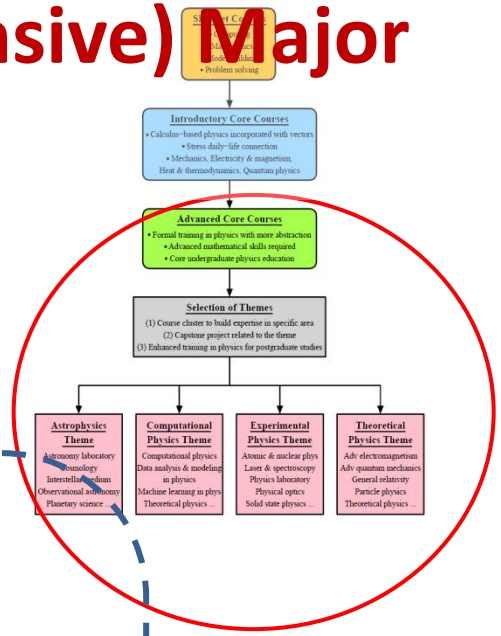
- Formal training in physics with more abstraction
- Advanced mathematical skills required
- Core undergraduate physics education

Optional

Selection of Themes

(1) Course cluster to build expertise in specific area
(2) Capstone project related to the theme
(3) Enhanced training in physics for postgraduate studies

Astrophysics Theme	Computational Physics Theme	Experimental Physics Theme	Theoretical Physics Theme
Astronomy laboratory	Computational physics	Atomic & nuclear phys	Adv electromagnetism
Cosmology	Data analysis & modeling in physics	Laser & spectroscopy	Adv quantum mechanics
Interstellar medium	Machine learning in phys	Physics laboratory	General relativity
Observational astronomy	Theoretical physics ...	Physical optics	Particle physics
Planetary science ...		Solid state physics ...	Theoretical physics ...



The two physics-related Minors provides a flavor of the discipline.

- **Minor in Astronomy**
  - Training on both observational and theoretical aspects, with **minimum physics and mathematics requirements**
  - Suitable for both physics and non-physics major students
  - Advanced courses in astrophysics continue to be offered to both undergraduate and postgraduate students.
  - HKU continues to actively pursue **astronomical research** and **recruit postgraduate students** in astronomy.

- **Minor in Physics**
  - Fundamental outlook on physics, with flexibility to explore one's interest
  - Helpful for study of other science or non-science disciplines

There are multiple ways to focus on studying astronomy in HKU.

- If I want to study astronomy, should I select the

  Minor in Astronomy?

  Major in Physics (Intensive) with Astrophysics theme?

  Major in Physics - Minor in Astronomy combination?

  - The Minor in Astronomy is suitable for science or non-science students with *minimal physics and mathematics requirements.*
  - If you want to pursue postgraduate research in astronomy, then EITHER Major in Physics (Intensive) with Astrophysics theme OR Major in Physics - Minor in Astronomy combination are good

Why choose to study physics @ HKU?

- **Faculty with diverse research interest**

  Broad range of courses taught by expert staff on that topic; Outside experts invited to offer specialty courses

- **Outstanding track record on research**

  Many channels for students to get involved, e.g. research project courses, Summer Research Fellowship

- **A friendly learning environment**

  Small class size; ***Low student-to-teacher ratio (lower than 6:1)***

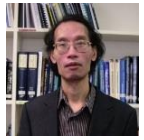
- **Long standing tradition of rigorous physics training**

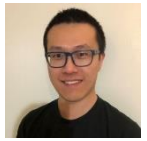
  Alumni network in business, education, government and academia

We have leading experts in a focused range of research areas.

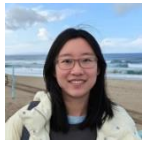
➢ **Primary Research Areas of professoriate staff**:

Atomic, Optical and Quantum Physics

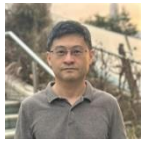


Astronomy and Astrophysics

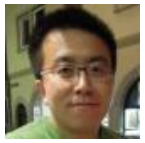



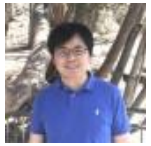

Experimental Condensed Matter and Material Science





Theoretical and Computational Condensed Matter Physics







Experimental Nuclear and Particle Physics


Learning takes place in research labs.
Overseas Research Fellowship Scheme
(8-10 weeks during summer)

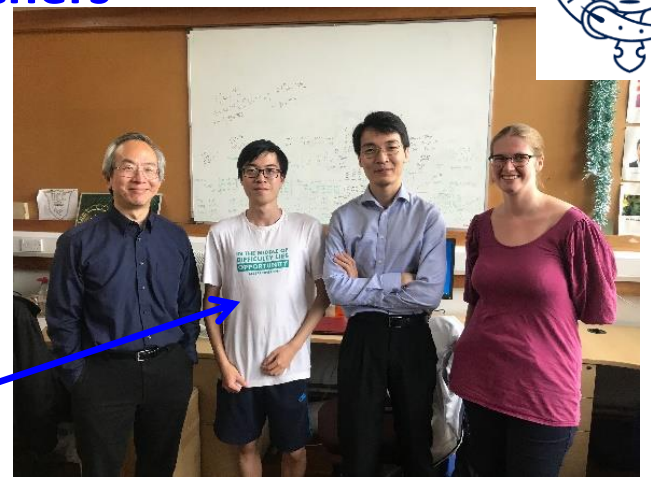
- Participants engage in research field of their own choosing;
- Physics Department **match student's interest with researchers**
- **Reimbursement** of full airfare and partial expenses

Marco Yeung (experimental nuclear physics) with Prof Shunji Nishimura, **RIKEN**

Kelvin Tsang (experimental particle physics) Prof Jeff Tseng, **Oxford**

2019 summer (pre-Covid)

Zhao Qingqing (computational condensed matter physics) Prof Owen Miller, **Yale**



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2023 summer

Adrian Law (Quantum Computing),
University of Toronto

Justin Chau (Particle Physics),
CERN

Learning takes place while you are working.

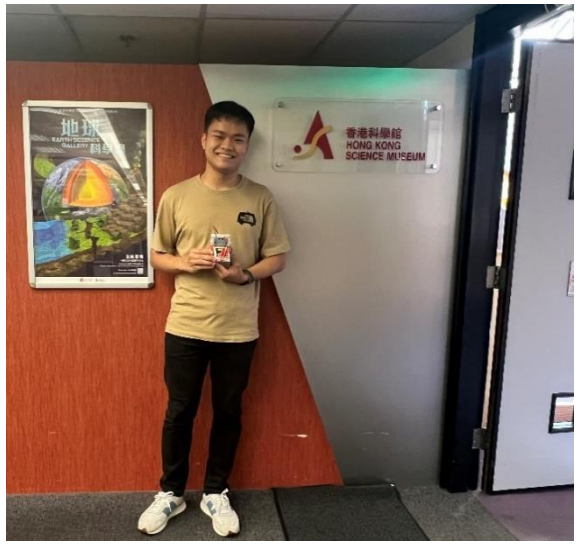
Summer Internship
(6-8 weeks during summer)

- Participants engage in actual work to apply their book knowledge
- Department arranges for selected candidates to be interviewed by the institution.

2023 summer

Lesson observation ~ Existing experiment classes for elderly and children

香港科學館
HONG KONG
SCIENCE MUSEUM



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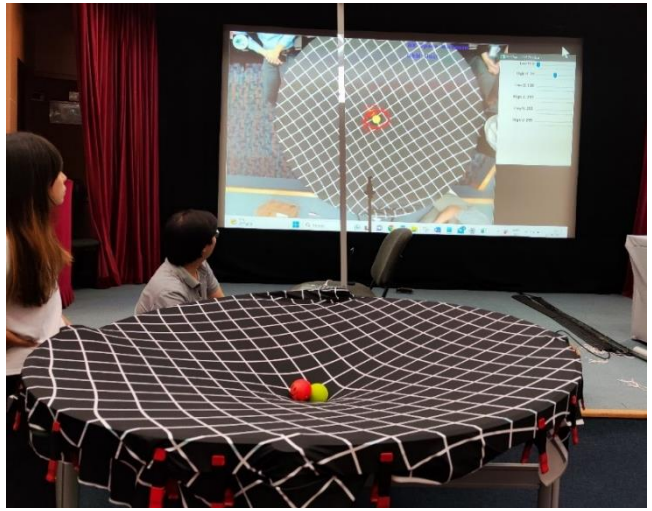
2023 summer

香港太空館
HONG KONG SPACE MUSEUM

Young Astronaut Training Camp - Stargazing and constellation identification



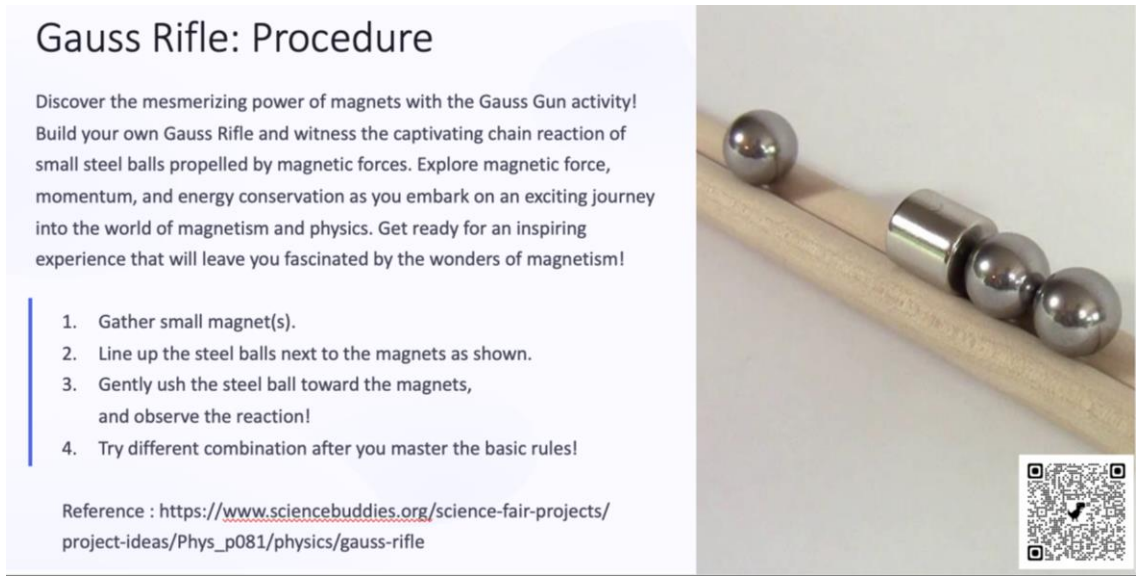
Starry Wonderland – “Solar System Q & A” booth

Learning takes place while you are teaching.
Summer Internship (Secondary Schools)
(6-8 weeks during summer)

- Participants get first-hand experience working both in and out of classroom settings
- Department arranges for selected candidates to be interviewed by the institution.

2023 summer

Maryknoll Secondary School (Designing and creating teaching and learning material)



Learning takes place outside HKU classroom.
Undergraduate Overseas Experiential Learning activities (1-2 weeks)

Summer School on Nuclear Physics at RIKEN (2016, 2017, 2018, 2019, 2023)

- Together with Peking University & Seoul National University
- 80% of all expenses paid

5 HKU undergraduates who took nuclear physics course and training

RIKEN NISHINA CENTER

Nishina School at RIKEN (Tokyo, Japan)

Our students embark on interesting careers and further studies after graduation.

Education:	Research Assistant Research Assistant I Physics Panel
Commerce and Industry:	Software Engineer
Community, Social, & Personal Services	Behavioral Therapist Research Assistant Imaging Software Engineer

Employers include: Hong Kong Industrial Artificial Intelligence & Robotics Centre, local universities, secondary schools, high-tech start-up company, etc.

- Georgia Institute of Technology
- National University of Singapore
- Stanford University
- The Chinese University of Hong Kong
- The University of Hong Kong
- University College London
- University of California San Diego
- University of Toronto

Hope you will consider to join our family!

Contact us at physdept@hku.hk

for inquiries

HKU Department of Physics

Course Selection Guidelines homepage:

https://www.physics.hku.hk/undergraduate_studies/course_selection_guidelines/