

The Physical Society of Hong Kong

Physics Research Experience for Sixth-form Students (PRESS–2001)

Research Projects Supervised by Teaching Staff in Physics and Applied Physics Departments in Universities

Coordinated by: Physical Society of Hong Kong

Background and Objectives:

It is generally believed that while the quality of students in Hong Kong is as good as students anywhere in the world, the education opportunity and learning experience our education system provides is too rigid compared with many other countries in the world. In particular, it has not provided sufficient flexibility for our very talented group of students to explore their hidden talent.

The Physical Society of Hong Kong (PSHK), with its members coming mostly from the physics and applied physics departments in local universities, has been active in promoting physics and science education since its establishment in 1966. In 2001-2002, the Society will coordinate a unique event entitled “Physics Research Experience for Sixth-form Students” (PRESS) for a selected group of Form 6 students. This project, sponsored by all six physics-related departments in universities in Hong Kong and coordinated by the Physical Society of Hong Kong, aims at providing additional learning opportunity to our best secondary school students who are interested in science. The project provides real scientific research experience for extraordinary F.6 students who have shown strong interests in science, and in physics in particular. The student(s) will work under the supervision of our physics faculty members on a real research project. A list of projects provided by the physics and applied physics departments in HK for 2001-2002 is given in Appendix A. Students who are interested in participating in the project should follow the application instructions given in the application form (Appendix B).

Students selected to join the project are expected to work on the project continuously throughout the 2001-2002 academic year. If the response from the students is sufficiently encouraging, PSHK will consider turning it into a regular event in the future.

The Organization:

The event PRESS will last for the whole 2001-2002 academic year. A rough calendar of events is shown below:

Early August, 2001	Announcement of list of projects to schools
Mid-August to Early September, 2001	Consultation period: Interested students/teachers are encouraged to contact potential supervisors
September 15, 2001 Time: 10AM Venue: Room 311, Chong Yuet Ming Physics Building, University of Hong Kong.	Briefing session explaining the project details to teachers and interested students. <i>Interested students should further discuss with individual faculties for details of the projects between 16th July-15th Sept. 2001.</i>
September 28, 2001	Application deadline
September 29, 2001 – October 13, 2001	Selection of students to each project. Result will be announced by October 13, 2001
October 22, 2001 – May 30, 2002	Project investigation will be carried out under the supervision of physics faculty member in universities
June 2002	Presentation/exhibition of project results by participating students

Project organization details:

- (1) The participants must be F.6 students in registered secondary schools. The number and selection of participants in each project is decided by the student's preference AND the faculty who supervises the project with the coordination of the Physical Society of Hong Kong.
- (2) The department/faculty in charge of the project will be responsible for the successful implementation of the project. The Physical Society of Hong Kong will be responsible for coordinating the selection process and the presentation/exhibition of final results.
- (3) Interested students are strongly encouraged to discuss with individual faculties to find out more details of the project before they apply. This would allow the students to know more about the research (which is very different from classroom teaching and project work conducted in secondary schools) and would allow the faculties to know more about the applicants.

**For enquiries: Contact Dr. Tai Kai NG (HKUST) at 23587477
Dr. Hoi Fung CHAU (HKU) at 28591925
Dr. Pak Ming HUI (CUHK) at 26096351**

Appendix A: List of Projects

Appendix B: Application Form

Appendix A: List of Projects

The PSHK website www.pshk.org.hk has links to the webpages of the physics departments in Hong Kong. Number of possible students in a project is given in parentheses.

(1) Hong Kong Polytechnic University (Department of Applied Physics) <http://ap.polyu.edu.hk/>

- (a) Dr. K.H. Wong
Fabrication and characterization of high temperature superconductors (2)
- (b) Dr. Y.W. Wong
Pressure sensitive plastics (2)
- (c) Dr. C.L. Mak
Fabrication and characterization of ferroelectric materials (2)
- (d) Dr. V.C. Lo
Topics in web teaching (2)
- (e) Dr. K.S. Lau
Demonstration experiments (2)

(2) Hong Kong University of Science and Technology (Department of Physics) <http://physics.ust.hk/>

- (a) Dr. T.K. Ng, Dr. K.Y. Szeto, Dr. K.Y. Wong
Use of IT + simple experiments on demonstrating/teaching physics

- (b) Dr. K.Y. Szeto
Celestial Mechanics

Let's consider the orbital equation for the Earth – Sun system. We would like to do the following investigations:

- (1) Can we perform numerical integration of the Newton's law of gravitation to obtain good values of the period?
- (2) Can we visualize the orbit?
- (3) If there were a correction to Newton's law of gravitation, how can one observe the change in the orbit?

- (c) Dr. T.K. Ng
Electricity and Magnetism

Is there any simple way to understand and visualize Faraday's Law? Can we combine simple experiment and computer simulation to understand how Faraday's Law works in motors, electric generators, etc? Can we understand easily what electromagnetic wave is?

- (d) Dr. T.K. Ng
Astronomy and astrophysics

- (1) How do a pair of binary stars move around each other, and how will they appear when observed from the Earth?
- (2) How does a neutron star eat up its companion?
- (3) How do galaxies get distorted when they collide?

We would like to answer these questions by performing simulations and to produce an interactive CDROM for these problems.

(3) Chinese University of Hong Kong (Department of Physics)

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

(a) Dr. M.C. Chu

Cosmic Ray Telescope (1 student)

(4) University of Hong Kong (Department of Physics)

<http://www.physics.hku.hk/>

(a) Dr. F.C.C. Ling or Dr. C.D. Beling

Experimental determination of shielding power of different materials against gamma radiation

This project aims at determining the material dependence on stopping the gamma radiation. The effects of the material thickness will also be investigated. The experimental work will be supervised by radiation workers in our department in compliance with safety regulations. All the radioactive sources used are weak sealed sources for teaching purpose.

(b) Dr. F.C.C. Ling or Dr. C.D. Beling

Fabrication of a light detector using semiconductor material

A metal-semiconductor contact will be fabricated by evaporating a thin metal film onto a semiconductor substrate. This structure can be used as a device for light detection. The properties of this device will be studied.

(5) Hong Kong Baptist University (Department of Physics)

<http://physics.hkbu.edu.hk/>

(a) Dr. K.W. Cheah

Study on thermal wave propagation

This project is to study how thermal wave travels in different materials, in particular, when thermal wave moves from one material to another. It is known that heat conducts at different speed in different material, and therefore, in right condition heat can build up at material junction. This can be a great problem for many systems, e.g. computer, and airplane.

In this project, the student gets to learn using advance electronics to take temperature and record the data into computer. In analyzing data, the student has to use thermal conduction property physics to calculate the results.

(6) City University of Hong Kong (Department of Physics and Materials Science)

<http://www.ap.cityu.edu.hk/>

(a) Dr. Ho-Fai Cheung

Study of surface wave on water

Objectives:

1. To measure the relation between wavelength and frequency of standing waves on a water tank for different depth of water in a water tank.
2. To measure the relation between wavelength and velocity of standing waves on a water tank for different depth of water in a water tank.
3. To observe the propagation of wave caused by boats in the Tolo Harbour.

Application Form

Physics Research Experience for Sixth-form Students (PRESS)

Coordinated by: The Physical Society of Hong Kong

Applicant's Name	(in English)		(in Chinese)	
Age		Sex		
School				
Correspondence Address				
Telephone No(s)		E-mail address		
My preferred project(s) are:	1st choice	2nd choice	3rd choice	
Have you discussed with the project supervisor(s)?				
Other skills:				
Teacher's recommendation: (to be filled out by a science or physics teacher)				
Recommended by (Name and Signature): _____				

Applicant's Signature

Teacher's or Principal's Endorsement

School Chop

Date

Completed application form, **together with a copy of your HKCEE results**, should be returned to PSHK (c.c. Dr. T.K. Ng) **on or before September 28, 2001**. (Address: **Department of Physics, Hong Kong University of Science and Technology, Clear Water Bay, Kowloon. Fax: 23581652**).