

Department of Physics



NUS Physics Department Office, *Waves & Particles Sculpture*



Our Objective

The NUS Physics Department has the primary objective of advancing knowledge of physics and training of qualified manpower needed by Singapore to acquire and develop an economy based on high technology. We intend to play a key role in the advancement of Singapore into a high-tech era.

Our department has excellent internationally recognized research strengths in several frontier areas including nanoscience, quantum information technology, optical and magnetic materials and biophysics. We provide a stimulating and exciting learning environment for all students who wish to major in physics. Our rigorously trained physics graduates will be able to embark on career paths in research and development (R & D) in the physical sciences, engineering and microelectronics industries, as well as education and training, government scientific services sectors and IT. The unique problem solving skills our graduates acquire will also enable them to work and succeed in commerce, banking and finance.

Physics is one of the most fundamental of all sciences, and is the basis of our scientific knowledge of the physical world.

It seeks to explain the behaviour of matter, time and space in the universe and covers phenomena ranging from subnuclear interactions to cosmological events in the universe.



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Why Study at NUS Physics Department?

The NUS Physics Department is made up of faculty members who are well respected in their areas of research and education. They promote excellence in a wide range of areas such as condensed matter physics, surface physics, materials science, high energy physics, atomic physics, superconductor, solid-state ionics, astrophysics, infrared spectroscopy, laser optics, x-ray fluorescence, ion-beam applications, optics, acoustics and computer simulation.

The Physics Department currently offers Bachelor of Science and Bachelor of Science (Honours) in Physics with Specialisation in Astrophysics and Specialisation in Nanophysics. In addition, the Department also offers Minor in Biophysics, Minor in Medical Physics, Minor in Nanoscience, Minor in Physics and Optical and Semiconductor Technology and several general education modules and cross-faculty modules for general scientific interest such as Understanding the Universe, Great Ideas in Contemporary Physics, Einstein's Universe and Quantum Weirdness, Physics in the Life Science, Introduction to Nanoworld, Science of Music, Modern Technology in Health and Medical Care, Clean Energy and Storage, The Art of Science, the Science of Art, Computation and Machine: Ancient to Modern, Sky and Telescopes and How the Ocean Works.

Our programs combine fundamental training in physics with emphasis on broad applications of physics in modern technologies. They have strong scientific emphasis and a high degree of flexibility, allowing students to plan their individual educational experience in accordance with their career aspirations.

What Our Alumni Say...

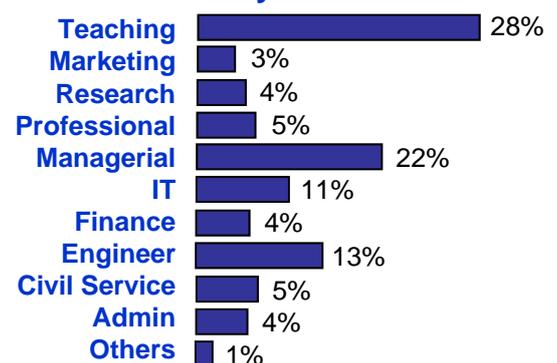
"Physics is the most fundamental of all disciplines in natural sciences. It teaches you to be analytical and gets you thinking in a certain way. That helps to breakdown problems into parts and see them for what they are, which is really useful in police work." - Mr Tan Kah Khin, Head, Intellectual Property Rights Branch, Criminal Investigation Department, Singapore Police Force. Mr Tan graduated from NUS with B.Sc. (Honours) in Physics in 1997.

"I had vivid memories of my Physics undergraduate programme at NUS which had left indelible marks on my career choice as a teacher. As the saying goes, 'You can never tell where a teacher's influence stops...it affects eternity.' A BIG thank you and best wishes to all my teachers. Cheers!" - Dr Ho Boon Tiong, Assistant Professor, Deputy Head (Outreach & Professional Development), Natural Sciences & Science Education, National Institute of Education, Nanyang Technological University. Dr Ho graduated from NUS with B.Sc. in Physics in 1985.

"My undergraduate days at the NUS Physics Department had been times of scientific misadventures and exciting explorations. Little did I expect that these experiences were moulding me into becoming an adaptable and dynamic individual who takes calculated risks." - Chew Boon Ning, Lijen Industrial Development Medalist 2001-2002. Mr Chew, now a Teacher in Catholic Junior College, graduated from NUS with B.Sc. (Honours) in Physics in 2002.



Careers of Physics Graduates



Facilities and Research Work

The aim of the Department in research development is not only to acquire new knowledge in fundamental areas, but also to tackle problems of relevance to Singapore's industrial development. The Department is involved in inter-disciplinary research with other branches of science as well as engaging in collaborative work with industry. The Physics Department has a number of first-rate laboratories which are equipped with excellent and modern research facilities. Among them are the Surface Science Laboratory (SSL), the Centre for Ion Beam Applications (CIBA), the Center for Quantum Technologies (CQT), the Graphene Research Centre (GRC), and the Organic-Nano Device Laboratory (ONDL). In addition, the Department has a well-equipped workshop to support the research activities.

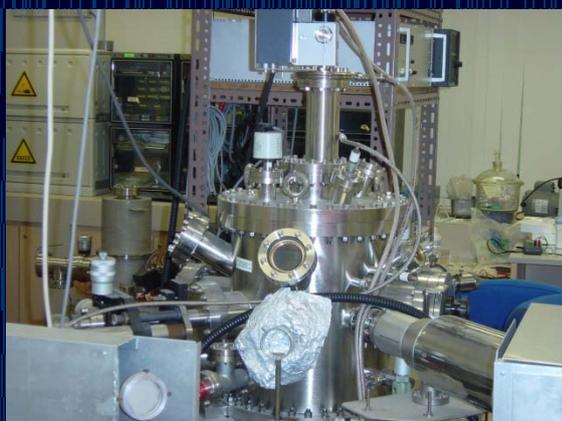
There are around 90 staff members who are actively involved in research work besides their primary teaching duties. The number of postgraduate students is 120. The amount of annual funding, from the university, industries and government agencies, for new and ongoing research projects exceeds 2.5 million dollars, exclusive of equipment costs. The Department's excellence in research has been evidenced by the presentations of plenary/invited talks by its staff in international conferences and by their service as referees for international journals.



Facilities for Electron Spectroscopy for Chemical Analysis in Surface Science Laboratory (SSL). The laboratory also operates several ultrahigh vacuum scanning tunneling microscopes (STM), and a synchrotron beamline for surface science research at the Singapore Synchrotron Light Source (SSLS).



Facilities in the Centre for Ion Beam Applications (CIBA) - Proton Beam Writer, Nuclear Microscope, and High Resolution Nuclear Scattering Spectrometer. CIBA is a state-of-the-art research centre utilizing advanced high energy (MeV) ion beam techniques covering a wide range of disciplines, including biophysics, lab-on-a-chip technology, nuclear microscopy of degenerative diseases, microphotonics, advanced materials characterization and semiconductor micromachining.



Facilities for laser molecular beam epitaxy (L-MBE) deposition of thin film in the Centre for Superconducting and Magnetic Materials (CSMM). CSMM is an excellent research centre for materials and devices R&D. This is one of the facilities developed in-house to fabricate thin film and nanostructures.



Computer Laboratory. The department currently houses 2 major computer laboratories with 170 high-end PCs interconnected on the Tera-Scale Campus Grid platform. This platform is able to provide computing power equivalent to a supercomputer.

Our Undergraduate Physics Programs

Our programmes combine fundamental training in physics with emphasis on broad applications of physics in modern technologies. They have strong scientific emphasis and a high degree of flexibility, allowing students to plan their individual educational experience in accordance with their career aspirations. Besides the major curriculum, students will be able to take the following programmes during their undergraduate candidature in NUS:

Nanoscience Minor Programme

Minor in Optical and Semiconductor Technology

Minor in Physics

Minor in Biophysics

Minor in Medical Physics

Specialization in Astrophysics

Specialization in Nanophysics

Undergraduate Research Opportunities Programme in Science (UROPS)

Student Exchange Programme with Overseas Partners

Double Degree Programmes with prestigious *French Grandes Ecoles*

Higher Degrees: Masters and Doctor of Philosophy

Students who excel in their undergraduate physics program may pursue higher degrees, Masters of Science and Doctor of Philosophy in a wide range of research topics at the frontiers of fundamental Physics and *state-of-the-art* technology & techniques. Excellent candidates are strongly encouraged to apply for NUS Research scholarships (check out <http://www.physics.nus.edu.sg>).

What Do You Do?

Physics graduates combine fundamental training in physics with emphasis on broad applications of physics in modern technologies so as to fill the knowledge gap between academic science and engineering. You will be armed with a clear understanding of scientific principles and at the same time be aware of how physics is applied to industrial problem solving and technology development.

Where Can You Work?

You will be able to embark on career paths in R & D in the physical sciences and engineering industries, the semiconductor and microelectronic industries, junior college education and polytechnic training, government scientific services sectors, as well as IT, commerce, banking and finance. Some examples of career fields are included below for reference.

Academia

- Instrumentation Specialist
- Polytechnic Lecturer
- Professor
- Research Fellows
or Assistants in research
institutes and universities
- School or JC Teacher

Government

- Government ministries,
statutory boards and agencies
such as:
- Agency for Science,
Technology and Research
(A*STAR)
 - Central Provident Fund Board
 - Economic Development Board
 - Inland Revenue Authority
of Singapore
 - Ministry of Defence
 - Ministry of Transport
 - Public Utilities Board
 - Urban Redevelopment
Authority

Industry

- Aerospace Analyst
- Bank Executive
- Computer Architecture
Designer
- Industrial Design &
Production Planner
- Industrial Scheduler
- Laboratory Officer
- Meteorologist
- Technical Consultant
- Technical Writer
- Semiconductor Analyst