TRINITY COLLEGE DUBLIN

Trinity College Dublin is one of the great universities of the world and was ranked at number 13 in Europe in the Times Higher Education Supplement in 2009. It is widely recognised for the high quality of its graduates, the international standing of its research and scholarships, and the value it places on contributing to Irish society and the wider world.

Trinity College provides a liberal environment where independence of thought is highly valued. With a distinguished history, it also has all the facilities associated with a modern university. Located in the heart of Dublin city centre, it has some 15,600 students and 3,700 staff. Students can experience a well-rounded university life through the range of clubs, societies, volunteer groups and other social activities.

In research, both the School of Physics and School of Chemistry have worldwide reputations and several staff are recognised as leaders in their fields, particularly in nanoscience. Several members of both Schools carry out research in the state-of-the-art facilities within CRANN (www.crann.tcd.ie). Much of this research is funded by Science Foundation Ireland. Both Schools are also major participants in the Trinity Centre for High Performance Computing, www.tchpc.tcd.ie. Graduates from both Schools are in strong demand for a wide range of jobs in industry and commerce.

For more information, visit:
www.tcd.ie/Chemistry/Nanoscience

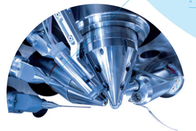
Graduates from the Schools of Physics and Chemistry are in strong demand for a wide range of jobs in industry and commerce.

SCHOOL OF PHYSICS

The study and teaching of physics at Trinity College has a long and distinguished history and has included figures such as Hamilton, Lloyd, Fitzgerald and Walton, who made important contributions to physics. Ernest T. S. Walton is the only Irish recipient of a Nobel prize in Science (1951). The Sami Nasr Institute for Advanced Materials, completed in 2000, houses the central part of the School today. The School of Physics provides excellent modern facilities for teaching and research for a very lively community of over 200, including over 20 academic staff, more than 50 postdoctoral fellows and over 100 graduate students, representing ten nationalities from three continents.

SCHOOL OF CHEMISTRY

The School of Chemistry at Trinity College has a rich history and will celebrate its 300th year in 2011. The School offers degree programmes in Chemistry, in Medicinal Chemistry and in Chemistry with Molecular Modelling. The School of Chemistry participates, together with University College Dublin in the CSCB, the Centre for Synthesis and Chemical Biology, www.ucd.ie/cscb, and currently leads the Chemistry strand of the DRHEA, the Dublin Region Higher Education Alliance.



ENTRY REQUIREMENTS

Nanoscience, Physics and Chemistry of Advanced Materials

- Course Code: TR076
- Points 2010: 410
- Degree Awarded: B.A.

Special Entry Requirements

- Leaving Certificate
  - *OA2 or HC3/Mathematics*
  - *HC3 in two of Physics, Chemistry, Biology, Physics & Chemistry, Applied Mathematics, Mathematics.*
- GCSE: Grade A Mathematics or Advanced GCE (A-Level): Grade C Mathematics

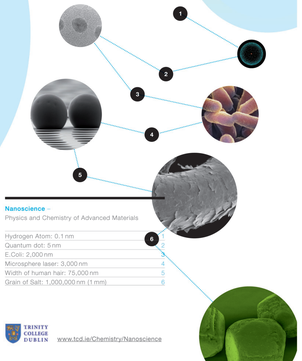
Advanced GCE

- Advanced GCE (A-Level): Grade C in two of Physics, Chemistry, Biology, Mathematics, Applied Mathematics

Combinations not permitted

- Physics & Chemistry with Physics or Chemistry
- Applied Mathematics with Mathematics

N-PCAM



Nanoscience –
Physics and Chemistry of Advanced Materials

Hydrogen Atom: 0.1 nm	1
Quantum dot: 5 nm	2
E.Coli: 2,000 nm	3
Microsphere laser: 3,000 nm	4
Width of human hair: 75,000 nm	5
Grain of Salt: 1,000,000 nm (1 mm)	6

TRINITY COLLEGE DUBLIN

www.tcd.ie/Chemistry/Nanoscience

ABOUT THE COURSE

Nanoscience, Physics and Chemistry of Advanced Materials (N-PCAM) is a four year honours degree course. It aims to teach students how to use and apply the principles of chemistry and physics to solve practical problems associated with the development of nanoscience. The first two years provide a solid foundation in Physics and Chemistry. In the last two years, students study in detail a number of topics in nanoscience. The course is offered jointly by the School of Physics and School of Chemistry. The course code in TCD is TR076.

WHAT IS NANOSCIENCE?

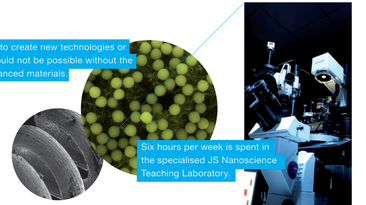
Nanoscience is the study of small scale matter, the minuscule building blocks of the material and biological worlds. Typically nanoscientists study materials of less than 100 nanometres. One nanometre is one billionth of a metre. Nanotechnologists are concerned with the behaviour of materials at these small dimensions and how they can be manipulated to do useful things.

Nanotechnology is being used to develop smaller and more powerful electronic devices, lasers, medical diagnostics and materials with completely new properties. Companies like Intel, Hewlett-Packard, Roche and Cregganna depend on nanotechnology for industry growth. Nanoscience is contributing to product innovation in virtually every field of manufactured goods, estimated to exceed $3 trillion in products globally by 2015. In Ireland, we are well positioned to play a lead role in this nanotechnology revolution

Nanoscience does not belong fully to either Physics or Chemistry. Therefore, a new approach is required. N-PCAM brings together part of both subjects so that students gain a deep and lasting understanding of the science of advanced materials that underpins the nano revolution.

NANOSCIENCE AND ADVANCED MATERIALS

The ability to create new technologies or devices would not be possible without the use of advanced materials. Energy is an important issue for any new device, and making devices smaller approaching the nano-scale can reduce the energy cost, while increasing speed. Nanoscience incorporates applications in photonics, medical diagnostics, ultra-fast electronics and many other areas which in addition use advanced materials. Advanced materials include superconductors, polymers, lasers and optoelectronics and they can be found in applications ranging from computers and electronics, to telecommunications and broadcasting, to airlines and healthcare.



COURSE MATERIAL

Junior Freshman & Senior Freshman

In these first two years, students take foundational modules in Physics, Chemistry and Maths. The modules include lectures, laboratory classes and problem solving tutorials. In addition to these standard courses, there are specialised tutorial classes introducing students to the study of nanoscience.

Junior Sophister & Senior Sophister

In the Junior Sophister year (3rd year), students really begin to specialise in nanoscience. Six hours per week is spent in the specialised JS Nanoscience Teaching Laboratory where they will be introduced to a wide range of techniques for the synthesis, preparation and characterisation of nanoscale materials. Some laboratory training is provided in CRANN (www.crann.tcd.ie) using their state-of-the-art facilities.

The Senior Sophister (fourth year) course further explores nanoscience and other topics. In this year, students carry out a major research project (3-5 months) where they become familiar with the applications of advanced materials, nanostructures or nanodevices in real-life situations. In most cases the project is pursued abroad in an academic or industrial research laboratory, and recent examples of laboratories where projects have taken place include the IMEC micro- and nano-electronics research centre in Leuven, Belgium; The Scripps Research Institute, La Jolla, California; the University of Alberta, Canada, and the University of Wollongong, Australia, and the University of Potsdam (Universität Potsdam), Germany.

CAREER OPPORTUNITIES

This degree will provide graduates with a flexible qualification for employment in cutting-edge high technology industries, such as the semiconductor, polymer and optical industries. Our graduates will be strongly sought-after in the knowledge economy where their interdisciplinary training in Physics and Chemistry will give them a clear edge in solving real-life problems in high-tech industry. There are also opportunities to carry out post-graduate study in nanoscience, a key research area in Trinity College, with world class facilities in CRANN, (www.crann.tcd.ie). CRANN was pioneered by the Schools of Physics and Chemistry in Trinity College.

Graduates of the Physics and Chemistry of Advanced Materials (PCAM) course before its re-direction into the nanoscience realm are now working in a range of fields, including multinationals such as Intel, indigenous start-ups and in further academic research.

'I am currently working as a materials scientist in SolarPrint. SolarPrint is developing Dye Sensitized Solar Cells (DSSCs), a novel 3rd generation printable flexible solar cell technology, which uses abundant, cheap raw materials and employs a low-cost, fast and easy manufacturing process. My work is in the area of research and development of this interesting and exciting field.

Nanotechnology is not a future science, it is already around us. There are nano materials in make-up, toothpaste, computers and teddy bears. That is why it is important that N-PCAM exists for Irish students. Welcome to the future!'

Dr Michele Keyes
Former PCAM graduate

For more case studies, go to
www.tcd.ie/Chemistry/Nanoscience