



Dates for your Diary Dublin City University, Faculty of Science and Health

Chemistry Summer Camp Leaving Certificate Students 3 - 6 June

A practical laboratory based camp designed for 4th & 5th year students with an interest in chemistry



Science Summer Camps First and Second Year Students Week 1, 9 - 13 June Week 2, 16 - 20 June

An interactive science camp aimed at developing the investigative and problem-solving skills of students preparing for their Junior Certificate

For information and booking on any of the above contact Caroline Magee at the Faculty of Science and Health, Dublin City University.
Tel: 01 700 7724 or 01 700 8975.
E-mail: caroline.magee@dcu.ie or science@dcu.ie



CAO Change of Mind Closing Date 1 July



Transition Year Workshops Biomedical Diagnostics Institute Autumn 2008

A 3 day workshop covering topics such as antibodies and the immune system, polymer technology, and fluid flow.

For information and booking contact Clare Scalzo
Tel: 01 700 6444
Email: clare.scalzo@dcu.ie

“If my clothes could speak” E-textiles and wearable sensors

Dr. Sarah Brady tells us about her research in the area of e-textiles



What we wear is a statement and our choice of clothing tells others something about us. But what if our clothing could “actively” tell us things, useful things? This is the challenge of a new research area, wearable sensing and e-textiles.

E-textiles, sometimes referred to as “electronic” or “smart textiles”, are textiles with added built in capabilities through the integration of technology.

But just how do you reliably integrate technology into textiles without compromising the soft “wearable” characteristics of the material?

This has been the main question behind much of my research in DCU. Rather than weaving the components into the fabrics, I chose to coat the yarns of the fabric with a flexible plastic or polymer so that the resulting material would be “functionalised”, that is, have the capability to work as a sensor without taking away from the usability of the fabric. The integration occurs on the nano-scale so the technological components become less visible whilst retaining the comfort and functionality of the garment.

Polymers are interesting materials. Up until the 1970s it was thought that all polymers were non-conducting, that is, they prevented the flow of electricity from one point to another. However, in

that decade, a new family of polymers, aptly named electrically conducting polymers, were presented to the world by Professors Alan J. Heeger, Alan G. MacDiarmid, and Hideki Shirakawa; their discovery opening up the possibility of developing new materials that could conduct electricity and even act like metals.



What I discovered was that when conducting polymers were mixed with textiles they adhered to one another, right down to the fibre level, and that when combined in this way, it was possible to connect the textiles to conventional electronic systems with the material becoming the sensing component of the system.

During my studies I examined these e-textiles, characterising and assessing them using standard chemical and engineering techniques, until finally I had a material that I could use to develop a prototype sensing unit.

This unit was a wearable pressure-sensing device that could rapidly detect changes in structural conformations. The sensing unit could be incorporated into garments, such as a t-shirt or an insole, or any configuration where there was a change in the material's shape. Then using a miniature radio, information could be transmitted to a central processing unit (mobile phone or PDA) for data collection and display.

Tests were run in collaboration with the School of Health and Human Performance to determine whether the results achieved with the sensing unit were valid in comparison with standard laboratory equipment. For these trials the sensing material was incorporated into a t-shirt, so that when the user inhaled and exhaled there was a compressing and relaxing action on the material. When compared to standard equipment we found that this technology was statistically very good at monitoring the person's breathing. What I now had was a material that could justifiably be used to make breathing monitors for integration into sports clothing and use in everyday settings.

This area of research has no doubt huge commercial potential, so be prepared for “smart textiles” next time you go shopping!

Profiled

In this feature we hear from students both past and present as they talk about their experiences at DCU and their careers to date.

Conor McGeough

B.Sc. Applied Physics
Yr. 1

I chose this course because of my interest in physics at school and because of the wide range of career choices I would have after graduation.

Applied Physics is a great course covering both the fundamentals of physics but also branching out into specialised areas such as astrophysics and thermal physics. The course also gives students a chance to study independently, which I find very rewarding.

Not only is DCU valued for its academic reputation but also for its buzzing student life. Whether it's sports, computers or the performing arts, there is something for everyone and joining clubs and societies is a great way to make new friends.



LaLarukh Haris

B.Sc. Biotechnology
Yr. 2

Hearing of my father's experiences as a surgeon ignited my interest in science at an early age and this is why I chose to study the B.Sc. Biotechnology at DCU.

I am happy to say that I've loved every minute of the past two years. The programme is challenging with a lot of time dedicated to practical laboratory work, however I still find time for lots of extra-curricular activities.

I recently represented DCU at the London International Youth Science Forum where I learnt more about biomedical engineering research and I am now looking at doing my PhD in this area.



Brian Cushen

B.Sc. Analytical Science
Yr. 4

I came to DCU four years ago and registered for Common Entry into Science. At the time I was unsure where my interests lay and the common science first year introduced me to the basics whilst allowing me some more time to make a decision.

In second year I progressed into the B.Sc. Analytical Science and continued to study modules in both Chemistry and Biology.

In third year I choose the Forensic and Environmental Pathway and at the moment I'm doing my final year research project on Luminescence and Ruthenium Containing Polymers. I will be back next year to do my PhD and would then like to travel and work in a University abroad.



To hear more from our undergraduate students visit their video profile pages at www.dcu.ie/study_at_dcu.shtml

Christina Duffy graduated from Dublin City University (DCU) in 2007 with a B.Sc. In Physics and Astronomy. She is currently completing her PhD. by research in the Department of Earth Science and Engineering, Imperial College London. Here she talks about her experiences to date.



In sixth year I had little idea of what area of study I wanted to pursue. So I found myself at Science Open Day in DCU in November 2002, where experiments were being carried out in the corridors by the Physics Department. A stack of A4 leaflets caught my eye, 'New 4 year degree course BSc. Physics with Astronomy to begin October 2003.' I immediately knew this was the one for me and registered that October.

Initially we were integrated with the Applied Physics class covering many of the same fundamental topics. In the latter years we focused more on the astronomy side with modules such as Stellar Physics, General Relativity & Cosmology and Galactic Dynamics. Having spent the summer holidays working in the National Centre for Plasma Science & Technology (NCPST) at DCU, I knew research was what I wanted to do. One evening, on a random internet search, I typed 'meteorite' and 'PhD' into the search engine. The result - a project entitled 'Elucidating the Origins of the Solar System(s); Anatomy of Primitive Solar System

Materials.' The project was an EU collaboration based in the Earth Science & Engineering Department, Imperial College London.

Adjusting to the hectic pace of life in London didn't take long and six months later I am really enjoying the project as well as having joined the boat club at Imperial. A typical day involves a 5am alarm call, rowing on the Thames by 6am, cycling to Imperial for 8:30am to spend the day cutting up and analysing 4560 billion year old pieces of meteorite and generally trying to establish a paradigm for the origin of the solar system.



Dr. Paul McCormac received a Ph.D degree in Organic Chemistry from Dublin City University (DCU) in 1996 and a B.Sc. in Analytical Science from DCU in 1991. He is Director of Process and Analytical Development with Avecia Biotechnology Inc. Avecia Biotechnology is a world leading provider of manufacturing services to the biotechnology and pharmaceutical industries, specialising in the manufacture of oligonucleotides and proteins by chemical, enzymatic and fermentation processes.

Paul's background in both analytical and process chemistry is key to his role and the training in DCU has been a great asset to his career. The course structure in DCU, covering elements of industrial biology and chemistry is particularly relevant to the biopharmaceutical industry and the benefits of the INTRA program which he spent working in the Quality Control department at Bristol Myers Squibb was of real benefit in terms of a future career in the pharmaceutical industry.

Education and Outreach Initiatives

Physics Education Group

Summer School in Junior Certificate Science

From June 30th to July 18th the Physics Education Group within the Centre for the Advancement of Teaching and Learning (CASTel) at Dublin City University (DCU) will host its first Summer School in Junior Certificate Science by Guided Inquiry.

The Summer School is a three-week program in physics and physical sciences, designed to support inquiry-based teaching of Junior Certificate Science. The School is open to all full-time teachers of Junior Certificate Science; no background in physics is required. The Summer School is supported by a grant from the Research & Development Committee of the Department of Education and Science. A €1000 Euro stipend (subject to tax and PRSI) is available upon completion. Limited places remaining.

For further information contact Paul van Kampen.

E-mail: paul.van.kampen@dcu.ie

Web: www.castel.ie

Science Summer Camps 2008

Chemistry Camp 3rd to 6th June

A camp for fourth and fifth year students with an interest in chemistry. This camp is laboratory based with an emphasis on the Leaving Certificate curriculum.

Science Camps 9th to 13th June or 16th to 20th June

A camp for first and second year students who would like to develop their interest and knowledge of physics, chemistry and biology as well as engineering, computing and sports science. Activities involve students carrying out investigations and experiments in the laboratories.

Camps are non-residential and run from 9:30am - 4:00pm each day.

Cost per participant per camp: €100.00

For further information contact Caroline Magee, Faculty of Science and Health.

Tel: 01 700 7724 or 700 8975 E-mail: science@dcu.ie

B.Sc. in Environmental Science and Health

A Global Classroom

2008 saw the continuation of the Global Classroom module delivered as part of the B.Sc. in Environmental Science and Health. This module comprises of students from the University of Wollongong, Australia; University of Colorado, U.S. and Dublin City University (DCU) communicating via video link to discuss current scientific events that not only have great significance to their respective countries but to a larger extent the international community.

Students share different viewpoints based on their own personal knowledge but also on geographical location. This makes for very interesting discussion and debate, as issues that seem trivial in one country can be a source of contention in another. As an example, water scarcity has never been a big issue in Ireland yet can be a common occurrence in Australia.

There are many aspects to like about the global classroom module not least the ability to communicate with other students halfway around the world and learn from their experiences. Also, associated with the global classroom module is the fantastic opportunity to complete an INTRA placement in either one of the participating Universities.

Biomedical Diagnostics Institute

Imagine if life-threatening health events could be detected long before the critical stage was reached! This is the vision at the Biomedical Diagnostics Institute (BDI) at Dublin City University (DCU).

Teacher Internships

Each summer, the Institute offers teachers the opportunity to work with our world-class scientists and experience first-hand current research developments as they carry out their own research project. The ultimate output of each project is the design of new curriculum activities that can be included in the teacher's own teaching programme. Teachers will be funded to carry out this research.

For further information contact Emma O'Brien.
Tel: 01 700 5349 E-mail: emma.obrien@dcu.ie

B.Sc. Physics with Biomedical Sciences

The first cohort of students enrolled on the B.Sc. Physics with Biomedical Sciences (PBM) in October 2007. This innovative programme was developed by the School of Physical Sciences in the current context of the booming health and biomedical sector.

The PBM programme is a multidisciplinary physics programme offering a range of subjects in life and physical sciences. It aims at producing graduates with a broad and detailed knowledge of physics and a good understanding of the physical, chemical and biological principles underpinning the biomedical sciences. Students study the fundamentals of physics, physiology, biology, chemistry and anatomy, followed by the study of more advanced biomedical subjects in the final year of the programme e.g. Medical Imaging and Medical Applications of Lasers.

The PBM programme is delivered in an innovative manner that includes teaching and training at a leading research hospital (e.g. St James's Hospital or Beaumont Hospital) and research based projects in the biomedical area.

Students graduating from this programme are well placed to take on careers in many exciting and fast-growing areas such as biomedical research, design of novel biomedical instruments and sensors, biomedical optics, etc. They are also ideally suited to undertake further studies in order to achieve the qualification of Hospital Physicist.

This resource aims to assist teachers and students of the Junior Certificate Syllabus to investigate the topic of energy, in particular, photosynthesis. This resource was compiled in association with the Centre for the Advancement of Teaching and Learning (CASTeL).

What is energy? (3A6)

ENERGY is the ability to do **WORK**

There are many forms of energy which include:

Potential, Kinetic, **Light**, Heat, Sound, **Chemical**, Nuclear, Electrical, Magnetic.

Managing Energy?

The Law of Conservation of Energy states: *Energy may neither be created nor destroyed but **only converted** from one form to another.*

Carbon Dioxide is a **reactant** in photosynthesis while Oxygen is a **product**.

What are the other reactants and products in photosynthesis?
What state are the products of each reaction in? How can you tell someone that in writing?

Carbon Dioxide (2B2)

Q. What are the properties of Carbon Dioxide - CO₂?

Q. How can we use these properties to test for CO₂?

- Heavier than air (denser and sinks) – compare with balloons
- Does not support combustion (fire-extinguisher) - lighted splint
- Slightly soluble in water (fizzy drinks)
- Colourless, odourless & tasteless gas

What's so important about CO₂?

Photosynthesis

Breathing (respiration)

Combustion (fire-extinguishers)

GLOBAL WARMING!!

Carbon dioxide is often classified as a **greenhouse gas**.

This means that if the amount of carbon dioxide is not controlled that the earth's temperature will rise and begin to feel hotter like a greenhouse.

What does that mean for all of us?

(IC7 & OB60)



How do we convert energy?

Example: conversion of LIGHT ENERGY (3A7)

Plants convert light energy to chemical energy by PHOTOSYNTHESIS.

Q. What is this equation? What does it mean for the plants? What does it mean for us, humans?

The plants use this chemical energy to grow which in turn provides food and oxygen for others e.g. humans.

Q. What other ways can light energy be used?

- Solar panels (energy harvesting)
- Electronics (Light Dependent Resistors)
- Research and other photochemistry materials (for more info. see current STAR research projects in DCU)

Q. What are the variables for photosynthesis?

What must we have to **begin with** in order for photosynthesis to occur?

What do we **get out** after photosynthesis has occurred?

Q. How can we investigate photosynthesis?

How do we know that sunlight is needed for photosynthesis?

If we place a plant (e.g. watercress) into a black box and cut out a hole in the side of the box, through which light can shine, the plant will bend and grow towards the light. This is called **phototropism**.

How do we know that water is need for photosynthesis?

Would photosynthesis work on the moon?

Why or why not? What variables are affected?

What is your Carbon Footprint?

A carbon footprint is a measure of how human activities impact on the environment in terms of the amount of **greenhouse gases** produced and is measured in units of **carbon dioxide**.

Q. How can you reduce your carbon footprint?

What's recommended in the media? Think about the use of aeroplanes, recycling, electricity...etc.

Look at the **photosynthesis equation**: what can you increase or reduce?

- **Reduce** the production of carbon dioxide
- **Increase** the ways in which carbon dioxide is used up (photosynthesis)

We welcome your comments on this resource or on any other item in SCI FACT. Please forward all comments to science@dcu.ie