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Faculty of Science and Technology Summer Taster Day – July 1st 2010

Departmental Sessions

Communication Systems

The Department of Communication Systems specialises in modern communication technologies, from mobile phones to satellites, GPS and computer networks. Our students learn skills like developing multimedia applications and digital communication technologies for fixed platforms and mobile devices. The courses taught in the department cover many facets of communication technology with students specializing in one of the following areas: Media Technology, Intelligent and Robotic Systems, Communication Engineering, and Mobile experiences research.

The Communication Systems session will involve a hands-on practical workshop based on 3G mobile phones. The department has a number of world leading researchers in this rapidly expanding field and has an ongoing research partnership with Nokia.

Our workshop will explore the world of mobile phone development by looking at m3Dcam – as one application created in the department that allows people to use their camera phones to generate 3-D images. These 3D 'anaglyph' images can be viewed on the phone's screen using a pair of 3D glasses, or saved to a community website at www.m3dcam.com.

Maths and Stats

Maths for the win and the design of games - Jak Marshall

We've all been involved in a game at some point, sometimes without even knowing it. When it comes to sport, games, war or romance it helps to have an effective strategy in mind. Even simple tasks such as passing somebody in the street require decisions that we take for granted yet make on a regular basis. Like it or not, choices are a fact of life and knowing how to make good ones is of great importance to us, whether we're deciding

how to run our country's hospitals, manage the local football team or just win at noughts and crosses.

During this talk we will delve into all of these problems and more, drawing from a wide array of techniques and ideas from the world of mathematics and statistics. In addition to making the audience world champions at rock-paper-scissors, there will be a discussion of how good game design can benefit society and how the world acts as a game under natural or man-made conditions.

Statistics in the real world: from storms to stocks - Rebecca Killick

The world is a constantly changing place, and statisticians deal with vast amounts of data that are usually collected over a period of time. Often, during this collection something (most likely beyond our control) changes which may affect our results. The statistical process of finding where a change has occurred is called change point detection. We present simple methods for detecting a change whilst highlighting some practical considerations that statisticians need to take into account. This talk looks at various datasets, such as hurricane wave heights and stock market indices.

Physics

Lancaster physics department: number one for research in the UK

In the just published (Dec 2008) Research Assessment Exercise, Lancaster's Physics Department is the top ranked physics department in the country. 25% of our research has been rated as being world-leading in terms of originality, significance and rigour. 90% of our research is considered to be internationally competitive.

In your visit you will be shown low temperature demonstrations with liquid nitrogen, high energy particle detectors, and be taken on a departmental tour to see some of our major research projects.

High energy Particle Physics Group:
Members of the High Energy Particle group and Cosmologists in the department are actively involved in international collaborations to study the most fundamental interactions of elementary particles, which dominated the Universe immediately after the Hot Big Bang and explain the forces that we see in the Universe today. Although most of the experimental work is carried out at international laboratories such as the Large Hadron Collider at Geneva, we can still provide interesting demonstrations at Lancaster:

a cloud chamber and a detector for cosmic ray muons from some of the most energetic events in the Universe.

Low temperature group:
Low temperature physics gives unique access to large-scale quantum phenomena, notably superconductivity in some metals and superfluidity in liquid helium-3. Work is also in progress on quantum vortices in superfluids, phonon scattering, thermal transport in sintered powders and phonon spectroscopy of low-dimensional structures. You will be shown the "fridges" which cool to a temperature below -272^{O}C

Biomedical Physics Group:
The Lancaster Group are paving the way towards uncovering possible interactions between cardiovascular oscillations and brain waves, thus bringing new understanding of how the human organism works, and also providing new means of studying diseases.

Optoelectronic group:
The main objectives of the research programme of the Mid-Infrared Optoelectronics Research Group are the fabrication and evaluation of efficient semiconductor light emitting diodes, lasers and photodiodes operating in the mid-infrared (2-5µm) region of the spectrum. They are working on the next generation of BT lasers.

Geography

Students will attend a choice of interactive sessions including:

Geography from a Different Angle - Dr. Gordon Clark
The session will show how 'place' matters in the world today, not just in the everyday way we think of places but also in the different dimensions of modern life. The session explores some of the key features of modern geography.

Quiz on Migration and Britain - Dr. Nick Gill
This session introduces students to migration into, out of and around Britain. Participants will be asked to guess the answers to some demographic questions based on their knowledge of British culture.

Mobility and Climatic Change - Prof. Colin Pooley
Everyday travel is central to most aspects of contemporary life. However, it also has significant impacts in terms of congestion, personal health and environmental pollution. This session considers ways in which the students normally undertake everyday journeys

and the reasons for these choices. It explores the impacts of such trips and the factors which might encourage changes in travel behaviour.

Glaciers in the Landscape - Dr. P. Wynn
This session will look at what a glacier actually is and how they have been important in shaping the landscape in which we live today. It considers how glaciers move by using a few simple, practical experiments and looks for evidence of their presence through the features they have left behind.

Engineering

Insight into Engineering and Computer Aided Design Tools

Mention the word mechanical engineer to many people and it conjures up an image of greasy overalls, a set of spanners and involves lying underneath a motor car all day.

This session is intended to provide an insight in to the world of the modern engineer and some of the "hi tech spanners" at a designers disposal. In the world of modern motor racing, mass and aerodynamics are everything and shaving a few grams off the weight of a component means less mass to accelerate, brake, or get round corners giving teams more freedom elsewhere in design and an opportunity for them to move up the grid. However to win the points they have to finish, hence the designer has to ensure that the components are fit for purpose long before the lights go out on the track. This session will introduce some of the finite element tools at a designer's disposal allowing them to thoroughly test and validate their designs long before the car turns its first wheel.

Biological Sciences

DNA taster session – A modern "Whodunit?"

Background – Mystery in the Biology Class

A school caretaker locking up at the end of the day has found a biology teacher dead in their classroom. It looks like the teacher has been murdered.

The crime must have been committed at the end of the school day – perhaps by another teacher or an aggrieved pupil. Police scenes-of-crime officers recover samples of blood

and hair from the body and send them for DNA analysis using a technique called 'PCR' (the Polymerase Chain Reaction). This technique can identify variations between specific DNA segments in the chromosomes of different individuals. The results seem to suggest that there are two different types of DNA at the crime scene. This is therefore evidence of the presence of at last two different people, one of whom may be the murderer.

Could you be a forensic scientist?

Three prime suspects have been identified, and have provided cheek swabs for DNA analysis by the same PCR test. Your task is to analyse the results of the PCR assays and see if you can work out who the murderer is. You will need to load your PCR assay samples onto an agarose gel, for separation of the DNA products using a technique known as electrophoresis. Once the gels have been run, and after an explanation of the technique, we will be able to visualise the DNA and work out whodunit!

Computing (TBC)

"Interacting with the Everyday Devices of the Future"

Modern computer science encompasses a diversity of topics, including engineering tiny devices which sense the world around them, and using these to develop systems that allow people to do new things in intuitive ways. After a short introduction about Computing at Lancaster, you will be invited to participate in several 20min workshops. Participants will get hands-on experience with research prototypes which support new means for mobile interaction and usage of interactive surfaces, and will discuss the implications and alternative uses for these interaction methods. The specific workshops will include:

- Mobile phones can be used to touch displays in order to interact with them. Participants will be invited to explore and modify a picture board by touching it in order to upload and download pictures.

- Projectors are now being miniaturised to a point where they can be integrated within mobile phones. Participants can use a picture browsing application running on a projector phone. The new output capability (i.e. the projected image) makes picture browsing more intuitive. What else might a projector on a mobile phone allow you to do?

- We see currently a trend towards interactive tables such as the Microsoft Surface. This hands-on demo shows an interactive table developed in the computing department and several applications running on it.

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Environmental Science

Going up in smoke: investigating volcanoes

Why do some volcanoes erupt with a bang, while others simply ooze? During this hands-on session we will look at some of the properties of magma that control how a volcano erupts and what the volcano produces (lava, ash and pumice). We will use samples of volcanic rocks to work out how much air they contain – and therefore what type of eruption they were produced by."

Psychology

The media feeds common misconceptions about psychology. We've all seen movies where the lead character is a Freud-style therapist who "reads minds" and "analyses" the patient lying on their couch. But, psychology is a whole lot more than "fixing" dysfunctional personalities. At the Taster Day event we will showcase work from four areas of psychology: Neuroscience, Developmental, Cognitive, and Social, through hands-on activities and simple demonstrations designed to probe the inner workings of language, perception, attention, beliefs, self concept, reasoning and decision-making. Students will discover real-world applications of the science of psychology. They'll play the role of Psychologist in a criminal case, experience how the mind is tricked by illusions of vision, audition, and attention, and will learn about social behaviour. Students will also have the opportunity to explore brain anatomy and processing. Each demonstration will be supported by interactive displays. We are certain that the students will find something to inspire them!