



**Wales Institute of Mathematical
and Computational Sciences**

**Mathematics Masterclasses
Programme
Swansea and Carmarthenshire**

2010

<http://www.wimcs.ac.uk/schools>



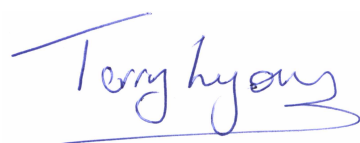
Royal Institution of Great Britain

Welcome to Mathematics Masterclasses in Swansea

As Director of the Wales Institute of Mathematical and Computational Sciences (WIMCS), I am pleased to welcome you to the 2010 series of Mathematics Masterclasses.

WIMCS and the Royal Institution of Great Britain are offering six mathematics masterclasses to year 9 pupils from schools in Swansea and Carmarthenshire with the support of the Mathematics Department, Swansea University, the School of Education, Swansea Metropolitan University, and the Mathematics Advisors for Swansea and Carmarthenshire.

The masterclasses are aimed at year 9 pupils who have an aptitude for and a real interest in the art and practice of mathematics. Through a variety of topics, you will be given a taste of the nature of mathematical thinking. Each class will be held on a Saturday morning from 9.40 a.m. – 12 noon in the Spring school term. Two university venues will be used both of which are in Swansea.



Professor Terry Lyons

Timetable: SATURDAYS 9.40 a.m. – 12 noon

Venue: Main Lecture Theatre, Main Teaching Block K, School of Education, Townhill Campus, Swansea Metropolitan University

23rd January **The secrets of counting infinite sets**

Vitali Liskevich, Swansea University

30th January **Fractals**

Alex Potrykus, Swansea University

6th February **Special relativity**

Andrew Neate, Swansea University

Venue: Faraday Lecture Theatre, Faraday Tower, Swansea University

27th
February **Pharaoh's formula**

Anna Elkin, Birchgrove Comprehensive School

Please visit the Egypt Centre afterwards.

6th March **Polygons, polyhedra and mathematical proof**

Charlie Stripp, Mathematics in Education and Industry (MEI)

13th March **The Golden Ratio**

Elaine Crooks, Swansea University

More information on each class

The secrets of counting infinite sets

We will begin by trying to understand the process of counting in a precise mathematical way. The next step will be to apply this to counting infinite sets. We will talk about an imaginary hotel with an infinite number of rooms in it. In this hotel, if all the rooms are occupied, does it mean that no more guests can be accommodated? Other secrets will be revealed too...

Fractals

Mathematical interest in fractals can be traced back to the late 19th Century. The term itself was coined by Benoit Mandelbrot in 1975 and describes a geometric shape that can be split into parts, each of which looks similar to the whole object. This property is called self-similarity. Approximate fractals can be found in nature, e.g. trees and ferns, snowflakes, crystals, etc. In this class we will give many more examples and study their mathematical properties.

Special relativity

Nearly everyone has heard of Einstein and his theory of Special Relativity and the idea that light travels at a constant speed (the speed of light). But where did this theory come from and what are its consequences?

We will first investigate the concept of relativity which actually dates back to the work of Galileo in 1632 and then look at what makes Einstein's theory of "special" relativity so different. We will show how the simple assumption that light moves at a constant speed leads to some extraordinary mathematical conclusions. Hopefully by the end you will be convinced that you can fit a 10m long ladder into a 5m long garage, that you can speed up or slow down time and that the universe is far more complicated and interesting than you imagined...

Pharaoh's Formula

In this masterclass we will travel back in time to Ancient Egypt 3000BC. We will explore the thinking behind Ancient Egyptian Mathematics, how their calculations were done and what their practical applications were.

Archaeologists have found mathematical texts dating from nearly 2000BC which were used for reference and teaching. We will look at two of these texts: the Mathematical Rhind Papyrus and the Moscow Mathematical Papyrus. We will look at their number system, how they manipulated fractions and how they solved problems in area and volume, including their approximation of pi.

Polygons, polyhedra and mathematical proof

This masterclass links geometry, algebra and mathematical proof, extending ideas from 2 to 3 dimensions to prove some surprising results. It involves both involving interactive discussions and hands-on group work.

The Golden Ratio

Are some rectangles particularly "nice"? Many people think that a rectangle is "just right" when the ratio of the short side to the long side equals a number called the "Golden Ratio". This is a very special number. In this session, we will explore some of its fascinating mathematical properties, and also show you how it crops up all over nature and art - from snail shells to rabbit breeding to architecture!

Please note we may need to change the programme if presenters are ill or severe weather prevents them from reaching the venue.

Please bring with you to each class:

- Notebook and ball-point pens, or pencils, with at least 2 different colours.
- Geometrical instruments: ruler, compasses, protractor.
- Scientific calculator.

Contact Information

Masterclass arrangements:

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