



**WYCHWOOD**  
SCHOOL • OXFORD

**STEAM: 'Symmetry'**



# Symmetry STEAM Programme

**Dates:** 22<sup>nd</sup> - 26<sup>th</sup> July 2024

**Age:** 13-15 years

**Programme size:** 24 (split into two groups)

**Package fee:** £300

**Package includes:**

- Hands-on workshops: learn through interactive lessons
- Expert tuition
- All course materials
- Lunch and snacks

**What you can expect:**

- **Gain hands on practical experience in the lab** with interactive lessons with Oxford University qualified tutors.
- **Small class sizes** for individual attention.
- **Make lasting friendships** with students from all over the world, creating memories that will last a lifetime.



## Programme Overview

Go beyond the curriculum to think like an **Oxford Scientist!**

This programme enables you to move beyond the school curriculum using science and mathematical skills in creative ways to explore the concept of **symmetry** in Science, Maths and Art. You will learn from expert teachers whilst collaborating with other students on the programme and discovering **new ways of thinking** in **science, technology, engineering, art** and **mathematics**.

Each day during the week is broadly split into three sections – one **laboratory** based practical session where you will develop your laboratory skills, one **mathematical** session where you will explore the theme mathematically, and one **creative** session where you will produce artwork inspired by the key scientific and mathematical ideas you have encountered.

### About the programme:

- **Discover the concept of chirality** and the relationship between one molecule and its mirror image.
- **Experiment using compounds** by extracting limonene and building and using a polarimeter.
- **Explore** crystalline and amorphous solids.
- **Learn about the mathematics of** symmetry and the concepts behind group theory.
- **Explore the applications of symmetry** to a diverse range of topics from combinatorics to geometry.
- **Investigate** how modular origami can be used to create objects of different symmetries.
- **Create artwork** using mirror images and tilings.

**Programme Tutors:** Abigail Stacey and Andrew Stacey

Abigail is the Academic Deputy Head at Wychwood School, Oxford and has worked for many years teaching science both in the UK and overseas in Norway and the US. She has an honours degree in Chemistry from the University of Oxford and a Master's Degree in Education from Oxford Brookes University where her thesis explored academic buoyancy and students' ability to persist with their learning when things get difficult.

Andrew is the Head of Mathematics at Oxford High School. He has a Master of Mathematics degree from the University of Oxford and a Ph.D. from the University of Warwick. As a teacher, his goal is to enable his students to understand the richness of mathematics, and to experience its depth and beauty for themselves.



## Sample Timetable

	Monday	Tuesday	Wednesday	Thursday	Friday
<b>9:00am-10:30am</b>	Science 1: Molecule Models and Chirality.	Maths 2: Symmetry as an Action - investigating how mathematical transformations are related to symmetries through physical and computer modelling	Science 3: Microscale Extraction of Limonene - students will extract limonene from oranges and compare it with its mirror image	Maths 4: The Art of Counting - building platonic solids and using structure to count their features	Maths 5 - Counting with Symmetry  Science 5: Investigating how the numbers of symmetries an object has places it in a particular group  Science 5: Amorphous Solids - making and investigating foams and gels in the laboratory
<b>Break</b>	Breaktime	Break time	Break time	Break time	Break time
<b>11:00am-12:30pm</b>	Maths 1: Symmetry as a Property - investigating the symmetries of objects through drawings and computer models	Science 2: Building and using a Polarimeter	Maths 3: Fractals - investigating fractals with computer programs and iterative drawings	Science 4: Investigating Crystals - growing crystals in the laboratory and investigating crystal forms through models	Original work
<b>Lunch</b>	Lunch	Lunch	Lunch	Lunch	Lunch
<b>1.30pm-3:30pm</b>	Art 1: creating pieces of art using mirrors and kaleidoscopes	Art 2: Escher tiling - creating art using the ideas of Escher	Art 3: Penrose and Aperiodic Tilings - creating art using aperiodical tilings	Art 4: Origami - creating a model using modular origami	Original work

### Wanting to do more?

Like all our programmes, our Practical Science programme can be combined with other programmes to make a 2, 3 or 4 week programme.

If you are interested in further developing your skills in science, we would recommend combining with the **STEAM: 'Cracking the code'** or **Practical Science** programme.

It is also possible to combine with our **Rowing** programme if something more sporting takes your fancy.

If the stage is more your thing, take a look at our **Musical Theatre** programme.

Please see our Programmes page for more information.





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