

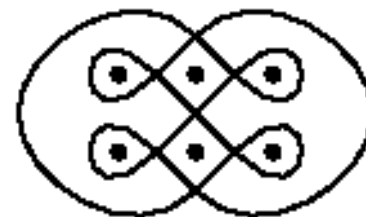
Mathematics for the Nation:  
Why we need an Exploratorium of Mathematics  
by  
Dr Jack Abramsky  
Director MWUK

ASDC Conference, The Royal Society, Wednesday 24 September  
Pecha Kucha session

**MATHSWORLDUK**



[www.mathsworlduk.com](http://www.mathsworlduk.com)



# MATHSWORLDUK



Oh no! A  
maths  
museum?

# MATHSWORLDDUK



"You want proof? I'll give you proof!"

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- ❑ After painstakingly explaining to a student that

$$\lim_{x \rightarrow 8} \frac{1}{x - 8} = \infty$$

- ❑ I tried to check her understanding with a different example. This is what she wrote:

$$\lim_{x \rightarrow 5} \frac{1}{x - 5} = \underline{5}$$

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- ❑ The good Christian should beware of mathematicians and all those who make empty prophecies. The danger already exists that mathematicians have made a covenant with the devil to darken the spirit and confine men to the bonds of hell.

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- ❑ I tell them if they will occupy themselves with the study of mathematics they will find in it the best remedy against the lusts of the flesh.
- ❑ Mathematicians are like lovers...Grant a mathematician the least principle, and he will draw from this a consequence which you must also grant him, and from this consequence another.
- ❑ Mighty is geometry; joined with art resistless

GALILEO

THE WORLD GOES  
ROUND THE  
SUN

RUBBISH

NEWTON

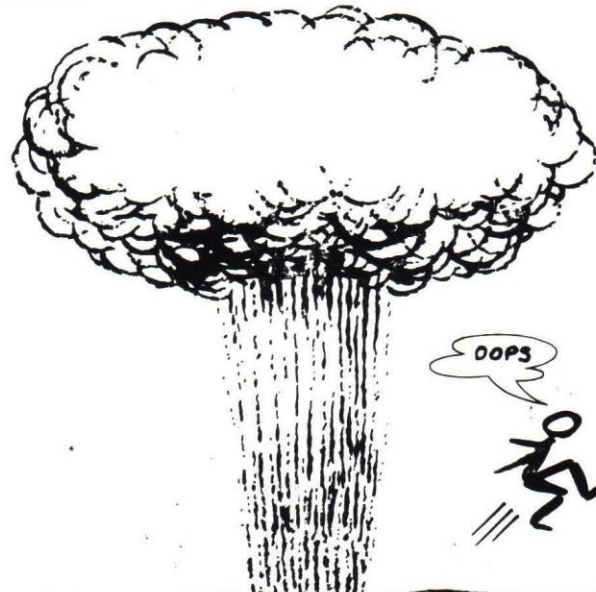
A PROJECTILE  
MAY BE MADE  
TO REVOLVE  
IN AN ORBIT AND  
GO ROUND THE  
WHOLE EARTH

RUBBISH

EINSTEIN

$$E = mc^2$$

RUBBISH



DOPS

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1969: First man on Moon



Space shuttle Columbia

# Some Personalities of Mathematics: The Solar System and its exploration



**Johannes Kepler  
(1571 - 1630)**

◆ Planets move in ellipses around the sun with the sun as focus

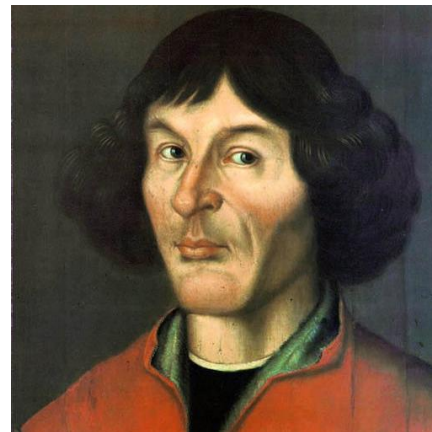


**Isaac Newton  
(1642 - 1727)**

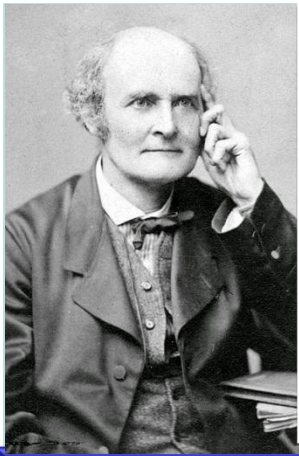
- ◆ 3 Laws of Motion
- ◆ Law of Gravitation
- ◆ Calculus
- ◆ BOOK: *Philosophiæ Naturalis Principia Mathematica* (1687)

↓ **Nicolaus Copernicus  
(1473 - 1543)**

◆ The Earth and the Planets revolve around the Sun







- ← Arthur Cayley (1821 – 1895)
- ◆ Group Theory
- ◆ Cayley tables
- ◆ Permutation Groups
- ◆ Matrices, Linear Algebra
- ◆ Cayley- Hamilton Theorem



- ← Evariste Galois (1811 – 1832)
- ◆ Killed in duel -for love or politics?
- ◆ Laid foundations of Group Theory

## Some Personalities of Mathematics: Groups, Symmetry and Conservation

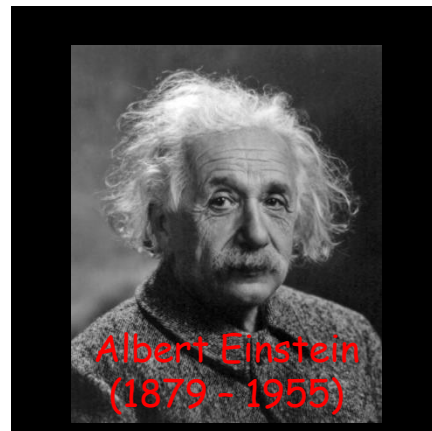
Emmy Noether →  
(1882 - 1935)

- ◆ Every conservation law is associated with a symmetry and vice versa
- ◆ Helped Albert Einstein with the mathematics of General Relativity

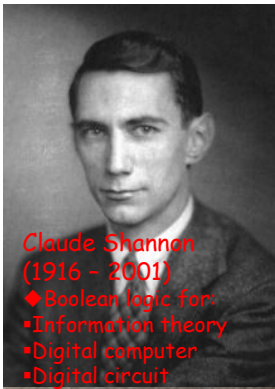


- ← Hermann Weyl (1885 – 1955)
- ◆ Symmetry structure of Quantum Mechanics
- ◆ Book (1931): *The Theory of Groups in Quantum Mechanics*
- ◆ Book (1952): *Symmetry*
- ◆ Powerful influence on development of modern physics: electromagnetism, general relativity, particle physics, gauge theories...

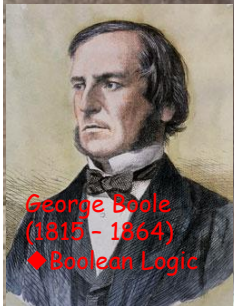
"Symmetry ... is one idea by which man through the ages has tried to comprehend and create order, beauty and perfection."



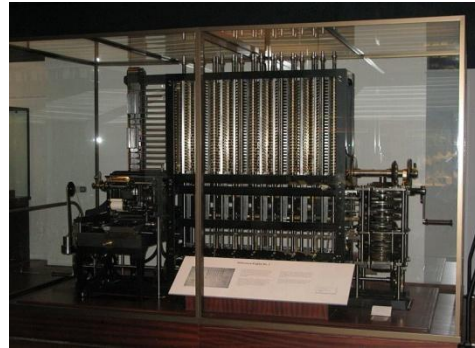
Albert Einstein  
(1879 - 1955)



Claude Shannon  
(1916 - 2001)  
◆ Boolean logic for:  
▪ Information theory  
▪ Digital computer  
▪ Digital circuit

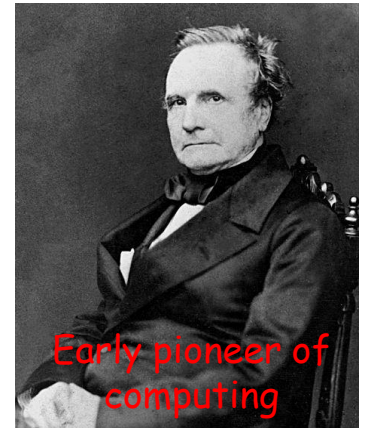


George Boole  
(1815 - 1864)  
◆ Boolean Logic

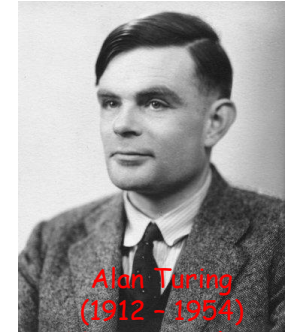


Babbage's difference engine

← Lady Ada Lovelace  
(1815 - 1852)  
Credited with inventing the first 'computer program' by showing how a machine could solve problems of any complexity.  
Daughter of the poet Lord Byron and friend and collaborator of the inventor and mathematician Charles Babbage (1791 -1871). →

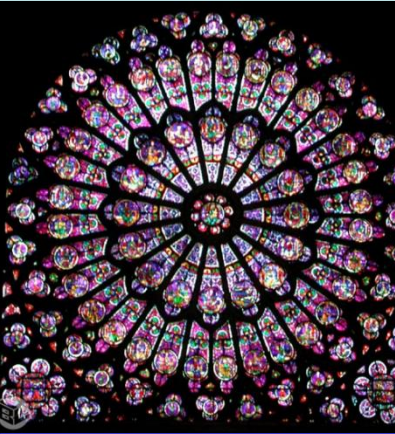


Early pioneer of computing



Alan Turing  
(1912 - 1954)  
◆ Turing machine  
◆ Modern programmable computers

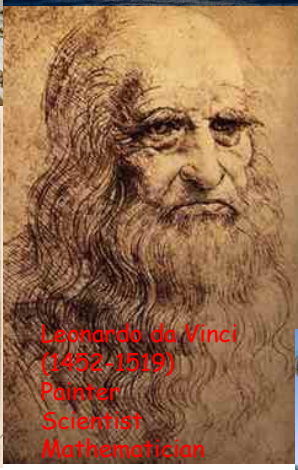
Some Personalities of Mathematics: computing



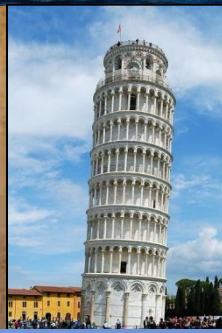
# Mathematics in Architecture and Art



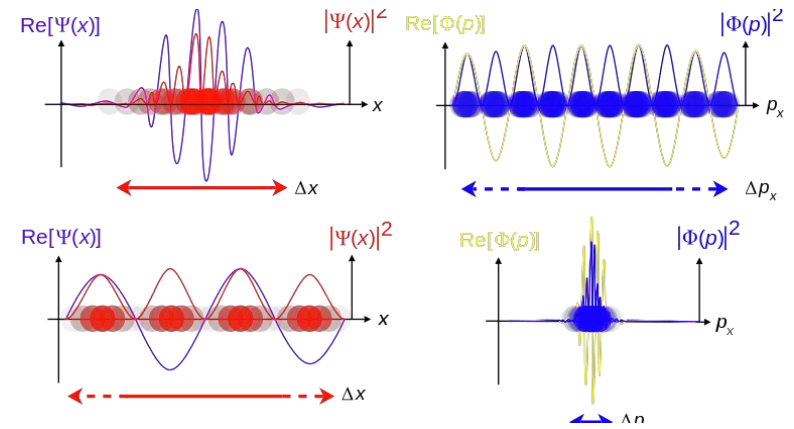
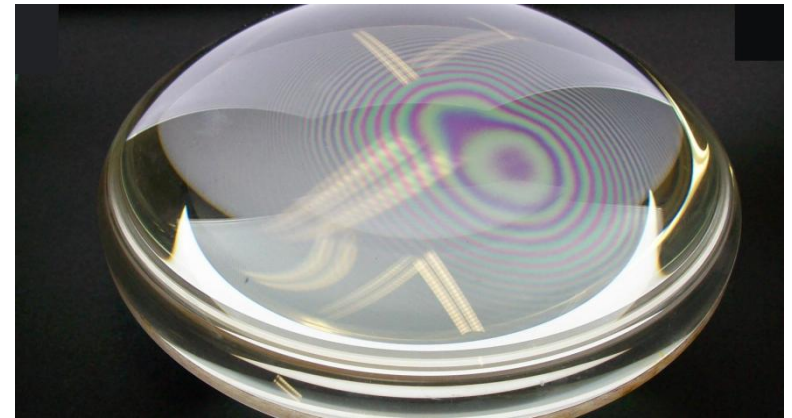
Christopher Wren (1632-1731)  
Architect  
Mathematician



Leonardo da Vinci (1452-1519)  
Painter  
Scientist  
Mathematician



# Mathematics in the Study of Waves and Vibrations



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☐ An A – Z of  
Uses of  
Mathematics

☐ WHAT  
WOULD  
YOU  
INCLUDE??

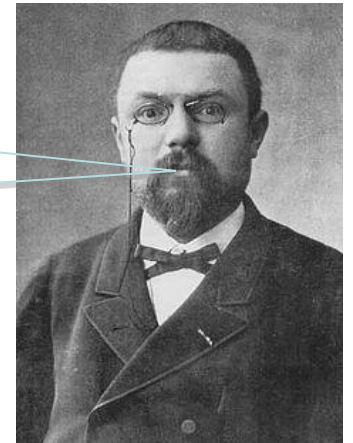
Aerospace	Navigation
Biology	Optimisation
Computing	Physics
Design	Quantum Systems
Engineering	Radiography
Finance	Social Sciences
Geology	Telecommunications
Hydrodynamics	Ultrasound
Insurance	Volcanology
Jurisprudence	Weather Forecasting
Kymography	X-Ray Imaging
Logic	Yield Analysis
Medicine	Zero Sum Games

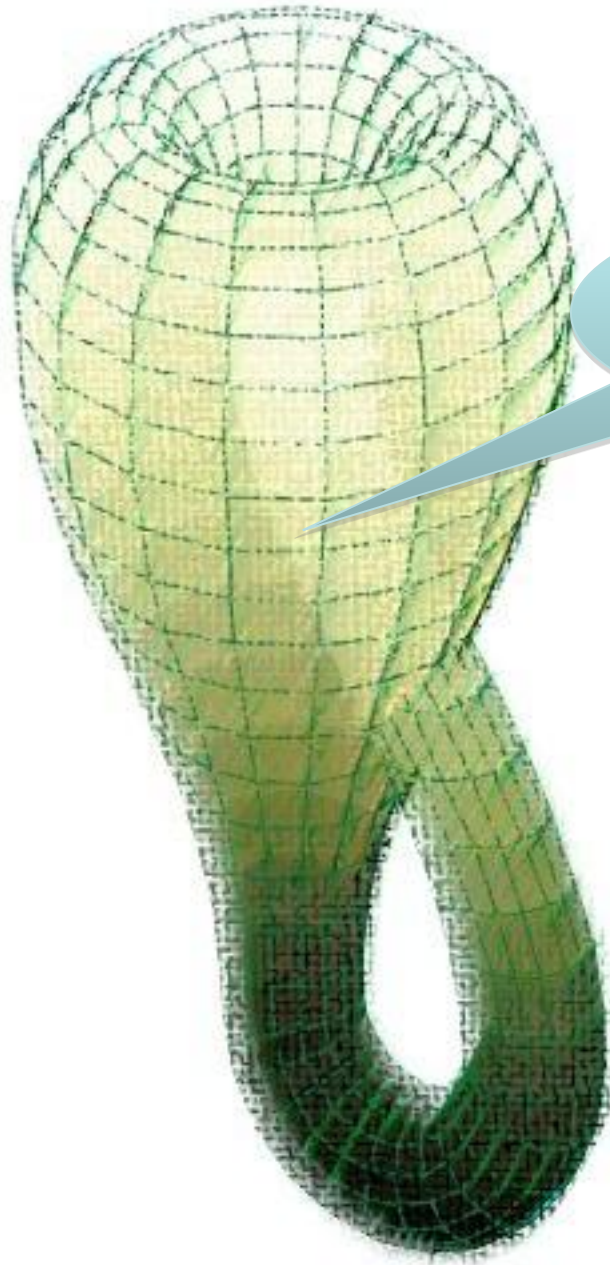
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Do you know what  
happened to  
Klein?

He got lost in  
his bottle!





Get me out of here!

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WELCOME to the UK's FIRST EXPLORATORIUM of MATHEMATICS

## □ Zones for mathematical ideas:

□ Numbers large and small, curves and surfaces, risk, symmetry, change...

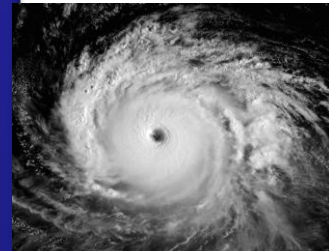
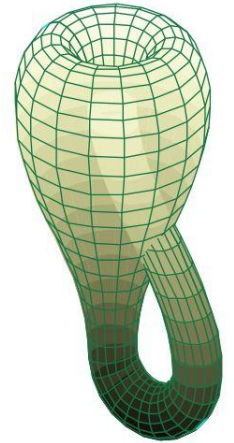
## □ Zones for the applications of maths:

□ Sport, medicine, computers, architecture, music, climate, security...

## □ Zones for people and stories in mathematics

□ Interactive displays, fun and puzzles for all

## □ Social meeting place: 'maths milieu'





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- ❑ Why mathematics?
- ❑ Because it reaches the parts other subjects do not reach

