

# From Archimedes to Automation in One Afternoon.

A Short Case Study by  
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## The Task

It is always an interesting time when talking about curriculum support requests with teachers.

Many schools are looking to make their ICT input as cross-curricular as possible and it was during one such discussion with a Year 5 teacher that I was set an interesting challenge.

“Can you cover ‘Control’ and ‘The Greeks’ in an afternoon?”

“Yes, I’m sure I can come up with something.”

## The Ideas

So what did the Greeks bring to the world of control?

It didn’t take long to find the great ‘Archimedes’ mathematician, physicist, engineer and inventor.

He is credited with designing innovative machines including siege engines and screw pumps.

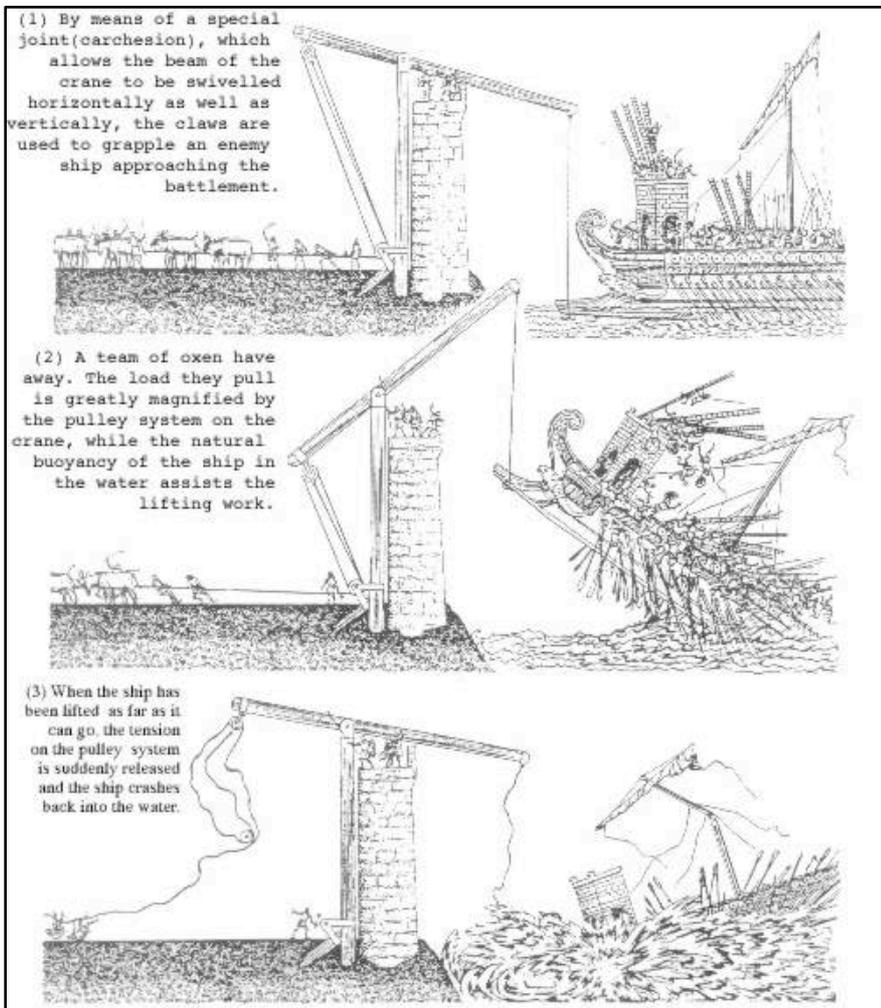
This started me thinking about the links we could make with the Design and Technology Unit 5C ‘Moving Toys’ where we could further investigate the use of levers and linkages.

Machines were created to make work easier

One machine, the ‘Aeorema’ or ‘mechane’, was a crane/arm-like device in an ancient Greek theater that could lower a ‘god’ onto the stage from the ‘heavens’ or made actors ‘fly’.

Archimedes designed machines capable of lifting attacking ships out of the water, the ‘Iron Hand’ or ‘Claw’.

This appears to be a forerunner of the medieval ‘Trebuchet’.



The word Automaton is derived from the Greek automatos, meaning “acting of one’s own will”.

Automation or industrial automation or numerical control is the use of control systems such as computers to control industrial machinery and processes, reducing the need for human intervention.

So ‘Control’ in the form of automation is a step beyond mechanization.

## The Solution

- \*Look at Archimedes and two of his inventions, the claw and screw.
- \*Use a lever linkage board to investigate some elements of the claw construction further. Introduce the terminology of ‘input’ and ‘output’ when referring to the movements.
- \*Introduce the simple lever mechanism and relate to the Greek theatre device. Have the pupils construct their own version using cardboard and paper fasteners.
- \*Use interactive simulations of a Trebuchet and Archimedes Screw in putting data and constructing machines to solve problems
- \*(In this particular case we split the group into two; one half made lever linkage mechanisms while the second half used the PCs and we rotated the activities.)
- \*Introduce the idea of automation as it is used in the Modern World and how it is controlled.
- \*Show the pupils how to write programs to control outputs in ‘Flowol2’ and allow time for experimentation using the built in mimics.

## Cross curricular links

History-The Greeks Unit 15: How do we use Ancient Greek ideas today?

ICT-Control Unit 5E: Controlling devices

Design&Technology-Unit 5C: Moving Toys  
Literacy-phonics, spelling and word derivation. Dramatic convention.  
Numeracy-(PSRN) problem solving, reasoning and numeracy, angles,  
weights and measures.

### **Extension**

It would be desirable to extend the pupils knowledge in the control of inputs, motors and buzzers.

The school had a control box which was only capable of working via a serial cable and so needed upgrading-however once in place it would be possible to make some more robust models of Greek machines or windmills and connect them to the 'Flowol' control software.

### **Useful websites**

<http://www.mlahanas.de/Greeks/InventionsC.htm>

<http://www.globalspec.com/trebuchet/>

<http://puzzling.caret.cam.ac.uk/game.php?game=11&age=1>

[http://www.sciencemuseum.org.uk/onlinestuff/games/grain\\_strain.aspx](http://www.sciencemuseum.org.uk/onlinestuff/games/grain_strain.aspx)

**“ ....this is fantastic, I'd never have thought of doing it in quite this way, but I can now see lots of ways I can take it further.....”**

**“I'm going to make a big theatre display over there and we can make really big levers to make the actors moves on it....”**  
**(class teacher)**

**“...can I put more than one lever on my machine 'cos I want to have two things happening?”**

**“Ah..I've got it....now I can see what to do to make the stone go further next time.....”**

**“How do I get on this site at home?”**  
**(Year 5 pupils)**

**We had quite a few “Eureka!” moments in this session.**