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A Brief History of Physics

What exactly *is* physics?
Well, in a way, it's everything.

Physics aims to tell us about a Big Bang that created the universe long ago, to explain how people got here from there (and why we won't be going anywhere else in a hurry), and to show how and why everything around us works as it does.

It tells how the first bits of matter appeared, how the first stars were born, and how, over billions of years, the universe came to be the vast and amazing place we know, with our planet an insignificant speck on the edge of one galaxy in 125 billion.

It explains almost everything that happens in the world around us: energy and movement, sound and light, electricity and matter. And its laws form the basis of chemistry and biology.

Physics also suggests exciting new ideas. For example, it says that time travel may be possible. Unfortunately, it also says that we're probably too big to have a go.

In short, modern physics gives us a fascinating, awe-

inspiring and sometimes downright weird view of the universe and our place in it.

Falling apples and rising balloons are just the start.



It's the law

Physicists – a mixture of mathematical thinkers and more practical types who enjoy doing experiments, such as smashing tiny bits of stuff into even tinier bits – think that they can explain all this because everything happens according to laws of nature.

These laws show that, if this happens, then so will that. If I hang a weight (me, for example) from a spring, the amount it stretches will be proportional to my weight: double the weight, double the stretch. (This particular law is known as Hooke's Law because it was discovered by the seventeenth-century British physicist Robert Hooke.)

The laws of physics are useful to us because physics is a practical science. What we've learned has helped us build everything from bathroom scales (that spring again) to a billion shiny gadgets, from the bulbs that light up our cities to the aircraft that don't (usually) crash down on them.

Of course, it has also brought us enough nuclear warheads to blow all of this – and us, and life as we know it – to bits.

How we found physics

People have always tried to explain and predict the world around them. It seems to be an essential part of what

makes us human. But it wasn't until we got past blaming everything from lightning to earthquakes on a bunch of irritable gods that we started getting anything useful out of our explanations.

So that's what physics is. But a quick run through two and a half millennia of scientific progress will give us a better idea of how it got us here. And, hopefully, prove to anyone still frightened by the subject that it doesn't bite – even if it does bang.

It's all Greek

Almost 2,500 years ago, the ancient Greeks did a lot of thinking about science. As well as running around naked at the first Olympic games, writing tall tales about gods, cunning heroes and many-headed monsters, and building wonderful temples, they came up with plenty of interesting theories.

For example, Thales supposed that all the earth floated on water, so that earthquakes were caused by waves. Aristotle, whose *Physica* is the first work on physics to use the word in the title, believed everything in the world was made up of earth, air, fire and water, with the heavens made of a divine substance called aether. Smoke, he thought, rose, because it was mainly made up of air, and air always tended to be above earth.

These were nice simple theories, but the Greeks generally argued that an object does something because it's the kind of object that does that kind of thing. This gets us nowhere: it's a circular argument; a good example of what modern physics isn't. (Today, we try to explain

things in terms of other things, which is a nice way of saying we usually like to blame someone else.)

Strictly speaking, the Greeks said that, for example, all circles we see are somehow shadows of the ‘Form’ of roundness. Forms were supposed to be divine, perfect and not of this world, so that the Form of roundness set the perfect example for all other round things. But, it seems, there’s no getting round the fact that an object’s roundness is still explained by the fact that it is, well, round. Which is, as we noted, circular.

Mind games

Part of the problem was that the ancient Greeks tended to think that you should be able to work out what happens in the world through the power of thought alone. The world around us was imperfect, so, they thought, there wasn’t much point looking at it too closely and expecting it to behave in a regular way.

And even when they did observe what was going on around them, they made some strange mistakes. For example, Aristotle made detailed studies of plants and animals, but thought that, as a rule, men have more teeth than women.

Predicting the planets

A few hundred years later, another ancient Greek called Ptolemy (ignore that first ‘p’ when you say his name or you may be accused of spitting) came up with a fairly