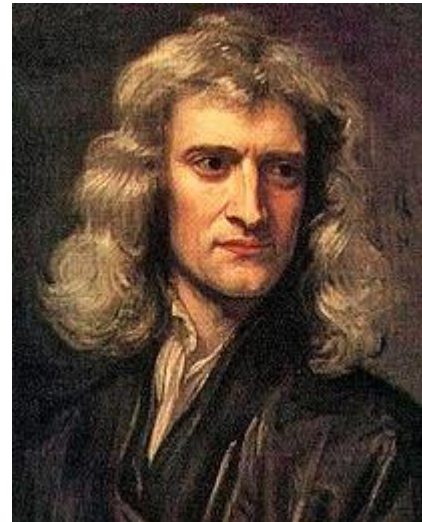


For this 'on this day' email, we go back to 16 April 1705, which was the day that QUEEN ANNE OF ENGLAND knighted ISAAC NEWTON for his brilliant work on mathematics and science - so from that day onward he was known as 'Sir' Isaac Newton. Maybe one day you will be knighted by the King of England (we will have a King by the time you are grown up) for your brilliant work in some area or other - we will see...



So Newton was one of the greatest mathematicians and scientists since ARCHIMEDES, who we talked about on Monday. Newton was interested in lots of things, but most famous for thinking about how things move. This led him to come up with a number of LAWS OF MOTION, the first one of which was that if something is just resting and still, it won't move unless a force is applied to it. So if you are just sitting on the sofa, you can't get off the sofa to do something else unless you force yourself to get up - you have to make the effort to push yourself into action. Newton's second law of motion that was when a force is applied to something, that something will not just start to move, but the speed at which it moves will increase for as long as the force is applied - and the rate at which the speed increases (the acceleration) will be greater, the greater the force. You see this law working when your mummy is driving. If she puts her foot down on the gas pedal, that applies force to the wheels of the car, and they not only speed up, but they turn faster and faster until your mummy takes her foot off the pedal, and stops the car accelerating.

These laws of motion led Newton to a very important discovery. The story goes that he was resting one day underneath an apple tree in his mummy's garden, when an apple fell from the tree and boinked him on the head. He then started thinking - why did the apple fall to the ground? His first law of motion tells us that the apple would not have moved unless there was some force applied to it - but what force was this? After all, no one had been up in the apple tree and taken an apple and chucked it at Newton. The apple just fell, of its own accord. So Newton came up with a theory - the theory of GRAVITY. What was pulling the apple to the ground was a force that Newton called 'gravity', and Newton suggested that everything in the world that has MASS (you, me, the iPad you are looking at this email on, the sofa you are sitting on, the food your mummy cooks for you – basically anything you can touch) exerts this force on everything else in the world that has mass. This force gets stronger the more mass something has, but it gets weaker the greater the distance between two objects that have mass. That's why the apple fell to the ground. The Earth is so big, it has a lot of mass (it's estimated the mass of the earth is about $6 \times 100 \times 100 \times 100 \times 100 \times 100 \times 100 \times 100 \times 100 \times 100 \times 100 \times 100$ kilograms) and so the force of gravity is very powerful between the Earth and anything near it. So the apple falls to the ground because the Earth's gravity pulls the apple towards the ground. This is also why the Moon goes round the Earth rather than just flying off into space - the force of gravity created by the Earth's mass keeps the Moon spinning around the Earth.

Newton's work on the laws of motion and gravity was so brilliant that for 300 years everyone assumed it was true. But then in the 20th century something was discovered that made people think that Newton's laws of motion didn't work properly. It was discovered that no matter how much force you apply to something, nothing can travel faster than the SPEED OF LIGHT. This seemed inconsistent with Newton's second law of motion. If your mummy

keeps her foot on the gas pedal in her car, the speed of the car should keep going up and up and up, until the car is travelling faster than light itself. But it was discovered this wasn't true – something stops things travelling faster than light. It took another brilliant genius called ALBERT EINSTEIN to explain why this was. And this led him to further discoveries about the nature of the force of gravity. But that's a story for another day.