I thought that for today's 'On this day' email, that we could go back to the 30 April 1897, when the British scientist J J THOMSON was the first person ever to suggest that the basic building block of matter - the ATOM - contained within it one or more tiny, tiny, tiny, tiny, tiny, tiny, tiny, tiny particles that he called ELECTRONS.

The Ancient Greeks were the first to suggest that everything in the universe is made up of tiny particles that they called 'atoms'. In Greek, 'atom' means 'uncuttable' or 'indivisible'. So the Greek was that everything in the universe was made up of these tiny particles, but these particles were not made up of anything else - they couldn't be cut or divided into something more fundamental or basic. So that suggestion was first made in 500 BC - 500 years before the birth of Christ - and had been accepted ever since then because it seemed to make sense. If you take a model made out of Lego, you can break it up into all the Lego bricks that go to make up the model, and then if you take one of those bricks you can cut it in half, and then cut one of the halves in half (what do you get if you halve a half - you get a quarter!), and then keep on cutting, keen on cutting, ever smaller and smaller - at some point you have got to get to something that can't be cut or divided anymore. And that was the atom - the basic building block of matter. So for almost 2,500 years people believed that the atom, which made up everything in the universe, consisted in one unbreakable particle. And you might have different kinds of atoms - but they would just be unbreakable particles of different sizes. So the hydrogen atom was the smallest sized unbreakable particle, the heilum atom was the next smallest, lithium was the next smallest, and so on.

So this is what everyone thought until JJ THOMSON came along, and he suggested that - no the atom is more complicated than that. Yes - part of the atom consists in a central unbreakable particle, which we can call the NUCLEUS (pronounced 'New - clee - oos') of the atom. But whizzing around the nucleus are one or more much tinier unbreakable particles, which he called ELECTRONS. So hydrogen has the smallest sized nucleus, but it also has one electron whizzing around that nucleus. Helium has the next smallest sized nucleus, but it also has two electrons whizzing around that nucleus. And lithium has the next smallest sized nucleus, and that has three electrons whizzing around the nucleus. So every atom is like a mini solar system. The nucleus is like the sun, and the electrons are like the planets moving around the sun. In our solar system, the sun has 8 planets moving around it (they are MERCURY, VENUS, EARTH, MARS, JUPITER, SATURN, URANUS, and NEPTUNE - it used to be that PLUTO was also counted as a planet, but they don't count that any more as it's too small - and you can remember the names of these planets using this MNEMONIC (remember, a mnemonic is a saying the first letters of which help you remember something) - My Very Enthusiastic Mother Just Served Us Noodles!). The atom that has eight electrons whizzing around its nucleus is OXYGEN - a very important atom, because without it we couldn't breathe!

JJ THOMSON's discovery was very important because it helped us understand more about the atoms that make up our universe. It also helped us understand ELECTRICITY. Even back to the days of the Ancient Greeks, people knew they could get shocks from touching certain fish, and that rubbing certain things like amber against fur meant that things were attracted to the amber - but no one understand why this was. And everyone knew about lightning and how frightening that was - but no one really understood where it came from or how it was

produced. And in 1800 an Italian scientist called ALESSANDRO VOLTA showed that if you mixed certain chemicals together, wires inserted into the mixture would get hot and could shock you if you touched them - but no one really understood why this was. But JJ THOMSON's discovery of the electron made it much clearer - electricity is produced by the movement, or flow, of electrons through materials. What makes them flow is an imbalance in the CHARGE at each end of the material - the electrons move towards the positively charged end, and away from the negatively charged end. Have you ever heard the saying 'Opposites attract'? Well, this is where it comes from - the idea was that electrons have a negative charge and so they are attracted to the positively charged end of the material and away from the negatively charged end.

JJ THOMSON's discovery should also made it clear that while the atom is really, really, really tiny, at the scale of the atom - or the SUB-ATOMIC scale - the atom is actually huge. If you take a hydrogen atom - which I just said has a central nucleus and one electron whizzing around it - if you expand the nucleus to the size of a basketball so that we can see it properly, the electron whizzing around that nucleus would be two miles away! And there is nothing in between. So if you think about it, everything in the universe is made up of mostly nothing - a central nucleus, then nothing, and then a huge distance away some electrons whizzing around the central nucleus. Very scary!

But that wasn't the end of it, in terms of understanding the atom. 21 years later, another British scientist called ERNEST RUTHERFORD showed that not even the nucleus of an atom is uncuttable or indivisible. He showed that by firing particles at the nucleus of a very big atom, you could break that nucleus down into smaller nuclei (pronounced 'New - clee - i') - which is the plural of nucleus. This led to the suggestion that the nucleus of an atom is made up of smaller particles called PROTONS and NEUTRONS. So the the nucleus of a hydrogen atom is made up of one proton and one neutron (with one electron whizzing around them), the nucleus of a helium atom is made up of two protons and two neutrons (with two electrons whizzing around them), the nucleus of a lithium atom is made up of three protons and three neutrons (with three electrons whizzing around them), and so on. It was also discovered that when you broke up the nucleus of an atom, you got a big release of ENERGY, in line with a formula proposed by the genius physicist ALBERT EINSTEIN - where the amount of energy released equalled the amount of mass lost when the nucleus was broken up times the speed of light and times the speed of light again (or $E = MC^2$). And this led to the development of ATOMIC BOMBS, which produced huge explosions by breaking up the nuclei of atoms contained inside the bomb.

So - a very significant day in history, today - with good and bad consequences. But it's rare for anything to happen which only has good consequences.