More Examples of the Bright Ideas Time: The Big Question

This is such an exciting way of encouraging the pupils' thinking skills. It can seem a little scary as we, as teachers, do not know all the answers but the joy is in the finding out!

The Big Question		
National Curriculum	**Prompt**	**Subject knowledge/ideas**
Sc2: Life processes & living things	How do you know the person next to you is alive?	KS1/2: Whether or not something is alive and how it is possible to know is one of the big ideas in science. This discussion will lead to an exploration of the characteristics of living things.
	Is a tree alive?	KS1: It is harder for children to understand a plant is alive, as it does not obviously move and certainly does not talk!
	Is a flame alive?	KS2: A flame appears to exhibit many of the life processes: • Nutrition - it uses fuel • Growth – fires become larger • Movement – flames flicker • Reproduction – flames can leap from one place to another • It produces 'waste' – ash and smoke • It needs oxygen Of course, a flame is not living as it is not made up of cells and it is not growing, reproducing or producing waste in a biological sense. This can form the basis of a very interesting discussion.
	I planted a tree in my garden 4 years ago. It now weighs 250kg more. Where did this 250kg come from?	KS2: It is amazing to consider the fact that the mass of the tree has been produced as a result of photosynthesis. Pupils at Key Stage 2 are not expected to understand the concept of photosynthesis but they are expected to understand 'the role of the leaf in producing new material for growth'. It is a common misconception amongst children and adults to think that the roots take in the food for the plant and this is not helped by the fact that some fertilisers are labelled 'plant food'! The roots take in the necessary minerals but the 'food' is provided by the Sun's energy which is captured in the leaf and together with the carbon dioxide and water forms the mass of the plant. The pupils therefore need to understand that the light and water and air (the carbon dioxide) are necessary for growth because the leaf 'processes' these to form the mass of the plant.

Sc3: Materials and their properties	What are the properties of a solid?	KS1/2: This is quite a challenging question - children often describe a solid as hard and can then be shown a sponge and asked if that is then a liquid. It is worth pointing out that we tend to recognise quickly which materials are liquids and which are solids but we find it very hard to pin down how our brain carries out this categorisation.
	What are the properties of a liquid?	KS1/2: Children will often describe a liquid as wet but what exactly does wet mean? They will tend to say that you can 'put your hand through a liquid' but then I can put my hand through sand in a sandpit. Children tend to be able to arrive at the concept of a solid having a fixed shape whilst a liquid will take the shape of its container. They may well lead them to point out that sand or flour will take the shape of its container. However, of course, one grain of sand will have a fixed shape. In scientific terms, the definitions can be made short and sharp: • a solid has a fixed volume and a fixed shape; • a liquid has a fixed volume and no fixed shape
	Where does a puddle go?	KS2: This is an example of evaporation, i.e. the change of state of the water in the puddle from a liquid to a gas. The liquid water in the puddle evaporates and becomes water vapour which is a gas. Evaporation is different from boiling! It takes place at a lower temperature and is much less vigorous. Evaporation takes place more rapidly when there is a large surface area so a puddle is ideal.
	Where does salt go when it is dissolved in water?	KS2: When a solid dissolves, it appears to disappear but where has it gone? This can lead to the big idea of atoms as the solid breaks down into very, very small particles which are spread throughout the particles of the liquid. They are so small that they cannot be seen.
Sc4: Physical processes	What can you see when there is absolutely no light?	KS1: Being in pitch darkness, where a hand literally cannot be seen in front of a face, brings home the concept that there needs to be a source of light in order to see. This then leads on to the following question.
	Why do we see 'history' whenever we look at the stars?	KS2: We see the stars as they were when the light left them. This means that there is a slight chance that some of the stars that we see no longer exist. Since the light that enters our eyes left them thousands or millions of years ago, it is possible that some have undergone a catastrophic happening and no longer exist as stars. It is also salutary to consider the fact that when the light left some of these stars, dinosaurs existed on Earth. The light that enters our eyes from

		these stars has been travelling through space since the time of the dinosaurs & only now enters our eyes!
	Why are insulators as important as conductors?	KS2: It is interesting to realise that electricity would be unusable if insulators did not exist, as well as conductors. Turning on any switch would a shocking experience!
	Why do the Sun and the Moon look the same size in the sky?	KS2: The Sun appears the same size as the Moon because it is much further away. In fact, the diameter of the Sun is 400 times the diameter of the Moon but it is also 400 times further away. This is an amazing co-incidence which means that the disc of the Sun, as we see it from the Earth, is almost identical in size to the disc of the Moon in the sky. The Moon can therefore just cover the Sun and obscure it completely during a total eclipse.
	What is between the Earth and the Sun?	KS2: Admittedly, there are two other planets between them but these are also relatively tiny and are in constant orbit around the Sun. Children tend to have quite a crowded picture of space and tend to think that there are other stars between the Earth and the Sun. They may also mention meteorites, asteroids etc. They will be very small amounts of matter but basically, there is just about nothing between the Sun and us. Nothingness is a very difficult concept to grasp.
	Why don't we feel dizzy?	KS2: We teach children that we live on a spinning Earth. We are expected to believe that all this motion is going on and yet when we look out of the window, everything looks very still! It is equally interesting to ask adults the same question - a common reply is, 'We are moving so slowly that we cannot feel it.' If the size of the Earth is considered and the fact that it turns all the way around once every 24 hours, then it cannot be moving slowly -–in fact, quite the reverse. The Earth is also moving on a huge orbit around the Sun once a year so it is, in fact, moving very fast indeed. The fact is that everything is moving **with** us and so we do not sense the motion. This is relativity! It is rather like being on a train at a station and the train next to you seems to move off. The only way to tell if it your train moving or the one next to you is to look at an external frame of reference – the station platform! If everything moves with you, e.g. being on a plane with the blinds down, there is no sense of being in motion, unless the plane changes its speed.