Perspective assembly

We live busy lives, full of action and activity. Sometimes things go well; sometimes things don't go well. Either way, we tend to give the greatest significance to things that are near us, and things that affect us most. That is why we sometimes lose perspective. We treat a minor setback as though it were the end of the world, or we take a small success as the greatest thing ever. It has never been more important to gain perspective. Looking at our lives from a distance, as it were. Seeing the big picture. Gaining the context which allows us to untangle competing areas of urgency or concern.

I have spoken previously about the healing qualities of humbling ourselves before something majestic. Gazing out across a mighty range of mountains or looking up at the night sky is therapeutic. The Romantics called it an experience of the sublime, and thought it the essence of their poetry or art.

Some Romantics were led to push back at science. They thought that understanding would strip the sublime of its power. The poet John Keats famously attacked Isaac Newton, saying that in his scientific work on light and prisms he was destroying the wonder of the rainbow. Keats said that Newton had 'reduced the rainbow to its prismatic colours'. I think Keats was wrong – science can give important perspective as well as deep wonder.

In fact, I think a rainbow is even more wondrous when we know how it comes about. Listen. A beam of light moves at different speeds according to what it is passing through – it only goes at the speed of light in the vacuum of space. So when a beam of light goes into a drop of rain, it slows down, and that bends (or refracts) the beam. Sunlight contains all the wavelengths of light, which we see as different colours. The different wavelengths of light are bent to different degrees, so the colours separate. This creates the spectrum of colours.

But it's not all about refraction. The refracted beam of light in the falling raindrop hits the back of the droplet and some of it is reflected back, like a mirror. That light then gets a little more refraction as it exits the raindrop from the front. This separates the colours yet further. This refraction, reflection, refraction is what makes a rainbow.

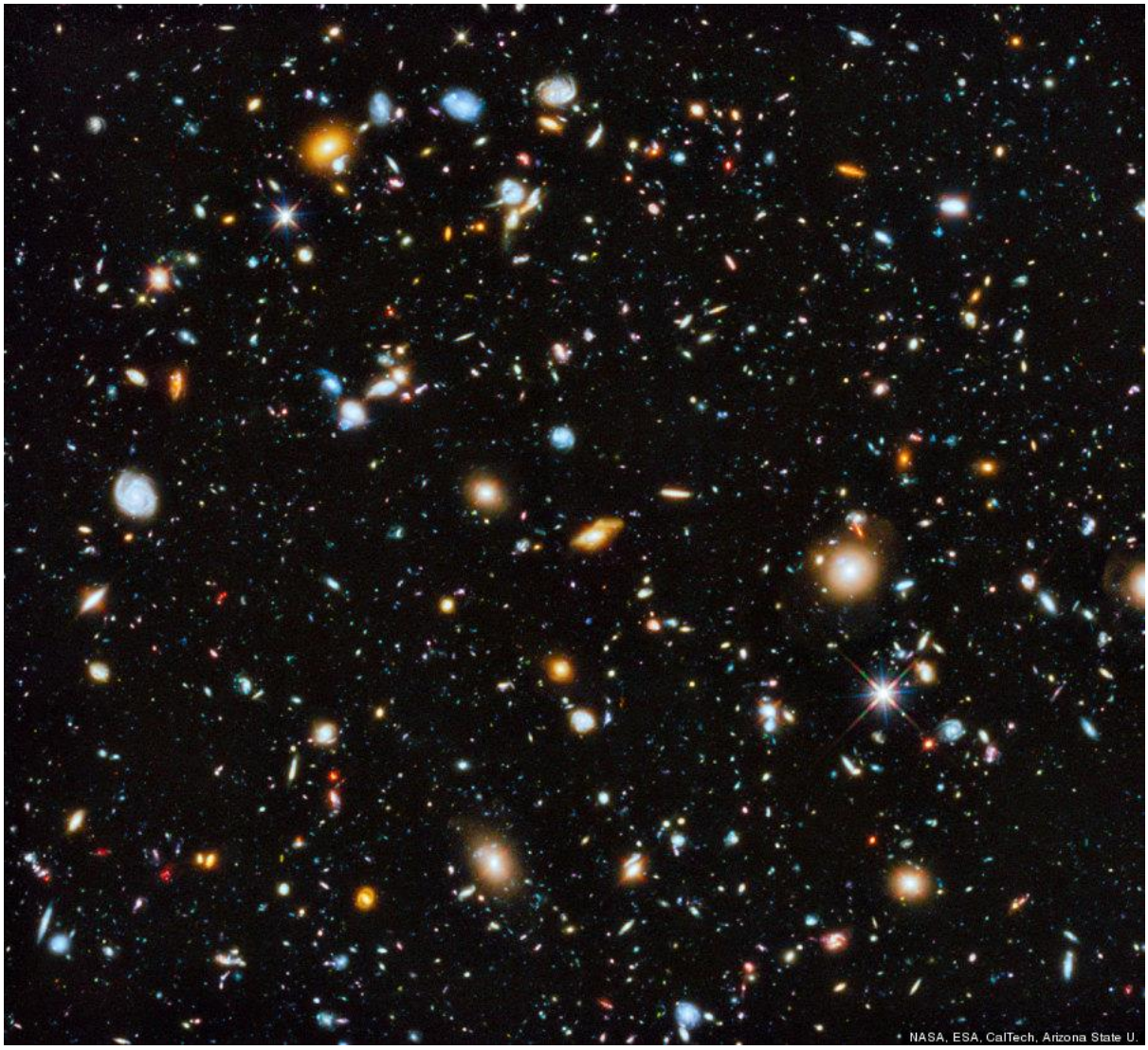
What about a double rainbow? The other bow is caused by light reflecting not once, but twice. The beam of light bounces for a second time, and emerges from the back of the droplet of falling rain. That second reflection is the reason why the colours of the rainbow are reversed in the secondary rainbow. Did you know that? Here is a picture to prove it.

I find that wondrous, and I find it gives me perspective – to think of a beam of light ricocheting amongst and through falling drops of rain.

Here's another source of perspective: the vastness of space. This is an image of the Milky Way galaxy – our home galaxy. You are looking edge-wise across a disk of stars 100,000 light years wide. Before you lie 400 billion stars.

Here is another image of the Millky Way. The glow in the centre is the heart of the galaxy, containing a supermassive black hole around which the whole galaxy turns. Dust clouds make the view a little more obscure. Imagine the size of the thing.

Here is a picture taken by the Hubble Space Telescope. They focussed upon a tiny spot in the night sky that seemed to be completely dark, with no light source in it. Then they exposed the camera to that spot during the course of 841 orbits of Hubble between 2003 and 2012. What they found in that apparently empty spot amazed them. You are looking at the picture they produced. In that tiny black space were 10,000 galaxies. Every spot of light you can see in this picture is a galaxy. Each of these galaxies may contain 400 billion stars or more. There are billions and billions and billions of galaxies out there.



There's more. What you are looking at is made up of visible matter – the protons, neutrons and electrons which make up atoms. However, all visible matter – all the vastness you are looking at - is just 5% of the universe. You can't see the other 95%. Almost all of the universe is made up of something else called Dark Matter and Dark Energy. We don't know what they are.

There's more. All of that was once contained in a single tiny point, which then exploded.

There's more. There may be an almost infinite number of alternative universes.

Here is a familiar scene. These are the White Cliffs of Dover. They are made of chalk.

The second picture gives a sense of scale – these are big cliffs. They can reach 350m – that well over a thousand feet high. The chalk was laid down during the Late Cretaceous geological era, between 100 million and 66 million years ago. At that time much of what would become Europe was submerged under a great sea. The sea bottom was covered with white mud formed from tiny algae. The algae floated in the surface waters and when they died, their minute skeletons sank to the bottom and, together with the remains of other sea creatures, formed muddy sediments. The sediments were deposited very slowly, one tiny skeleton at a time. We think the chalk formed at an average rate of 1cm per 2000 years. The chalk layer is actually about 500m deep – not all of it is above ground. That means that the tiny creatures lived their lives, died, and added their skeletons to the mud at the bottom of a lost sea for about 25m years. They did this about 100m years ago. To put that in perspective, our own species has been around for about 200,000 years. The entire length of time humans have existed would have added a single metre to a chalk deposit that is 500m deep. An average human life would add 4mm.

Are you feeling the perspective yet? Is it fun or is it a little scary? Scary can be good too.

Let me show you a final picture.

This is a lump of rock that was found in a desert in Morocco and given to me about ten years ago. I have it in my hand now. I call it my rock of perspective and I lend it to colleagues who might benefit from a little perspective and sense of wonder. Before I tell you about this rock and what it represents, let me give you a little context.

The earliest evidence of life is found in rocks from Greenland. The microbes in those rocks lived 3.7 billion years ago. For more than a billion years, all life was single-celled organisms, made up mainly of bacteria and algae.

Since that time there have been five official mass extinctions, where almost all life on earth was wiped out by one cause or another. The dinosaurs died in the last one, 65 million years ago, when a meteorite hit the Earth. Other causes of mass extinctions range from the massive lowering of the Earth's temperatures, to huge volcanic eruptions.

There is actually a sixth mass extinction, which was the earliest. About 2 billion years ago more sunlight was starting to penetrate the earth's toxic atmosphere. If you went back in time to that stage of the planet's development you would instantly choke to death. The atmosphere was poisonous and contained no oxygen, which you need to live.

Remember those microbes in the rocks from Greenland? These organisms were anaerobic - they lived in the absence of oxygen. They processed the other chemicals that were abundant in the early atmosphere and oceans. The efforts of these microbes created the conditions for all other life to evolve across the earth, but they didn't survive to see it. Cyanobacteria, named after their blue/green colour, were about to make an incredible breakthrough. They discovered how to use photosynthesis. The light of the sun – maybe bouncing through ancient rainbows - was used to turn carbon dioxide into energy. The by-product of photosynthesis is oxygen. Oxygen was a deadly poison to almost all life on Earth at the time. Almost all life died, leaving the blue-green algae with a planet all for themselves.

This rock is about 2 billion years old. It is a fossil of that blue-green algae – you can see the yearly layers of growth like rings on a tree. What I hold in my hand is incredibly ancient but it is more than that – it is the reason we in the room exist and are able to stay alive. It wiped out almost all life on Earth but it put the oxygen that you need in order to live into the

atmosphere. You, and all other life on Earth, owe your existence to the fossil I hold in my hand.

I hope I have expanded the horizons of your mind this morning. I hope you have learned something new. In addition to that knowledge, I hope you might have a little wisdom as well. My advice is this. Always maintain a bit of perspective. Don't be frightened to place yourself in context against immense and awe-inspiring things.

In doing so, don't see yourself as being small or insignificant – instead allow yourself to be awed and humbled by the majesty of our everyday surroundings. Accepting and appreciated the wonder and majesty of the world around us can only make us greater and wiser ourselves.