Unveiling the infinite

'The universe is written in the language of mathematics… without which it is humanely impossible to understand a single word of it; without this language, we wander about in a dark labyrinth'
-Galileo Galilei

Maths is beautiful. Maths explains almost everything man ever wished to know. It truly is the language of the universe as we know it.

Maths is the language of everything that surrounds us. Almost everything from vast galaxies to the minute cells and quarks that make up all matter can be explained using numbers, equations and expressions; some are so simple that we are exposed to them from our first few years of education, yet some are so complex that only very few people will ever understand them.

I use this word: 'almost', as there are still conjectures mathematicians over the span of centuries have not been able to explain using this 'universal' language. Where did this all come from? Almost one billion cubic light years of matter is compressed into our universe yet we're still not certain how it's ended up here.

Why are there things maths doesn't seem to have the answers to? Perhaps the minds of mere mortals cannot create a construct able to obtain answers for everything since the start of the universe. Maybe maths isn't a man-made construct after all? Perchance there are things we are yet to discover.

Math has been around forever. Right angled triangles didn't suddenly start working with the equation a^2 + b^2 = c^2, just because Pythagoras said they do. They always followed this nature. Humanity doesn't create math. Math has always existed, and each new theorem should merely be seen as a discovery, almost like finding a new species.

It's a language like any other; a form of communication and a way to understand things. Like all languages, maths can be denoted using lines and curves placed in a

particular, agreed upon way. Just like all languages, maths must have a creator. All languages spoken on earth are created by groups of people living in one specific area. If this is the case, who should be credited with creating a language 'spoken' by every star, atom and planet in our universe.

I believe the ability to design a language that explains everything in the entire universe is beyond human capabilities. Sure, we have created a logical way in which maths can be understood; however, the creation of such a complex and detailed language, that we barely understand ourselves, should not be credited to a population with a very 'tunnel visioned' and like-minded view of the universe.

A branch of mathematics that has inspired this idea is fractal geometry. Fractals are infinitely complex patterns that are self-similar across different scales. At first glance the lines and curves creating these patterns seem to have distant correlations to our universe let alone things we experience on a day-to-day basis. However, fractal geometry truly is an area of intimacy between pure mathematics and nature. Fractals are everywhere: clouds are not spheres, bark is not smooth, lightening doesn't strike in straight lines. Fractal geometry surrounds us wherever we are and ultimately provides us with a key to understanding our universe.

Humans did not construct fractals. They did not randomly appear in our universe because humanity said they existed. Like everything else around us, we discovered them and put them into a system which allows us to attempt to understand their complex and infinite nature.

In 1980, one of the most intricate and beautiful fractals in mathematics was discovered: the Mandelbrot set. Most people within the mathematics community, and many people outside of the discipline, have seen this image and have marvelled at its geometric intricacy. The fractal itself, apart from being hugely fascinating to look at, has even had real world applications. For example: low flying terrain navigation, potential placement of roads, tunnels and bridges, or area measurements.
Zooming into the set we see an infinitely complicated boundary reveals ever-finer recursive detail at increasing magnification. Such a complex and intricate piece of

mathematics that was discovered (not constructed) by a French Mathematician, Benoit Mandelbrot. The equation behind this complex fractal is relatively simple. Benoit took a complex number (z), squared it and then added a constant (c) to it.

(∴ the equation is f(z)= z^2 + c)

Mandelbrot repeated this equation for each ax+bi point in the area, and based on the behaviour on the calculation, chose a colour for that point. 'If a point takes one iteration to escape, its assigned colour one. If a point takes two iterations to escape, its assigned colour two.'

https://luckgrib.com/fractally/what.html#:~:text=Assigning%20a%20color.&text=as%20we%20know%20it%20escapes,escape%2C%20its%20assigned%20color%20two.

That's it! A fractal so complex and intricate, yet the mathematics behind it is simple enough for a ten-year-old child to understand. Maths fans all over the world, including myself, have been fascinated by this fractal. Personally, it has completely altered the way I perceive maths. Mandelbrot clearly discovered the fractal; he didn't construct square numbers; he didn't construct addition, and he did not construct the way a number behaves. The nature of how this equation works was discovered. It existed prior to Mandelbrot plotting it onto a complex plain, however, without his genius, it would have never been discovered.

We have brought ourselves to this delusion, believing the human mind is capable of creating constructs able to explain almost everything around us. We struggle to perceive the concepts of infinity, yet believe we are able to create a language, which even in its basic, purest form creates a fractal which displays this infinite behaviour.

So, how exactly was maths formed? I believe there is some 'greater intelligence'. After all, the Mandelbrot set is often referred to as 'Gods finger print'.

If some 'greater intelligence' is the reason the universe works the way it does then where did it come from? This comes back to the infamous dilemma of whether the chicken or the egg came first.

My answer to that question is we haven't been around for long enough to know; we haven't existed long enough as a species to discover everything. Whatever the true answer is, I'm excited for the future of mathematics and the answers they bring us (even if it disproves everything I have said!)