

## Time and prayer

Chaos takes time to result in something new. The weather does not change immediately because of the butterfly wing flap on the other side of the Atlantic. God, I believe, wants to hear our needs – most good parents do – and they want to do something about them, but time is important. The later you ask, the bigger the miracle required. Seek a healing of a cut on your foot, you seek a small miracle, seek a new leg when it has had to be amputated, you seek something unheard of.



## And fractals?

Fractals are generated by the same kind of formulae I introduced earlier.

They are universally beautiful with infinite detail whatever the magnification. They are also on the edge of things. The UK coastline is a fractal, unpredictable, beautiful. A cauliflower is a beautifully structured fractal with layer after layer of complexity. It is as if the beauty of the world is in these kind of systems, where the predictable edges into the unpredictable. Some people call this liminal, and they say that is where God is found. I love the imagery of that.

Heisenberg's uncertainty principle means that we now know that uncertainty about where something actually is located is built into the fabric of everything

It means you can never eliminate what seems to be randomness, but it just might be where God is.

## So what about pain?

It begs the question that if God can be so connected to human kind why is there pain and suffering. That is more complex because often pain and suffering are the consequences of our own behaviour rather than some divine providence. What is impossible to determine is the degree by which God already intervenes to counter pain and suffering. Given the model of Jesus on the cross for humankind, it seems that God would intervene to the absolute ultimate for us, but that intervention does not take away our freewill, and that is key. Indeed if the intervention did take that away we would no longer be able to love, give, worship, and live freely – we would no longer be made in the image of God, but operated as drones of the Almighty. Freewill really is both a dangerous and amazing gift of love.



At that edge of humanity is divinity, and it is that beautiful edge that connection, that unprovable engagement of God with us that makes us beautiful.

<sup>1</sup>Matt 13:31-32, <sup>2</sup>Matt 13:23, <sup>3</sup>Matt 13:33, <sup>4</sup>Mk 6:44, <sup>5</sup>Lk 21:2

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## Science and faith 2: chaos and fractals

In the 18<sup>th</sup> and 19<sup>th</sup> centuries many mathematicians, philosophers and scientists (including Descartes – see picture) believed they could explain everything that



happens in terms of cause and effect. Everything was totally predictable if only you knew enough about the

universe and how it operated. The universe worked by clockwork and people built clockwork orreries that modelled the solar system.



## So what went wrong

Well, the weather didn't help! They predict average temperature, wind and rain at a place on any particular date in the year, providing you kept enough records of years past, but they couldn't tell you if it was actually going to rain that day, or not. They could predict a day or two ahead by looking at the sky, but predicting a month ahead accurately didn't work. It still doesn't.



## Why can't we predict the weather?

We can, but only so far. To be accurate you need two things. Firstly you need to know an immense amount of data about the past and present, and secondly you need a big computer to process it



quickly enough so that your prediction arrives before the weather does!

The further forward you want to predict, the more data you have to

collect and the bigger the computer you need.

## The butterfly effect

Collecting this data is very big ask. Popularised by a film in the 1990s, the butterfly effect was the name given to the reality that the weather at one place in a month's time could well be dependent on the flap (or not) of one wing of a butterfly the other side of the ocean.



## How is that possible?

Well the problem is that the weather depends on itself. If it was raining an hour ago, there is a good chance it will be raining now. If it was raining down the road an hour ago, it increases the probability of rain now... and so on. It gets complicated! These kind of systems where something depends on itself in the past, are all over our world, indeed your life is full of it.

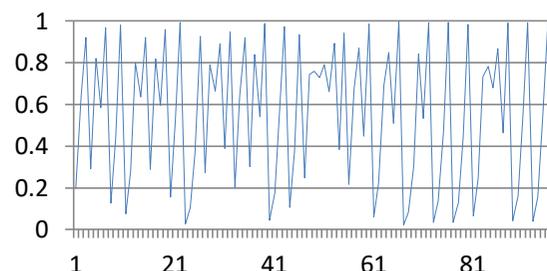
Special bit for those interested in Maths. Ignore - if you want to!! Here is a chaotic equation.

$$x_{n+1} = 3.98 x_n (1 - x_n)$$

If  $x_n$  starts at 0.2, say, it goes like this:

0.2, 0.64, 0.92, 0.29, 0.82, 0.58, 0.97, 0.13, 0.44

Unpredictable or what!



Your personality, at least in part, is dependent on your personality in the past. Unlike the weather, many such systems are very stable. I'm writing this in an aircraft whose engines operated on this principle. Their position is dependent on their position and speed a moment beforehand. But some systems are called chaotic because they are not predictable beyond some time limit.

Basically, if you had all the time in the universe and all silicon in all the planets in the universe were used to create a massive computer, it would never be enough to be totally accurate about the weather over Wimbledon in six months time.

## So what has this to do with God?

Well the butterfly effect shows it nicely. Where systems like the weather, and incidentally elements in our brains – like individual neurons

firing, are chaotic, it means the smallest, imperceptably miniscule change happening some time ago can influence, for example, your thinking, actions, the world about us.



This is built very firmly into our universe. And it gives God every opportunity to influence our lives and all life everywhere through the smallest, immeasurable, invisible event. It means that whilst we may never see or know the smallest miracle of God may be encouraging, inspiring or helping us.

This fits so well with Jesus' teaching. The picture of the mustard seed<sup>1</sup> growing into a great big tree, the seed sowing that produces 100-fold<sup>2</sup> growth, the yeast grain that leavens the bread<sup>3</sup>, the sandwich pack that feeds 5000<sup>4</sup>, the widow's mite<sup>5</sup> that is an essential gift worth having...

## Zillions of unseen miracles

Of course the annoying thing is that we don't see this operating. Anyone can say, it wasn't God it was indigestion. But that is the key to the faith thing. Faith is about being prepared to allocate some of that apparent randomness to the will of God. I would love to have seen the raising of Lazarus, the healing of the centurian's daughter, the sight-giving to blind Bartemaeus, but such 'big', obvious, faith-assuring miracles are apparently few and far-between compared to the constant influencing of the lives of billions of people every minute.