

An aerial photograph of a dense forest, where the trees are rendered in a dark, almost black, color. The forest exhibits a fractal-like structure, with smaller clusters of trees forming larger, more complex shapes. In the foreground, a large, prominent fractal tree structure is visible, characterized by its intricate, branching pattern. The ground is a light, pale blue color, and a faint, large-scale fractal pattern is visible on the surface, suggesting a self-similar structure. The overall scene is a visual representation of fractal geometry in nature.

**Exploring the Fractal
Geometry of a Mission
Shaped Church**

Pete Brazier

Exploring the Fractal Geometry of a Mission Shaped Church
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Contents

Introduction	3
Traditional or 'Euclidian' Geometry	5
Fractal Geometry	6
Drawing Fractals	7
Recognising Fractals	11
Dimensions	15
Fractal Theology	17
How big is your Church?	18
The Word of God	21
The Vine	21
"A discipleship movement shaped for mission"	22
Holy Communion	24
Beauty	25
Notes	28
Further Reading	30

Exploring the Fractal Geometry of a Mission Shaped Church



Can you tell me how long the coastline of Britain is?

We'll come back to that later on...

Introduction

Before we begin let me clarify three important points about the nature of what you are reading here;

- This exploration is not going to give you an off the shelf solution to the problems of Church decline in the 21st century. What I hope it might offer is a different way of describing church; a different way of describing theology and the relationship between theology and ecclesiology; between how we speak of God and how we do Church. As a result you may discover some exciting and new ways to think about what the Church might do next.

- This is just a short introduction to a much larger subject. It is not written with experts in mind, rather it is designed to make sense to a wide range of people. It has a focus on being particularly relevant to people involved with the British Methodist Church, but most of what is said here will apply to most denominations.
- This exploration is a journey and whilst I may be further along the route than you, I still don't know exactly where it might take us. Some of the ideas here may initially be confusing, but I encourage you to take the time to dwell with them and allow yourself the opportunity to see the world through slightly different eyes, before you make any judgement about the potential for any practical application.

Traditional or 'Euclidian' Geometry

So, what on earth do I mean by the 'Fractal Geometry of a Mission Shaped Church?' Perhaps the best place to start this exploration is by trying to get a better handle on what geometry actually is. Geometry isn't a physical thing in the world; you can't pick up a piece of geometry and hold it in your hand. Rather, geometry is a way of describing the world. In the same way that geology, or geo-logy is the study of the Earth, so geometry, or geo-metry was originally intended to be a way of describing the Earth.

There are no things in the world that are simply triangles, squares, hexagons or circles, but many objects can be loosely described in terms of those kinds of shapes. We can say that a mountain is a bit like a triangle and we can say that the Earth is a bit like a sphere, but thank God that the Earth, in reality, is a little more complex than that. Otherwise, where would you or I fit into it? This kind of Geometry is what we might call traditional or 'Euclidian' geometry. It's the kind of geometry which all of us will have learned at least a little about at school. However, in the end, this traditional kind of geometry

isn't very good at describing the wiggly, crunchy, fiddly things that make up the majority of the world we live in.

Fractal Geometry

In 1975, Mathematician Benoit B Mandelbrot coined the word Fractal, though he had been working on this area of mathematics for many years. Fractal geometry is a different kind of geometry that helps to describe the world in a much more sophisticated and dynamic way than traditional geometry. It hasn't managed to describe everything yet, but it has moved us a lot further forward in describing the complexity of the world around us, and most importantly for this exploration it helps to describe the seemingly random complexity of the world, in often very simple ways. Fractal geometry is different from traditional geometry, because it doesn't just look at the outward form of the shape; it also focuses on the internal processes that created that shape. Perhaps, as we begin to speak about processes that create the shapes we see in the world, we can already see where the theology and the geometry begin to connect.

Fractals are created by applying a process to a shape, situation or set of numbers; this creates a set of results and the process is then reapplied or reiterated upon those results as many times as is necessary or is possible. This repetition of patterns is what we call self similarity and often in the real world we can see patterns repeated not just side by side, like a fence, but repeated within themselves like a Russian doll, and with far more interesting results.

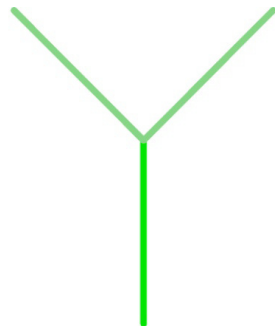
Drawing Fractals

Perhaps one of the easiest ways to understand fractals is by looking at how to draw a basic fractal tree.

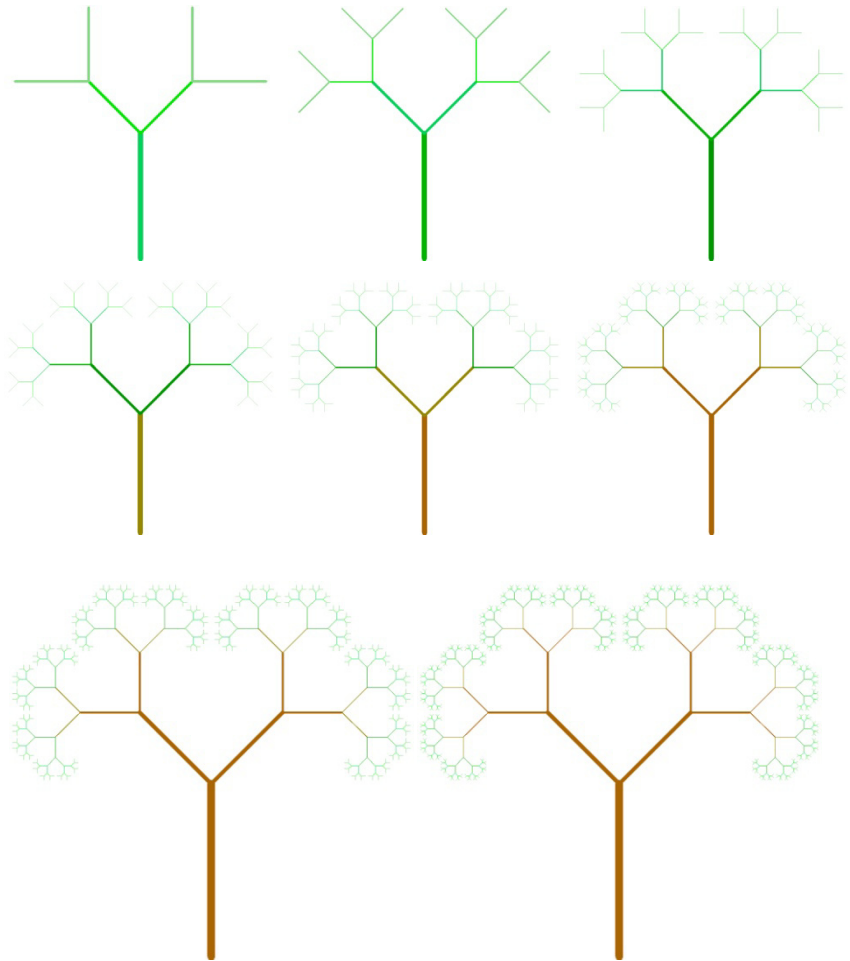
You can do this by taking a line like this one...



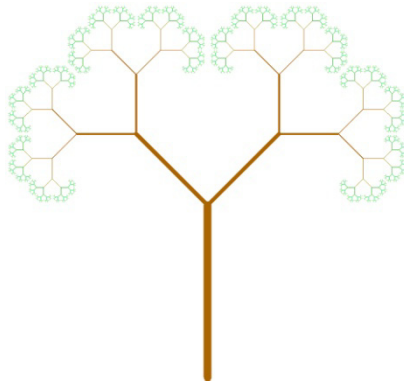
and adding two shorter lines at the top, at 90 degrees to each other.



Then you repeat
or reiterate that process on each of
those two lines,
and again on those
four lines
and again as many
times as you want.



Until you have something that looks a little bit like a tree.



1

Now this is a fairly crude fractal, but you can already see how this is better than triangles and squares for describing the real world, and if do the same process with just a little more sophistication, the result is radically different.

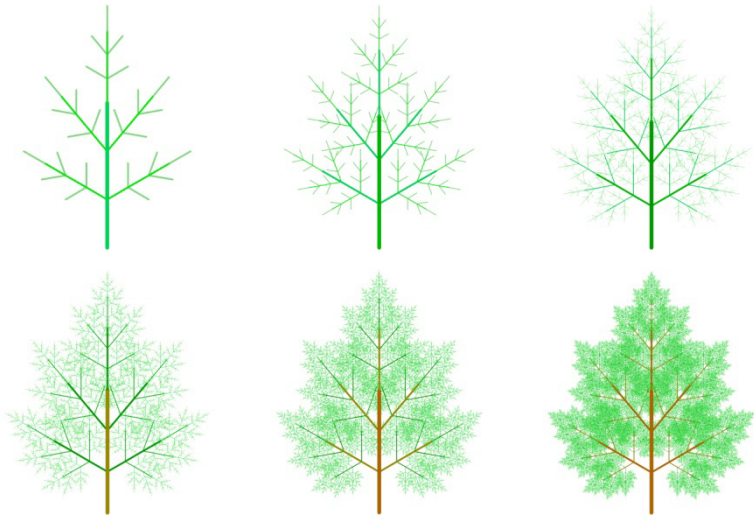
We start again with the single line,



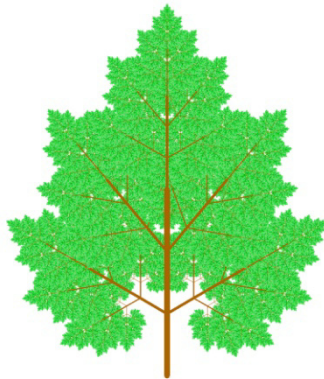
but this time add five shorter lines, at -60° , -40° , 0° , 40° and 60° .



Repeat the process several times,



and eventually it produces something that looks like a convincing image of a leaf.



2

Recognising Fractals

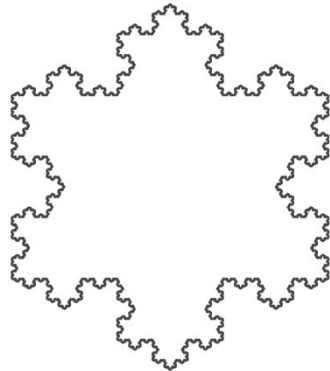
Fractals can be seen everywhere in the natural world and can also be created from mathematical formulas.



3

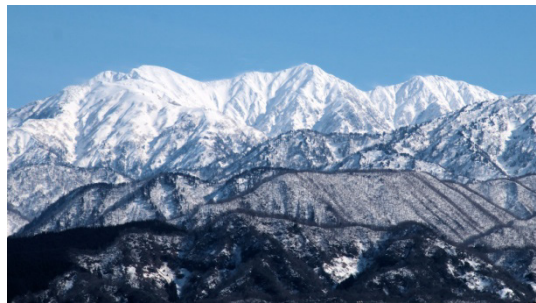
Some fractal patterns are obvious, like the repeated cascading patterns of a head of Romanesco Broccoli,

or this mathematically drawn 'Koch' snowflake.



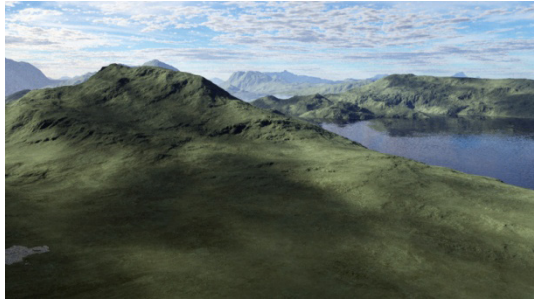
4

Other fractals are more difficult to identify, like the fractal patterns in the shapes of these mountains,



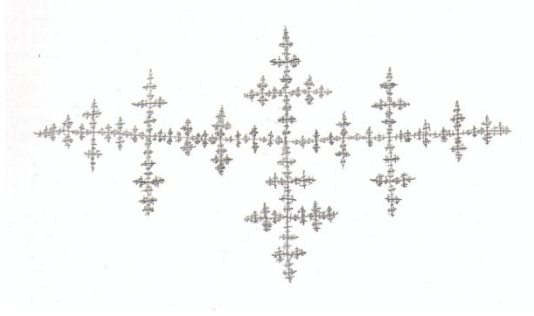
5

or this computer generated image of a landscape that doesn't exist in the real world.



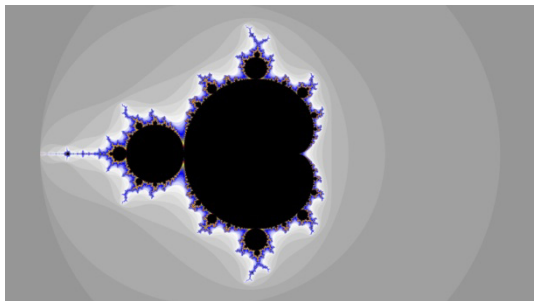
6

Some fractals are simple enough to be drawn by hand;



7

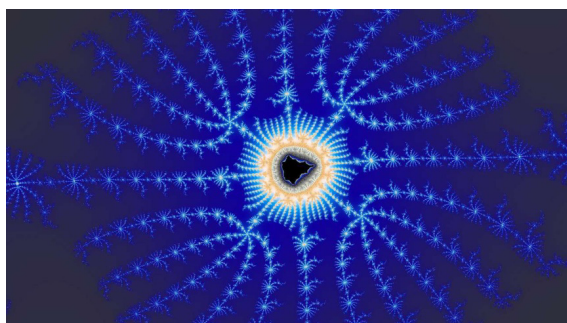
others require computers to calculate their complexity;



8

Above is the 'Mandelbrot set' devised by Benoit Mandelbrot himself. It's a fairly simple equation applied to a set of numbers represented initially by a circle. Each time the equation is reapplied, the computer displays the results with a different colour. Here it has been reapplied or iterated 150

times, but it could be reiterated to an infinite level. Computers can zoom in on the image created, discovering what seems like mysterious and unexplored worlds, all from a single equation. The level of complexity and beauty it can produce is breathtaking. Below is just one of an infinite number of images that can be produced from the Mandelbrot set.



9

Fractal patterns can also be seen in the way that lungs grow, where the tubes divide and subdivide in order to maximise the surface area; this is a fractal pattern that is programmed into our DNA. Every tree and every bolt of forked lightning produces variations on that same kind of fractal pattern, even though they are very different kinds of things.

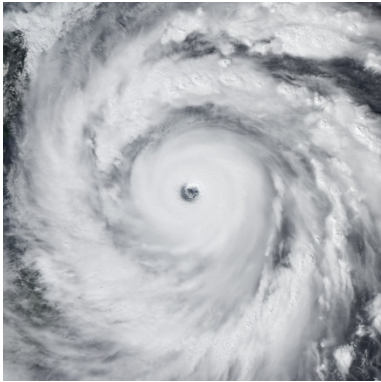


10



11

The fact that we can recognise the same or similar fractal patterns in seemingly unrelated situations, like this storm and this galaxy is particularly interesting for us theologically.



12



13

Perhaps this repetition of fractal patterns is what we are recognising when we see the parables and sayings of Jesus suggesting simple patterns of living that we can iterate in

many different and complex ways in an infinite number of situations.

Dimensions

The correct answer to the question 'can you tell me how long the coastline of Britain is?' is 'no', no one can, and the reason you can't tell me the answer to that question, is that the length of any coastline gets longer, the smaller the measurements you use.



The first diagram uses 200km lengths and gives a result of around 2,400km; the second uses 50km lengths and returns a result of 3,400km. Because of the wrinkles and complexities of the coast, your measurement is only as accurate as your units of measurement are small and the length gets longer and

longer as your unit of measurement gets smaller and smaller, until you are looking at the coastline at a molecular level where there is no longer any clear definition between coast and sea. There are ways of measuring the bumpiness of a coastline based on fractions of dimensions. You don't need to know all about that, but it's useful to know that in fractal geometry we can think differently about dimensions. The three normal dimensions are not always the most effective way of describing things, so we choose dimensions or ways of measuring that are more effective for the situation.

The coastline paradox illustrates that with the wiggly, crunchy complexity of the world, the kind of measurement we should take is entirely dependent on the purpose for which we are taking the measurement. The way we describe the world is dependent on what interests us about it. This is hardnosed mathematics, but it shows us a world that is open to wildly differing interpretations. Simply seeing the external geometry of a complex world is not sufficient, we need to think in terms of the internal geometry and we need to have a better understanding of the questions we are asking.

Fractal Theology

So how do we use this to help change our view of church, theology, ecclesiology and how to grow church well in 21st Century Britain? Let's start with the basics of some fractal theology.

If God created the universe, then the universe ought to reflect something of God. And if fractals reflect something of how the universe works, then they also ought to reflect something of how God works.

One of the basic problems in the development of our ecclesiology over the centuries is that we tend to think in a very linear and static way; we exercise a kind of Euclidian theology. We often try to answer big moral questions with yes or no answers, or at least try to create static rules rather than offer dynamic responses. Likewise, we tend to think of our ecclesiology, our way of being church, as something that should be set in stone or at the very least, damp concrete.

However, God is dynamic and infinitely complex, at the same time as being the very essence of simplicity. Our linear

theology struggles to keep in step with that paradox. Yet this ceases to be a paradox if we imagine God working in a fractal way. It makes sense that God is simple in principle, but creates and functions in a complex way on the basis of that simplicity. Fractal theology suggests that our churches ought to be living breathing organisms, and in order to grow, and to grow healthily we should think of them as organic and not concrete.

How big is your Church?

What if I were to ask you, 'how big is your church?' Like the length of the coastline, this is an unanswerable question. We might measure by means of membership, attendance, or community engagement; we might measure floor space, building volume or pew capacity; we might measure income, financial reserves, or charitable giving. There are an infinite number of ways to interpret the question and even more ways of answering it. It is a question to which all of our answers will be both temporary and inaccurate.

As I mentioned earlier, fractal geometry encourages us to think in terms of effective dimensions; useful levels and units for measuring the things we are trying to describe. For

example, in the Methodist Church we might say that our local district is one out of 31 districts in the connexion. This is a useful measurement for some purposes.

However, as we look closer we see that the districts are not equal in terms of how many circuits each one holds. We can count the circuits in a district but the circuits have a different number of churches, and the churches have different numbers of members. In addition, at all levels there are other aspects which affect the numbers like, single circuit districts, LEP congregations and regular attendees who aren't members, as well as many other variations that affect far more than just the straightforward numbers.

Even so, the Methodist identity exists within the one single connexion and each of those levels of organisation can function as effective dimensions for observing levels of self similarity. We can see how much the Methodist Church succeeds or fails to be Methodist at a district level in comparison to a circuit or congregation level.

One simple and useful observation we can make is that the Methodist structure is a fractal pattern which has what

Mandelbrot calls a wildly random nature; that is they have a similar level of randomness at all levels. This is something he recognised as an issue for financial markets. We often treat both markets and Church organisational structures as if they were mildly random.

What is mildly random? Well, a knife has mild randomness. At a large scale it has a very specific shape; the blade is sharp and shiny, but at a microscopic level the knife displays all sorts of jaggedness and bumpiness. If it was random at all levels it would visibly jagged and bumpy and hence useless as a knife. But here's the thing, the Methodist Church structure is wildly random; and so it should be.

Mandelbrot describes the wild randomness as being like the wind, random at all levels. We ought to be familiar with the suggestion that you never know where the wind is going or where it has come from, but you can measure its effects. Mandelbrot's understanding of wild randomness is in keeping with Jesus' description of the Holy Spirit. We ought to be wildly random as we follow the spirit, but we keep trying to make our church structures rigid and firm and that's not helping.

The Word of God

We take great pains to wrestle with the 'Word of God', and often we take that simply and literally to mean the written word of the scriptures. But both Genesis and John see the word of God as a far deeper and more fundamental part of the process of creation. In Genesis, God spoke and it was; and John hints that the word spoken was Christ himself; God incarnate through his own speaking; a creative act of self similarity. In both Hebrew and Greek, דָבָר (*Davar*) and Λόγος (*Logos*), the word is more than just the written word; it is an idea, a concept, it is the matter that is the focus of the moment. In fractal terms, the word is the pattern that is to be iterated. We are created in the image of God, iterated and reiterated on the basis of that original pattern.

The Vine

We can rethink much of our theology with this fractal mindset. For example, the vine and the branches thought of as a fractal, becomes a pattern of healthy church growth iterated from generation to generation and from one believer to the next,

eternally rooted through the Church into the word; rooted in the initial pattern, in the power of God. The vine is also a plant which is dependent on its context. Without a context the Church cannot grow, without an understanding of our context we cannot grow and without a context in the first place we would have no reason to grow. Like the frame, fence or wire upon which the vine grows, the church without its context is fruitless.

"A discipleship movement shaped for mission"¹⁵

It is perhaps meaningless to ask how big our churches are, but what we can do is begin to ask what shape our church ought to be. In particular, we can begin to think more in terms of what the internal fractal geometry of our church should be, instead of thinking simply in terms of the external shapes and the linear Euclidian geometry.

What do I mean by that? Well, when we try to grow church, when we try to plant new churches, what we usually do is to copy some or all of what we have done before. We take an

aspect or several aspects of our previous Christian experience; we copy them and paste them into the new context. When we do this we are copying and pasting the external shape and not reiterating from the internal patterns. Rather, we ought to be taking the simple dynamic principles of our faith and reapplying them on the basis of a good understanding of the new context as well as reapplying them to the rich complexity of traditions that we already hold. From that we should be iterating something new and unique from the product of those elements, just like the infinite images of the Mandelbrot set. This is very much the theology behind fresh expressions of Church, when fresh expressions are done well. It is also the theology expressed in Vincent Donovan's *Christianity Rediscovered*.¹⁶

These fractal theological shapes, just like the pure mathematical fractal, can be applied at many levels of scale. They can be applied to the individual, to the congregation, to the wider community, to the circuit, district, connexion and to other denominations. When it comes to church structure, we often wander to one extreme or the other. Either we seek the safety of rigid ecclesiology or we say let's throw out the

bureaucracy and the red tape and just follow the Spirit. But as we have seen through history, throwing out the bureaucracy now only means that it will grow back in a generation or two. If we are truly to follow the Spirit then we need to be brave enough to keep the structures and let the Spirit work through our structures. But perhaps we need to celebrate that randomness that exists and needs to exist at all levels, and build in a kind of fractal freedom into our system, that allows us to follow the patterns without getting stuck in a structural rut.

Holy Communion

One of the most important shapes in New Testament geometry must surely be that of the act of Holy Communion, as demonstrated at the last supper. When we follow the command to 'do this', we tend to see it as a call to copy and paste the activities, but if we look under the surface at the theology of this event we see some very interesting patterns. When Paul talks about the breaking of the bread, which represents the body of Christ, 1 Corinthians 11, he also talks about 'discerning the body.' The word which is translated as

discern is the Greek word διακρίνω (*diakrinon*) which literally translates as 'through separating.' He goes on to talk about the Church as the body of Christ in the very next chapter. So there is a connection between the breaking of the bread and the breaking of us as the church. We can also look at the pouring out of the cup, the blood of Christ, which in Old Testament theology adds up to the pouring out of the life force or spirit of the sacrifice.¹⁷ Together we see a very fractal pattern of breaking and pouring. If we think of the 'do this' fractally rather than just copy and paste, then there is a call to break or re-break the body of Christ, so the spirit may pour out. This is potentially not just a description of a rite, not only an act of worship, but perhaps also a description of how to be Church. When we come together we need to be prepared to break and re set the structures of the Church, to allow that randomness back in and in order for the spirit to continue to flow freely amongst us and be poured out to others.

Beauty & Simplicity

Fractal Geometry is sometimes seen as a barrier to those who do not consider themselves to be clever or academic. Fractals

can be a highly complex and abstract kind of mathematics and mixing fractals and theology does seem to take us into an even more specialised area. Yet, a child could do that exercise of drawing the tree and I suspect that anyone who has ever done a doodle during a dull lecture has inadvertently found themselves drawing something with fractal self similarity.

Fractals, are highly complex at the surface level, but underneath they are about a deep sense of simplicity. Often we intuitively recognise that internal simplicity and call it beauty; that intuitive sense of the beauty of God's creation. We see it in a sunset or in the view of a mountain range, but we also see it when one of God's traits is reflected in the actions of a human being. It is one of the few ways that we have of knowing anything about God.

What perhaps what we ought to be doing is honing that sense of beauty. We should be honing that intuitive ability to see healthy growth patterns, to recognise the fractal patterns within the Bible, within people and within the contexts in which we are seeking to be Church. Surely this is at the heart of what discipleship is about and is at the heart of how we recognise what kind of shape our church is in.

Questions?

These are some questions you might want to explore

- What shape is your church in?
- What patterns did it use to get there?
- What Bible passages do you think reflect a fractal nature?
- Are there any that particularly don't?
- How might you apply some of this thinking to your situation?

Notes

¹ Image produced using 'Fractal Grower' software available at <http://cs.unm.edu/~joel/PaperFoldingFractal/paper.html>

² Image produced using 'Fractal Grower'

³ Image 'Broccoli Detail' by Jacopo Werther, from [http://commons.wikimedia.org/wiki/File:Romanesco_Broccoli_detail_-__\(1\).jpg](http://commons.wikimedia.org/wiki/File:Romanesco_Broccoli_detail_-__(1).jpg)

⁴ Image produced using 'Fractal Grower'

⁵ Image 'Three Kekachi Mountains' by Hanoitaxi, from http://commons.wikimedia.org/wiki/File:Three_Kekachi_Mountains.jpg

⁶ Image produced using Bryce 7.1 Software

⁷ Image 'Hand Drawn Fractal' by Thunder Wave, from <http://thunder-wave.deviantart.com/art/Hand-Drawn-Fractal-171061204>

⁸ Image produced using 'Chaos Pro 4' software

⁹ Image produced using 'Chaos Pro 4' software

¹⁰ Image 'Dead Tree' by R Neil Marshman, from <http://commons.wikimedia.org/wiki/File:DeadTree.jpg>

¹¹ Image 'Facts about Lightning from' <http://images.frompo.com/c6ea23362d2f00e074f7aff76d3eef8f>

¹² Image 'Jangmi 2008' by NASA Earth Observatory, from <http://earthobservatory.nasa.gov/Features/WorldOfChange/storms.php>

¹³ Image 'Spiral Galaxy M101' by NASA & Detlef Hartmann, from <http://commons.wikimedia.org/wiki/File:NASA-SpiralGalaxyM101-20140505.jpg>

¹⁴ Images from The Coastline Paradox, Wikipedia
http://en.wikipedia.org/wiki/Coastline_paradox

¹⁵ A phrase coined by Martyn Atkins, General Secretary of the Methodist Church in 2011 as a way of describing the Methodist Church.
<http://www.methodist.org.uk/deepening-discipleship/discipleship-and-the-people-called-methodists>

¹⁶ *'...do not try to call them back to where they were, and do not try to call them to where you are, as beautiful as that place might seem to you. You must have the courage to go with them to a place that neither you nor they have ever been before.'* - Donovan, V.J. *Christianity Rediscovered, An epistle from the Masai*, Preface to the second edition (London: SCM Press, 2001) xix

¹⁷ Leviticus 17:11 (NIV) 'For the life of a creature is in the blood, and I have given it to you to make atonement for yourselves on the altar; it is the blood that makes atonement for one's life.'

Further Reading

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