

Patterns in nature: Spirals – Teachers notes

There are lots of different patterns in nature. Can you think of any patterns you might have seen?

In the past we didn't have cameras so if we wanted to capture what something looked like we would need to draw it. Naturalists are people who study the natural world. They needed to look closely at the things they studied and sketch them. They would look at organisms in great detail to make sure they sketched them accurately.

(left) Illustration of a mandrake by William Turner in the Tudor times. Turner was considered the father of English botany. He wrote the first herbal book in the English language. (There is a plaque to him on the Bagpipe museum at Morpeth as he was born there). A herbal is a book about plants, their properties and uses.

(right) Albany Hancock was a naturalist in the 1800s and with his brother John and sister, Mary, they raised money to create the Great North Museum. All 3 were interested in the natural world. John is considered the father of modern taxidermy. Albany was interested in the study of marine animals and fossils found in coal. He wrote a book on nudibranchs with Joshua Alder who is another naturalist from the time who lived in Newcastle.

Have you seen these spirals?

A selection of photos that show examples of spirals that can be found in nature.

Bottom left clockwise: snail, romanesco cauliflower (sometimes also called romanesco broccoli), chameleon, millipede, pine cone, hurricane

For younger students – Swirl by Swirl is a lovely book to read (it's available to watch on YouTube here <https://www.youtube.com/watch?v=DEqrFhHNunY>) with Early Years and KS1.

For older students – the Fibonacci sequence.

Investigate the sequence. Get students to try and work out what the pattern in the sequence is.

The Fibonacci sequence is everywhere! It is found in music, art, nature and using it to make a spiral helps photographers get a good composition in their photos! It is often called a golden spiral and is roughly similar to the golden ratio (which links to ancient Greeks if you want further back history!)

Try drawing a Fibonacci/ golden spiral.

This is also known as the golden section in music, there is a selection of songs below that include this sequence that could be played while drawing or spotting spirals.

Further activity ideas:

- Why not try going on a nature walk and looking for spirals there too! You could also look at man-made objects and see if there are any spirals to be spotted.

- Why not try printing spirals and getting them to cut around them and make them into mobiles (they could be insects, snakes, galaxies...)
- Experiment with spirals <https://www.mathsisfun.com/numbers/nature-golden-ratio-fibonacci.html>
- Drawing spirals – could go outside, chalk?
- Draw a golden spiral on plastic and use it as a window to look for good scenes
- Have a look at pics in nature, can you see a spiral?
- Count the spirals on plants – how many are there? Are there a Fibonacci number?
- Link to Islamic art – why it doesn't have figurative representations.
- Glass paint/ tiles
- Make a picture
- Look at Van Goughs starry night picture and other artworks containing spirals and swirls.
- Word art: write a poem in a spiral shape related to: Fireworks, Catherine wheel, snails, anything else swirly
- Dance/ drama – moving in spirals
- Waves – tunnel, surfing have to know how the wave will behave to be a good surfer.
- With pine cones, it might be nice to select a route through the spiral to paint?
- Have a look at Van Goughs Starry night – do the stars fit this pattern? Does any other artwork or photography?
- Test out measuring skills with a ruler, no grid? Just put the curve & the square and do the measuring before doing the calculations to show that human error can creep in but that the maths will (should!) always work?
- Working out the area of each section.

Music to accompany your class

Thank you to Carol Whinnom from the Union Chain Bridge project (<http://unionchainbridge.org/>) for the musical advice and links.

Music-wise - the design of the classic Stradivarius violin is in Golden Section proportions. (that's scientifically interesting in itself, as they haven't been bettered despite advances in technology since the 18th C. More myth-busting?)

To go with a general nature theme - these pieces are all quite relaxing, suitable for having on in the background while working and/or display Golden Section proportions try:

Debussy - Reflets dans l'eau <https://www.youtube.com/watch?v=Hyiu7fBUk7o>

L'isle Joyeuse - https://www.youtube.com/watch?v=9xNfmsN_8hQ

La Fille aux cheveux de lin - <https://www.youtube.com/watch?v=jGSZPRk6aXA>

La Cathedrale Engloutie - <https://www.youtube.com/watch?v=gN3S2LMF6Oc>

These are all quite short - 3 to 5 mins or so. Good to time a short specific task.

La Mer - this is a longer (25 mins) piece of music in 3 sections, the last of which is renowned for its G.S. structure but also goes back to the spiral/wave idea as it depicts the sea:

<https://www.youtube.com/watch?v=hIR9rDJMEiQ> 1. From dawn to midday on the sea 2. Play of the waves 3. Dialogue of the sea & wind

And, in a full spiral back, the front cover of this piece of music when published was Hokusai's wave <https://www.metmuseum.org/blogs/now-at-the-met/2014/debussy-la-mer>

And lots of Bartok & Wagner besides but these pieces are calmer and easier to have on in the background !

If you want to know more have a read of Roy Howat's *Debussy in Proportion*. You need to be a mathematician to be a musicologist!