



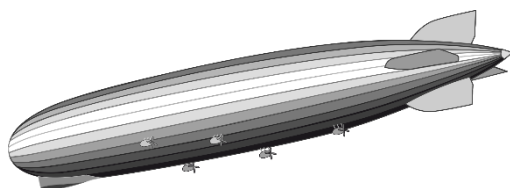
## Hydrogen - H<sub>2</sub>

Count Ferdi von Zeppelin wanted to fly  
A great big balloon, way up in the sky.



Not a balloon from a party you've  
bought for a lark,  
Or the ones kids have fun with, when at play, in the  
park.

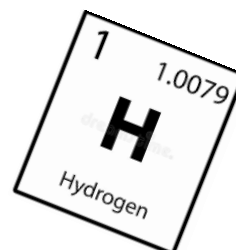
No, Ferdi's balloon would be massive and brash,  
Carry lots of people and earn lots of cash!



Back in 'the day', before swanky jet liners  
von Zeppelin's crafts offered transport much finer.

But to get a balloon 'way up there'  
It needs to be filled with gas lighter than air.

Ferdinand's choice of gas to put in  
Unfortunately, was hydrogen.



Hydrogen, without any bother:  
Appears in more compounds than any other.

It makes up three quarters of the universe -  
A convenient fact to finish this verse!

It's the energy that lets the sun create light.  
Providing clean power for our future? It might.



But for all of its uses - some quite incredible,  
It had one great drawback for Ferdi's dirigible.

For, when there's a spark near hydrogen gas  
A violent explosion ensues, so alas:



Zeppelins and fire - a poor combination  
Often resulted in incineration!

Though lifting less and rarer, try as you might  
Helium, at least, will never ignite.

For airships, with hydrogen, time had run out.  
Helium was the future without any doubt.

In the end, aeroplanes with propeller or jet,  
Mean airships are waiting in the wings yet.

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## INVESTIGATE THE SCIENCE

- ✓ In order for a balloon to float, it needs to be filled with something less dense than air. I'm sure you've had a birthday balloon filled with helium. Helium is twice as heavy as hydrogen but still much lighter than air (so less dense), so it floats.
- ✓ If you blow up an ordinary balloon with the breath from your lungs, it will fall towards the ground, although it's pretty much the same as the air around it. **Can you suggest a reason why it sinks?**



- ✓ **Hot air balloons** float because hot air rises. Try these experiments to show that air will rise when heated.



### **Materials:**

- A balloon that has been inflated several times, a small mouthed plastic bottle
- A container to hold the bottle that can be filled with water (enough to fill water up to the top of the bottle)
- Warm/hot water

### **Procedure:**

- Put a balloon over the lid of a small mouthed bottle (make sure the balloon has been inflated several times)
- Put the bottle into a container that is deep enough to nearly cover the lid
- Safety issue: Holding the bottle inside the container, have a parent fill the container with warm/hot water
- Wait until the balloon partially inflates
- After you've seen it grow, put it somewhere cool to see what happens

### **Explanation:**

- The hot water causes the air inside the bottle and balloon to also heat up. The faster moving particles inside the bottle start to move faster and faster and soon they expand to fill the balloon. No, it doesn't get too full, there isn't enough heat to get them moving that far apart.

## What you need

- A sheet of paper
- Cotton thread
- Scissors

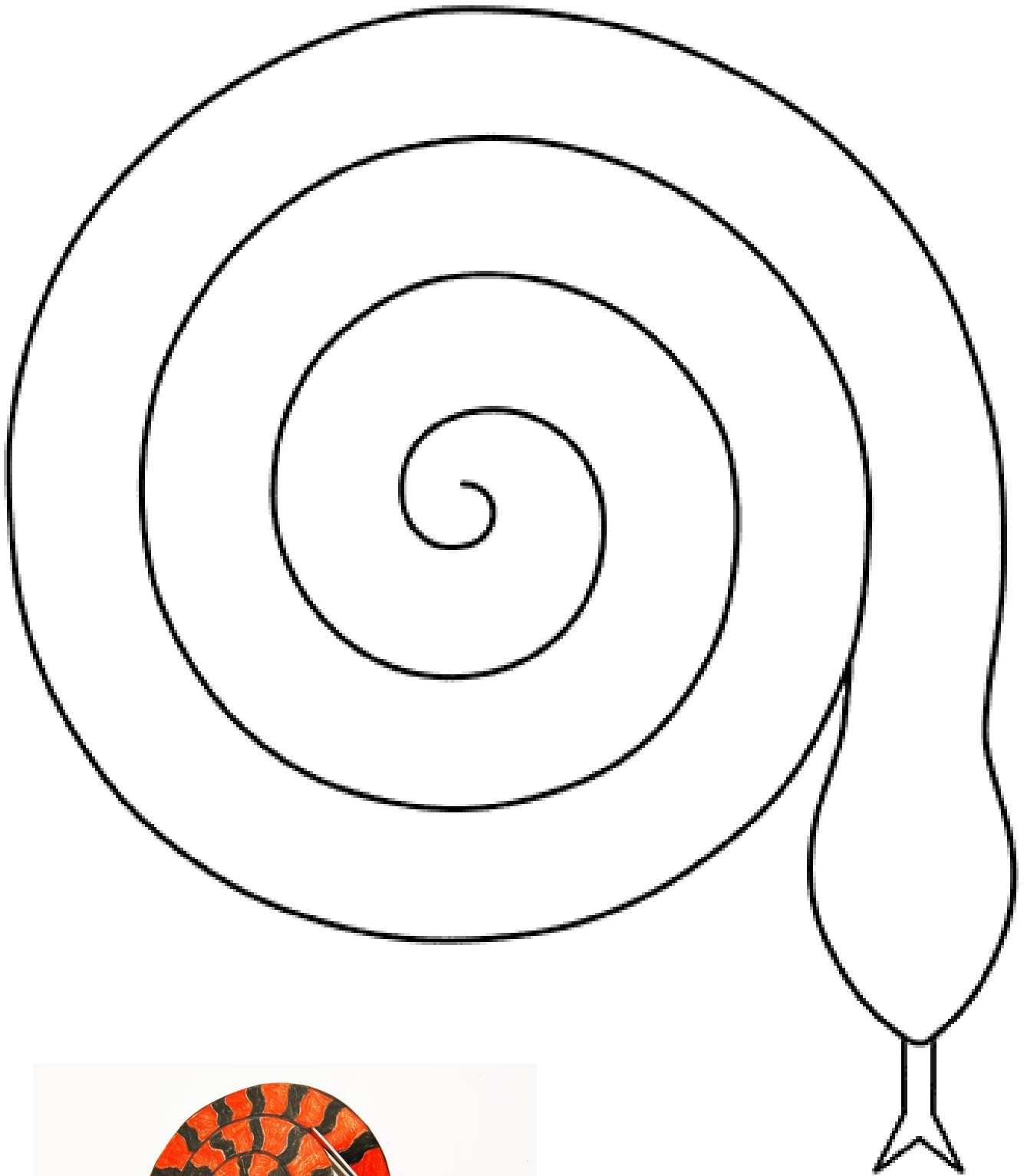
## Instructions

1. Cut a thick spiral shape in the piece of paper
2. Make a hole in the centre and thread the cotton through it
3. Hang the spiral above the radiator

## Results and Explanation

The spiral should start to spin slowly. The radiator raises the temperature of the air around it, so the particles move more quickly and spread out. This means the air is less dense and rises upwards. The rising air pushes on the paper causing it to spin.



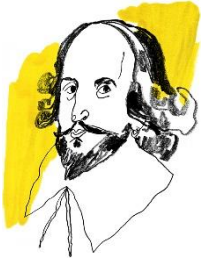




## INVESTIGATE THE STORY



- ✓ Ferdinand von Zeppelin was a German army officer and inventor. He was born in the early part of the 19<sup>th</sup> century. As part of his job as a soldier he'd experienced flights in hot air balloons - but these had always been tethered to the ground and so did not fly freely.
- ✓ He decided to improve upon the idea and invented his own airship which could carry passengers. However, history took a hold of his plans with the outbreak of World War 1.
- ✓ The big problem with Zeppelins and the airships that followed, including *The Hindenburg* and *R101*, was that they relied upon hydrogen to lift the balloon or 'dirigible' as it was known into the air.
- ✓ Hydrogen could do this because it is lighter than air, but it is also very explosive!
- ✓ Create a fact file, either electronically or on paper, poster, newspaper front page, comic strip or i-movie about one or more of the following:
  - Ferdinand von Zeppelin
  - Zeppelins during World War I
  - Airship disasters (see above for other airships)



## INVESTIGATE THE POEM

- ✓ This poem tells a story so.....it's a '**story poem**'. But it tells the story using a particular pattern of verse. Notice how each pair of lines rhyme with each other. These are known as **rhyming couplets**.
  
- ✓ Try to write a two-line poem about a subject that interests you or to retell a story you love. It could be about frogs, or Noah's Ark, it doesn't matter. Just make sure that the two lines rhyme with each other.
  
- ✓ Now, write another two rhyming lines to continue your story. These can have a totally different rhyme to the previous two - so no pressure looking for more words with the same endings as above!
  
- ✓ Keep going, just two rhyming lines at a time, until your story poem is complete! There, you've done it!