

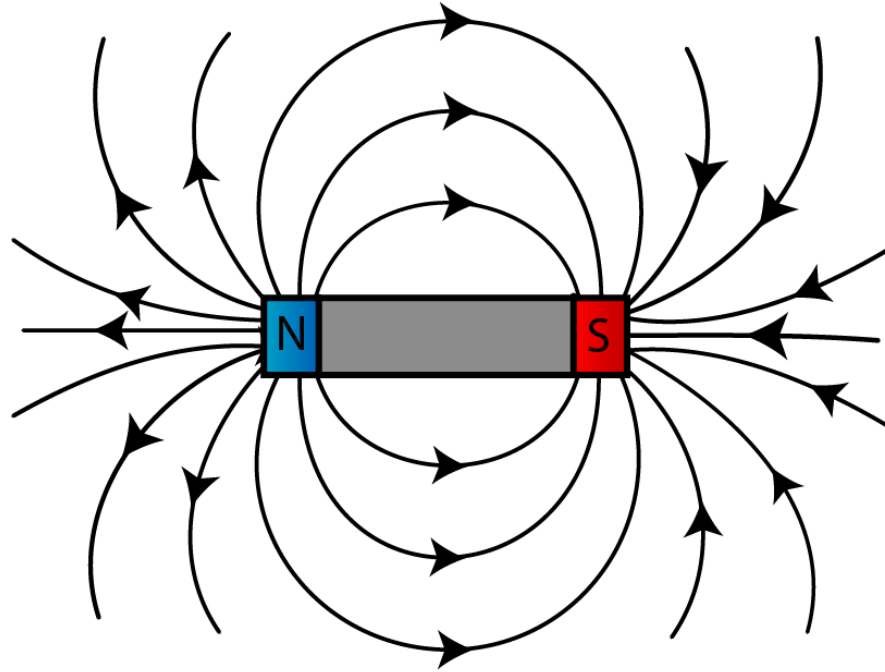
# DC Electric Motors

A decorative graphic consisting of multiple parallel, wavy lines of small blue dots, creating a sense of motion and depth. The dots are arranged in a way that suggests a three-dimensional wave or a series of overlapping paths. The overall effect is modern and technical, fitting the theme of the text.

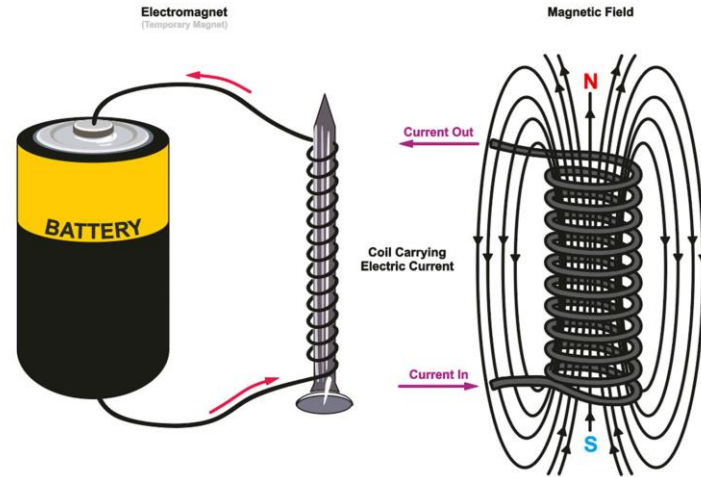
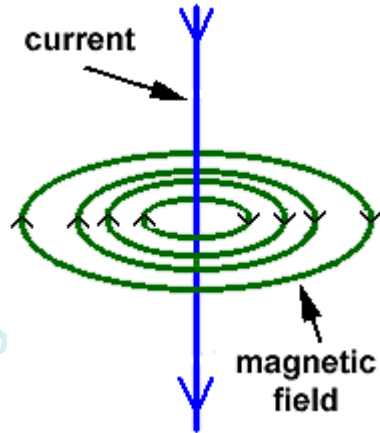
# Where do we find electric motors?



# Permanent Magnets

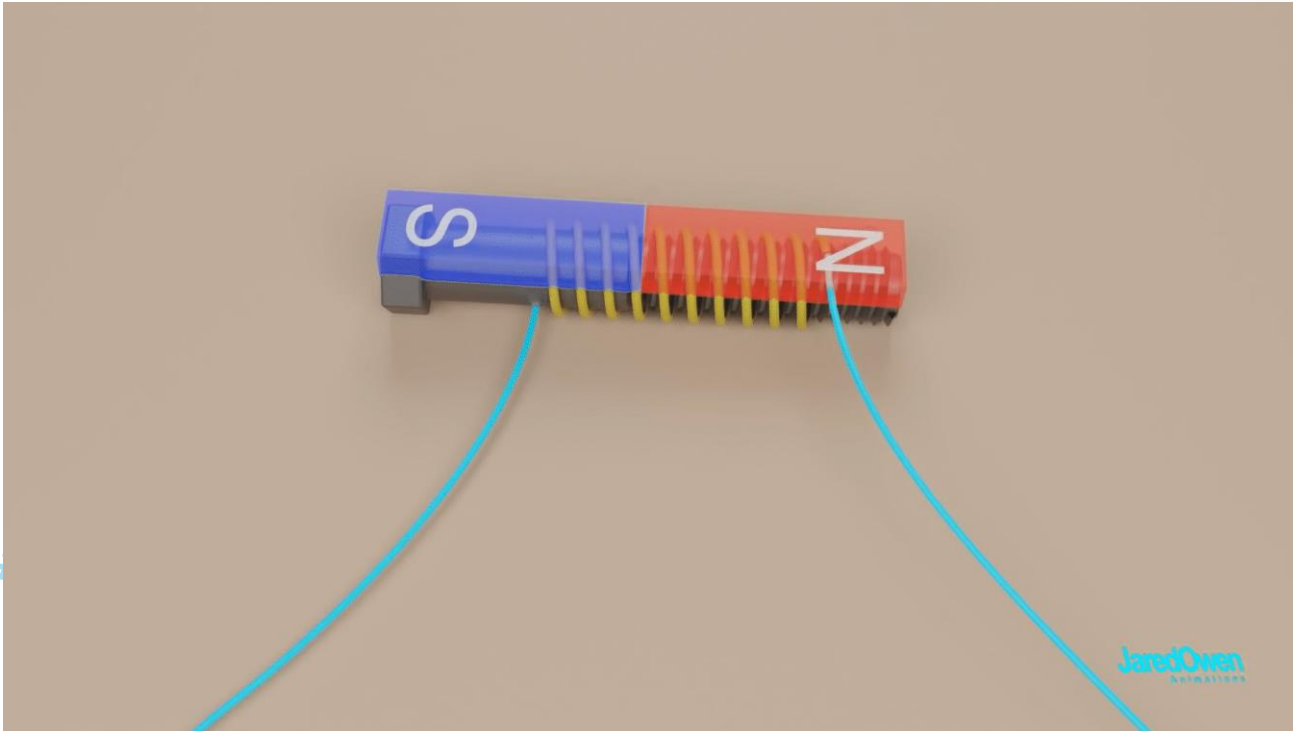


# Electromagnets



Electromagnet is a temporary magnet that produce a magnetic field when regular electric current passing into a coil. And that magnetic field will disappear when the current is discontinued.

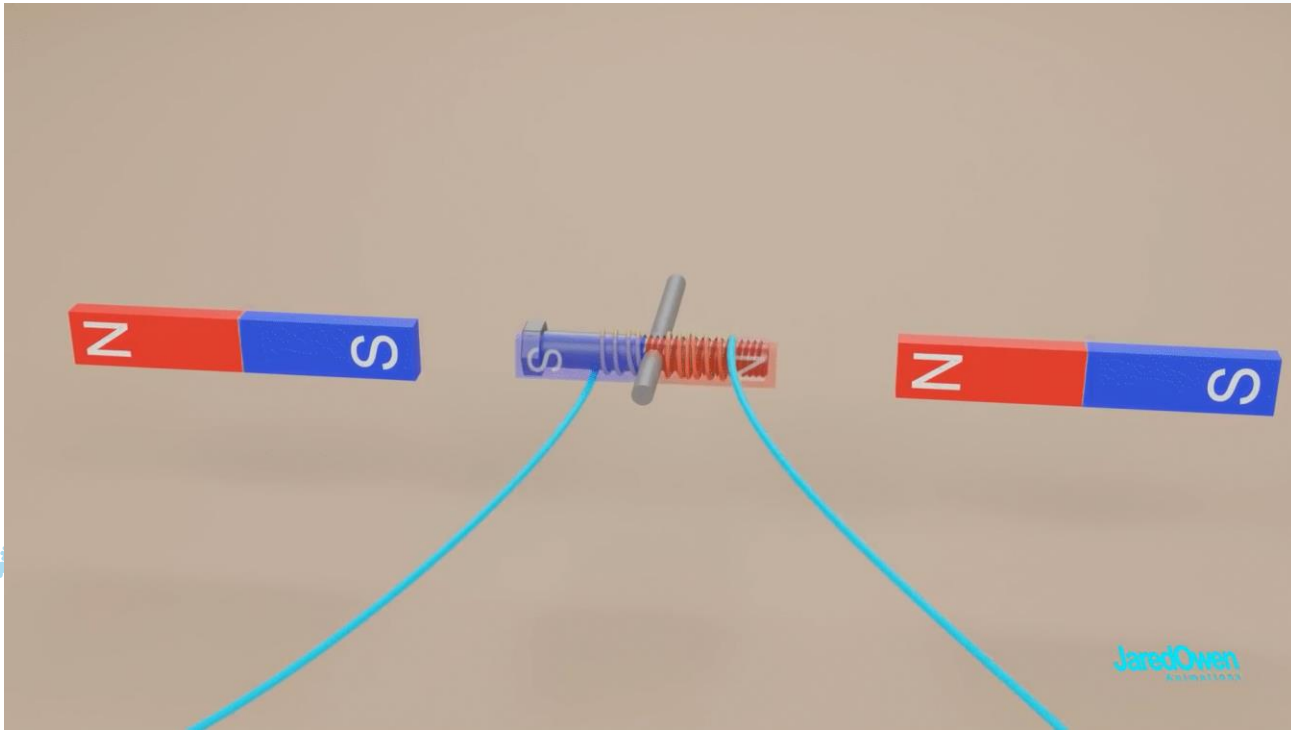
# Switching Polarity



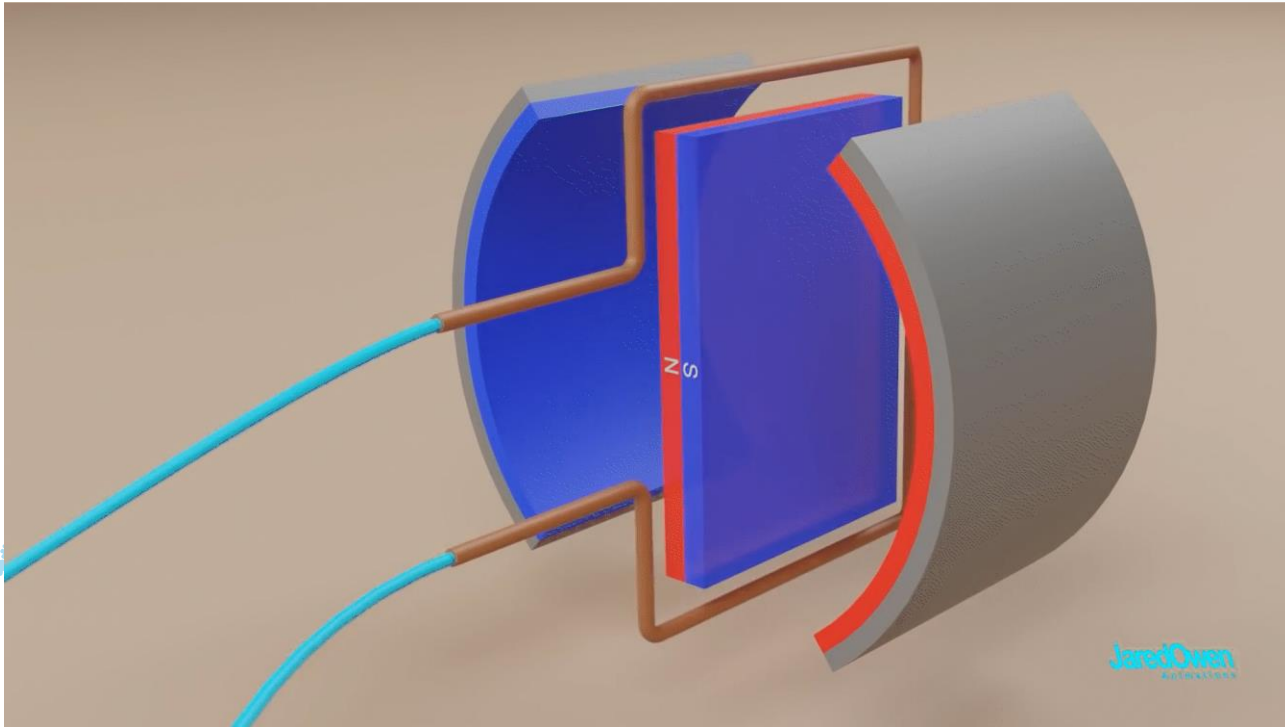
# DC Brushed Motors

The background is a solid blue gradient. A decorative element consisting of multiple parallel, wavy lines of dark blue dots flows across the bottom and right side of the image, creating a sense of motion and depth.

# Spinning!

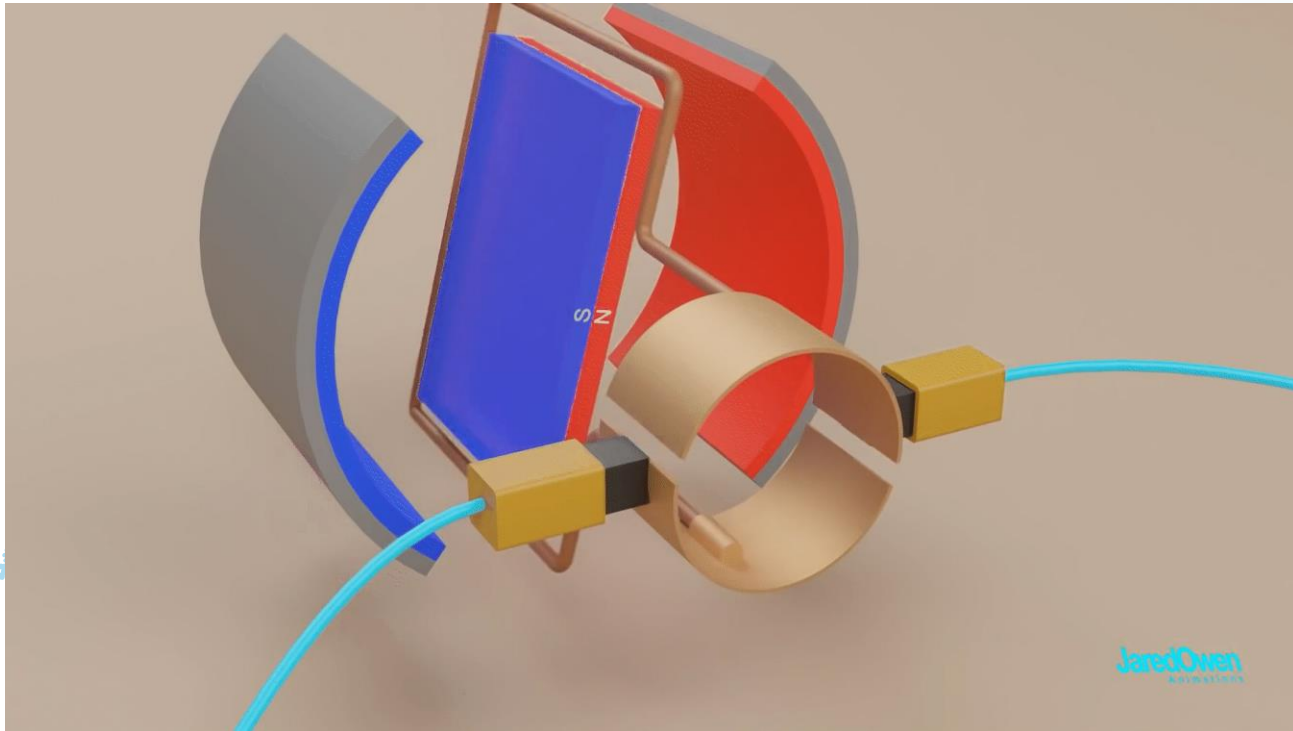


# The Armature

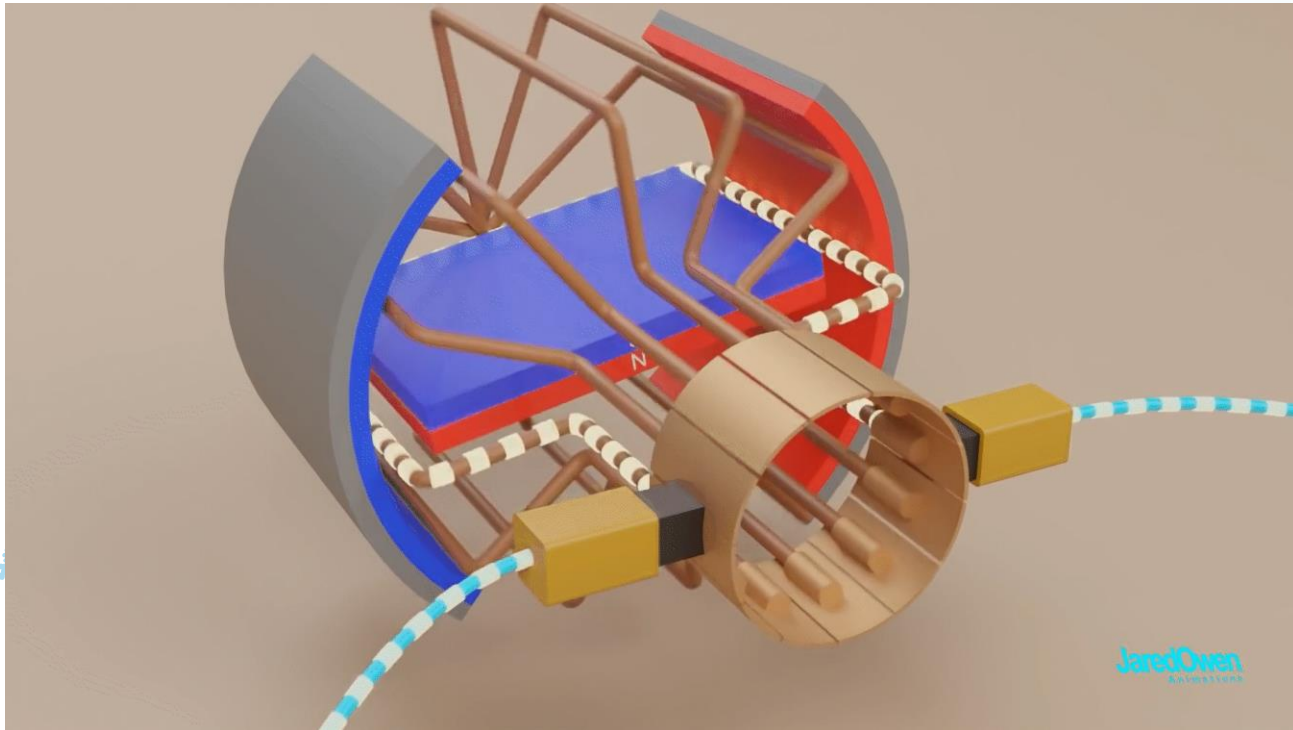




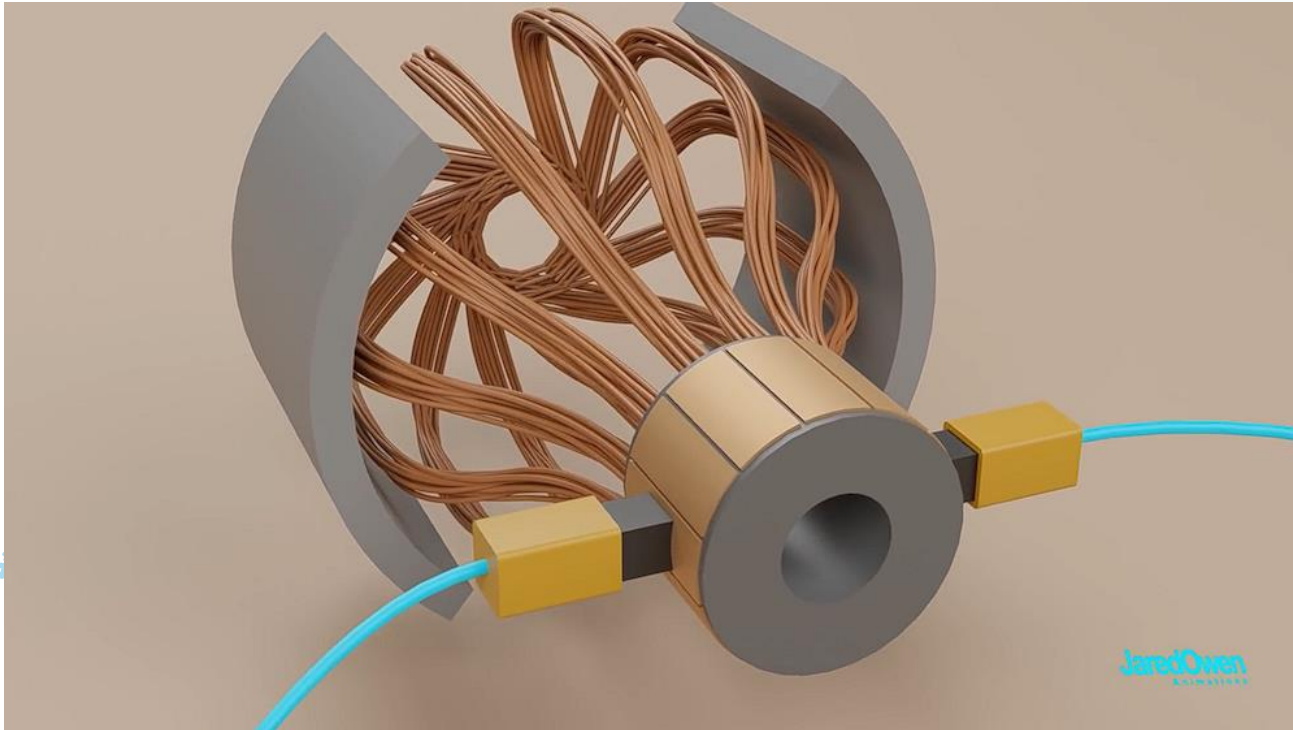
# The Commutator



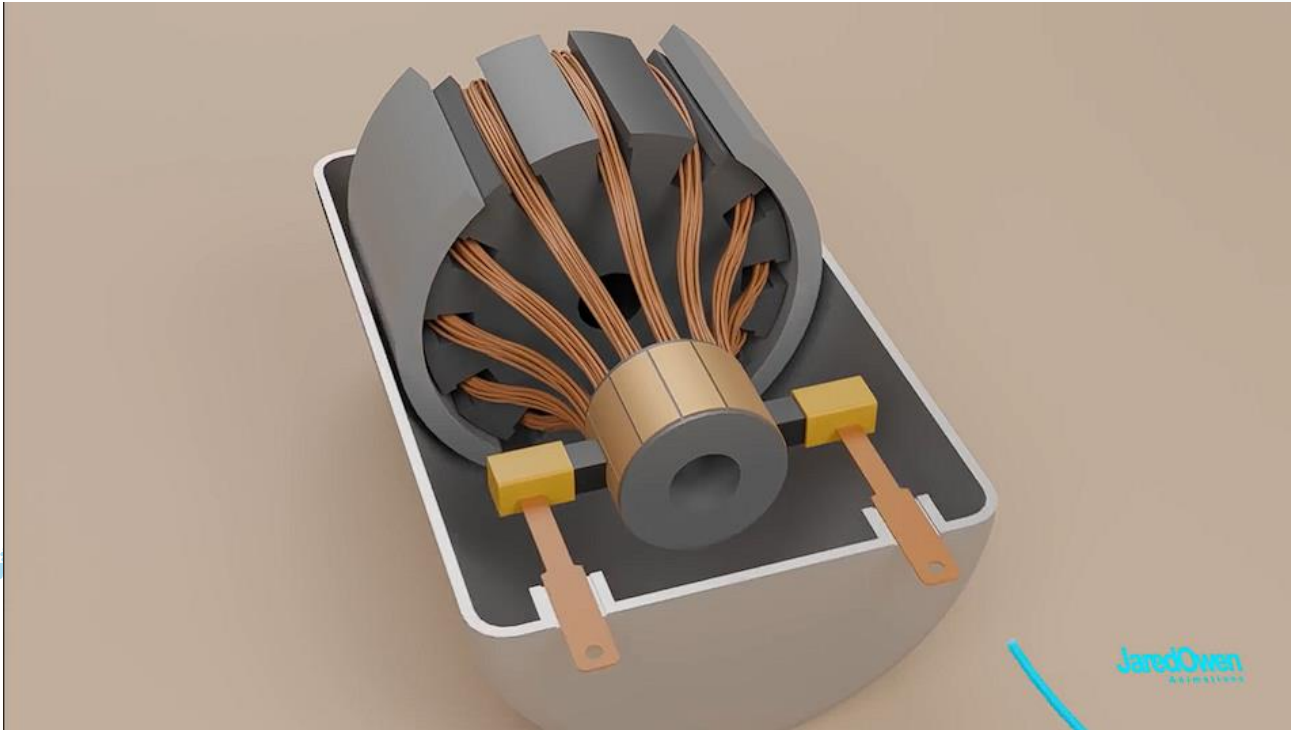
# More Armatures



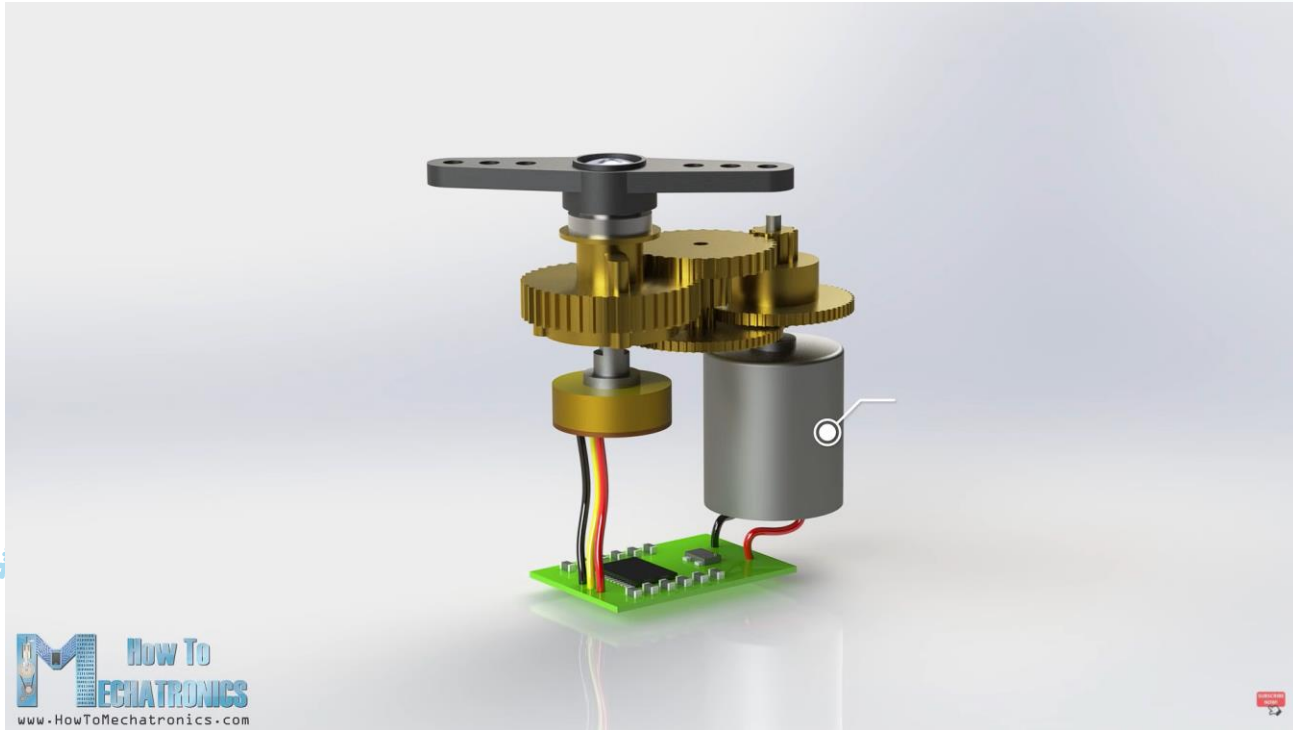
# More Wires = More Better



# Packaging it up



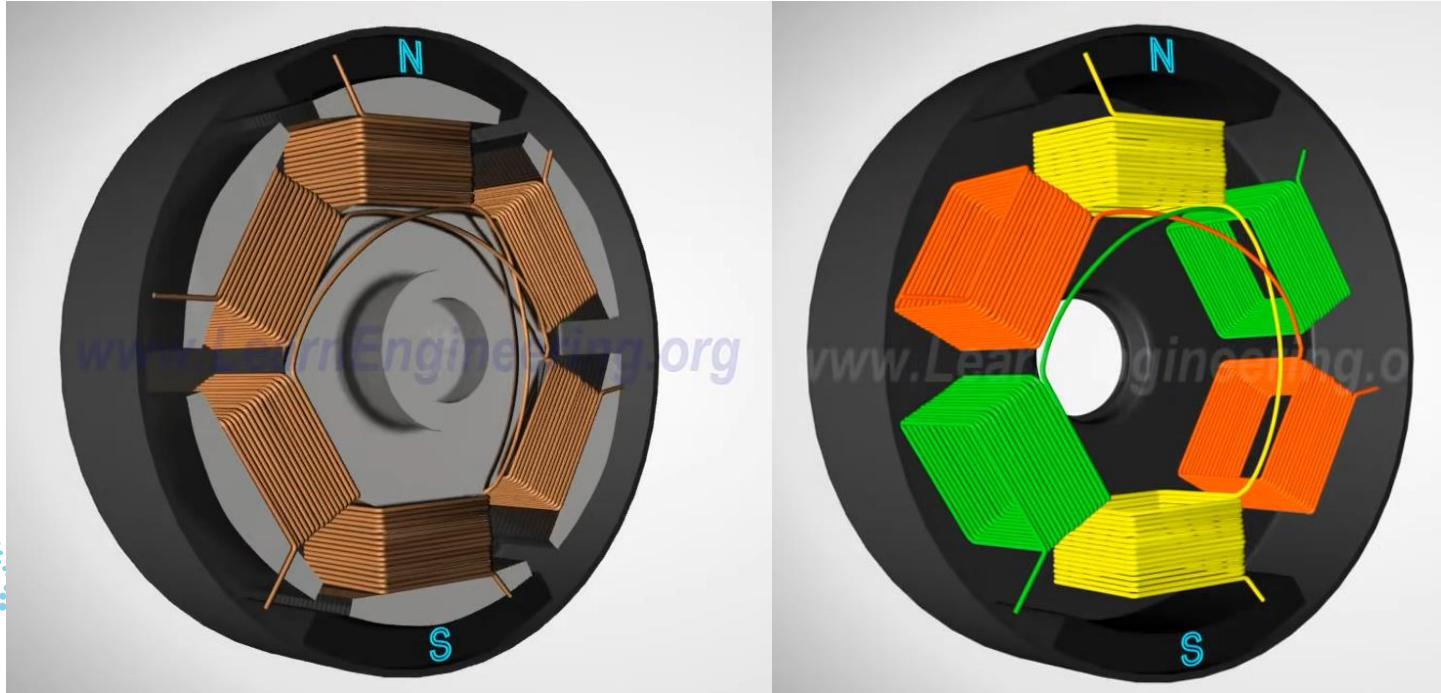
# Servos



# DC Brushless Motors

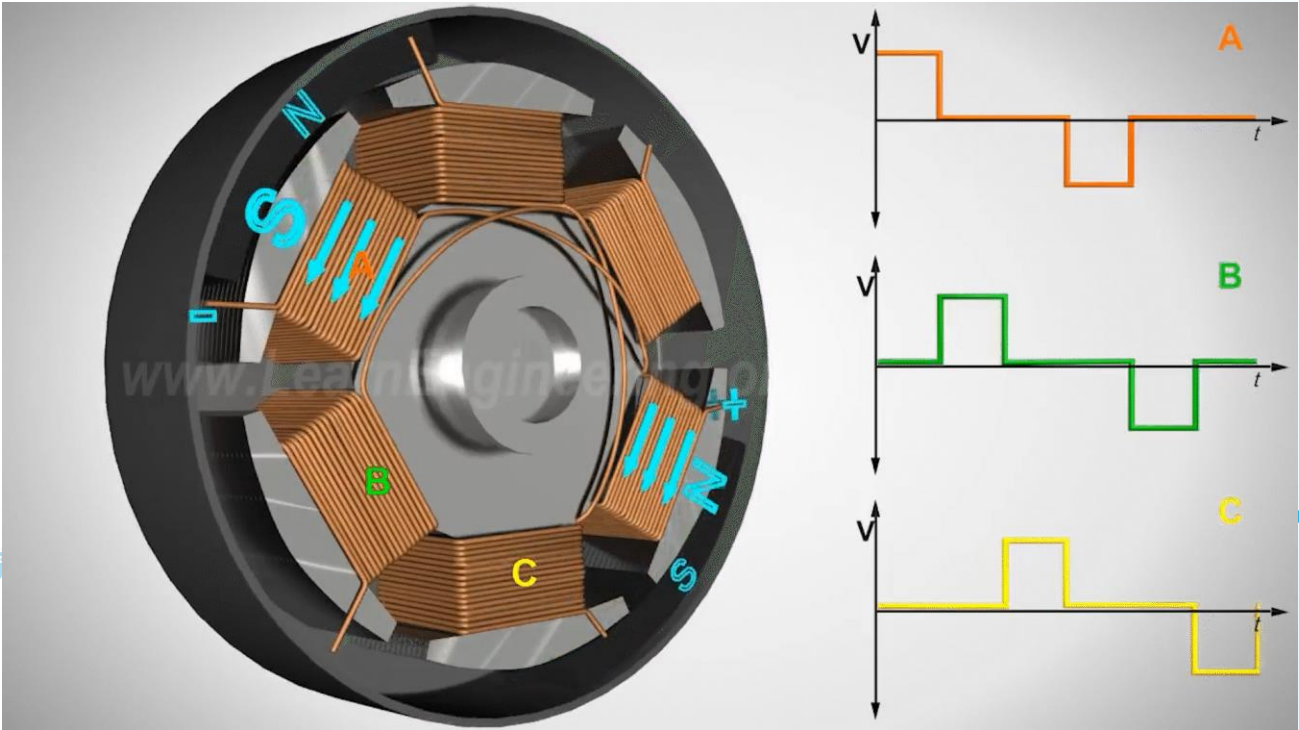
A decorative graphic consisting of multiple parallel, wavy lines of small blue dots. The dots are arranged in a pattern that resembles a sine wave or a series of overlapping curves, creating a sense of motion and depth. The background is a solid, vibrant blue color.

# Rotor on the outside?



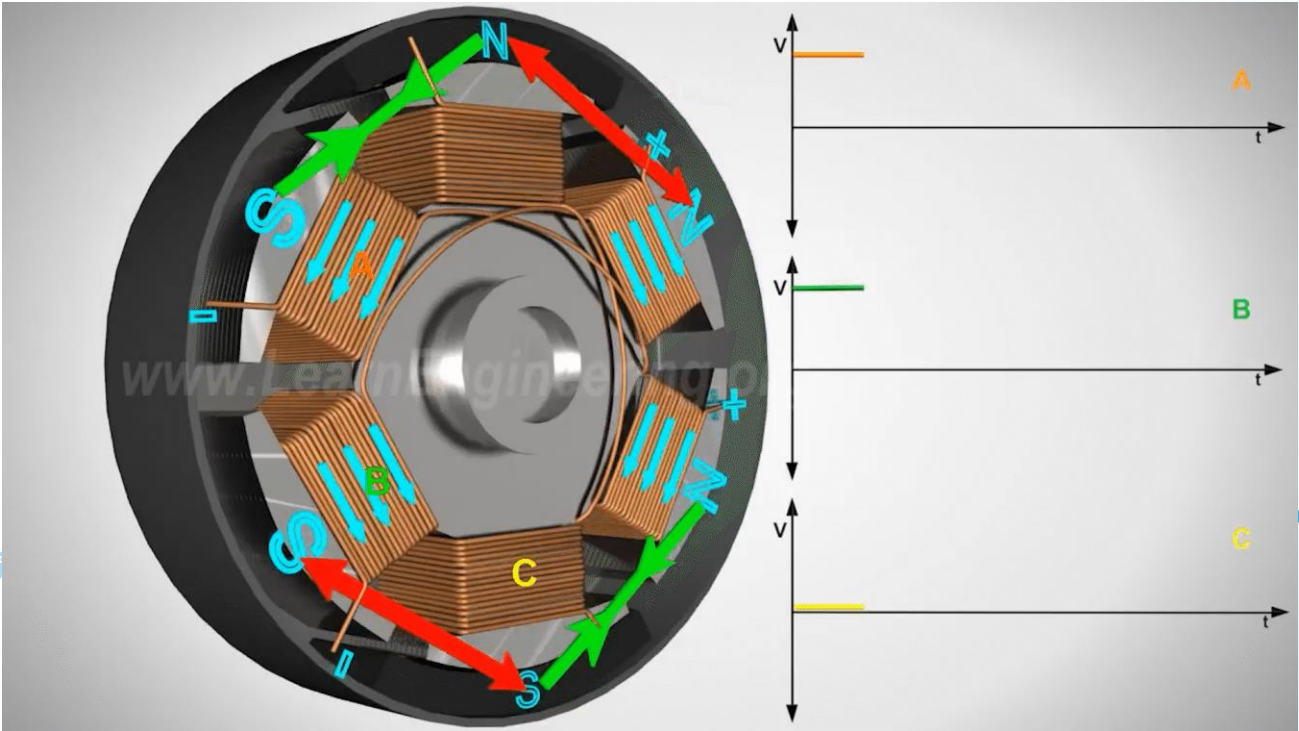


# More Spins





# MOAR POWER



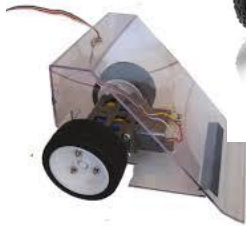
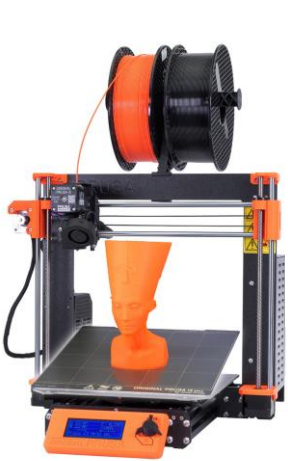
# Pros and Cons

	DC Brushed	DC Brushless
Pros	<ul style="list-style-type: none"><li>• Cheapest</li></ul>	<ul style="list-style-type: none"><li>• Smaller</li><li>• Lasts longer</li><li>• Most efficient</li></ul>
Cons	<ul style="list-style-type: none"><li>• Brushes wear out over time</li><li>• Loud</li><li>• Least Efficient</li><li>• Friction creates heat</li></ul>	<ul style="list-style-type: none"><li>• Most expensive</li></ul>

# Review

- What is a permanent magnet?
- What is an electromagnet?
- Explain how a DC brushed motor works
- Explain how a DC brushless motor works

# Where do we find electric motors?



# References

- <https://electronics.howstuffworks.com/motor.htm>
- <https://electronics.howstuffworks.com/brushless-motor.htm>
- <https://www.youtube.com/watch?v=CWuIQ1ZSE3c>
- <https://www.youtube.com/watch?v=bCEiOnuODac>