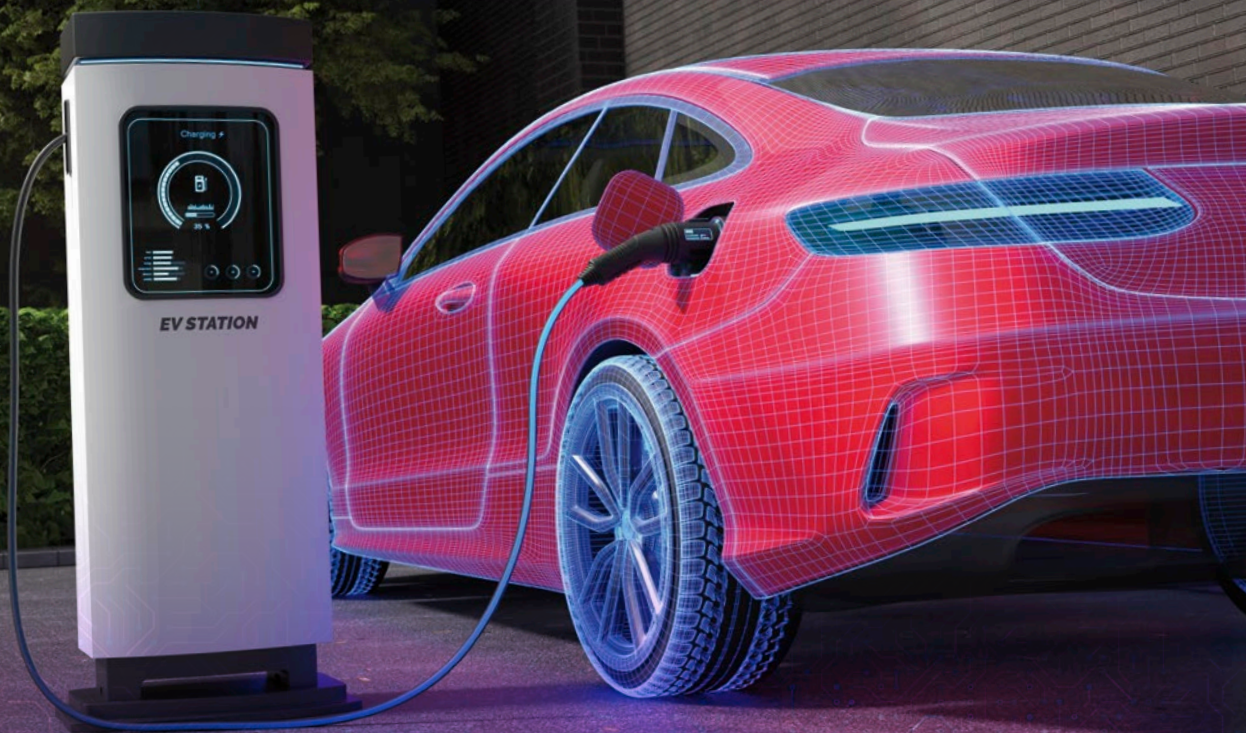


AMPED UP!

ELECTRICITY AND TECHNOLOGY



by Jenny Mason

Table of Contents

INTRODUCTION

POWERING THE IMPOSSIBLE 4

CHAPTER 1

CREATIVE DRIVES 6

CHAPTER 2

INVISIBLE AND UNSTOPPABLE 12

CHAPTER 3

COSMIC COMMANDERS 20

CHAPTER 4

SPARKS OF LIFE 26

GLOSSARY 30

READ MORE 31

INTERNET SITES 31

INDEX 32

ABOUT THE AUTHOR 32

Words in **bold** are in the glossary.

INTRODUCTION

POWERING THE IMPOSSIBLE

Less than 150 years ago, the light bulb was our wildest electric invention. Since then, electronic technology seems to defy all limits. Cars run on electric fuel and drive themselves. Robots explore outer space. Home devices obey our voices. And we pluck information out of thin air! High-tech electric tools get better every day!



WHAT'S THE BUZZ ON ELECTRICITY?

What is electricity?

Electricity is a natural force. It can be used to make light and heat or to make machines work.

Where does electricity come from?

Everything in the universe is made of super-tiny building blocks called **atoms**. Each atom has **protons**, **neutrons**, and **electrons**. Sometimes, electrons can move from one atom to the next. That movement creates electricity.

What's the difference between a conductor and an insulator?

Electricity moves through **conductors**. Conductors are materials that help electrons flow easily. Water and certain metals are conductors. **Insulators** slow or stop the flow of electrons. Wood, plastic, and rubber are insulators.

How is electricity measured?

Amps tell you how quickly the electrons are moving. Volts tell you how much pressure there is on the electrons. The energy of electricity can be put to work. The difficulty of the work is measured in watts.

$$\text{Watts} = \text{Amps} \times \text{Volts}$$

CHAPTER 1

CREATIVE DRIVES

Hooooom! There goes an electric vehicle, or EV. EVs pull their power from batteries. They do not make greenhouse gases, as gasoline cars do. Greenhouse gases make the planet hotter. That causes more dangerous weather. EVs are good for the environment. But making them tests the limits of human invention!

The all-electric Tesla S85 uses more than 7,000 compact battery cells.



Burrito Batteries

EVs use the world's most powerful batteries. Each battery holds a power burrito! Long, thin sheets of special minerals are rolled tightly together. One sheet has electrons. Another has protons. A plastic film with tiny holes stretches between the sheets. The burrito sits in a fluid that helps electricity flow. EVs speed up faster than fuel-burning cars. But their top speeds are slower.



Lithium-ion batteries are used to power EVs.

FACT

Some EV batteries weigh 1,200 pounds (544 kilograms). That is about twice as heavy as a fuel-burning engine.

Clean, Quiet, Fast

Fuel-burning cars need hundreds of mechanical parts. EVs use simple electric motors to spin their wheels. And those spinning wheels can transfer energy back to the battery. A moving EV can recharge itself!

The Aspark Owl goes from zero to 60 miles (97 kilometers) per hour in under two seconds!



Build an Electric Motor

Build an electric motor from supplies found at any hardware store. You'll need an adult's help for this activity.

*Heads Up! Metal tweezers conduct electricity.
A rubber handle protects you from getting zapped.*

Supplies:

- a ruler
- a reel of copper wire
- wire cutters
- rubber-handled tweezers
- 4 stacked disc magnets
- 1 AA battery (1.5 volt)

Steps:

1. Cut an 8-inch (20-centimeter) strand of copper wire. Wrap the wire loosely around the battery. Leave the ends at the top and bottom unwrapped.
2. Use the tweezers to bend one tip of the wire. It should touch the positive (+) end of the battery. Stick the disc magnets to the negative (-) end.
3. Stand the battery upright on its magnet end. Next, use the tweezers to bend the bottom tip of the copper wire around the magnets. *Swoosh!* The coil spins and spins!
4. Try flipping the magnet stack. What happens? Then flip the battery. Connect the positive (+) terminal to the magnets. What happens?

