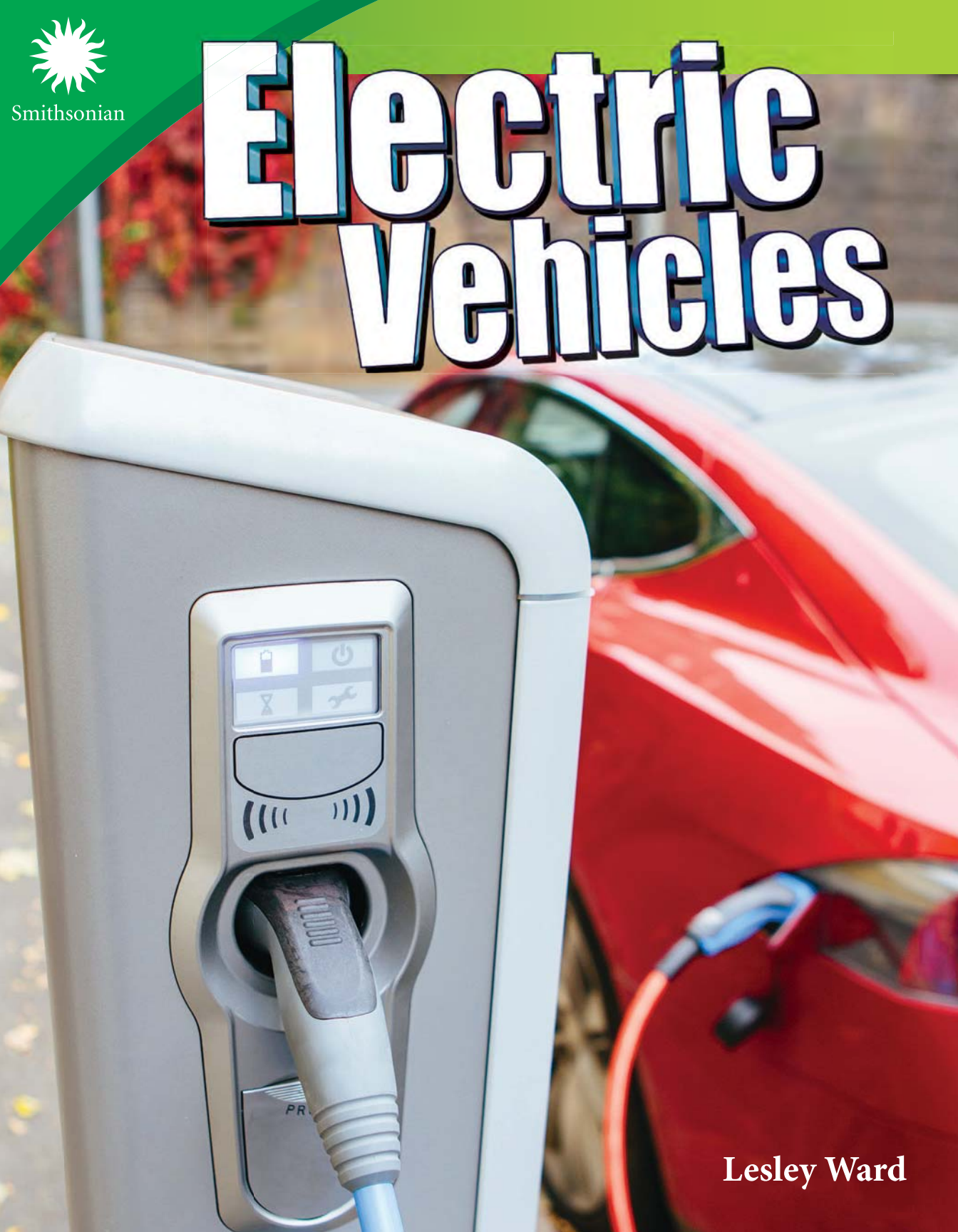
Smithsonian

Electric Vehicles



Lesley Ward

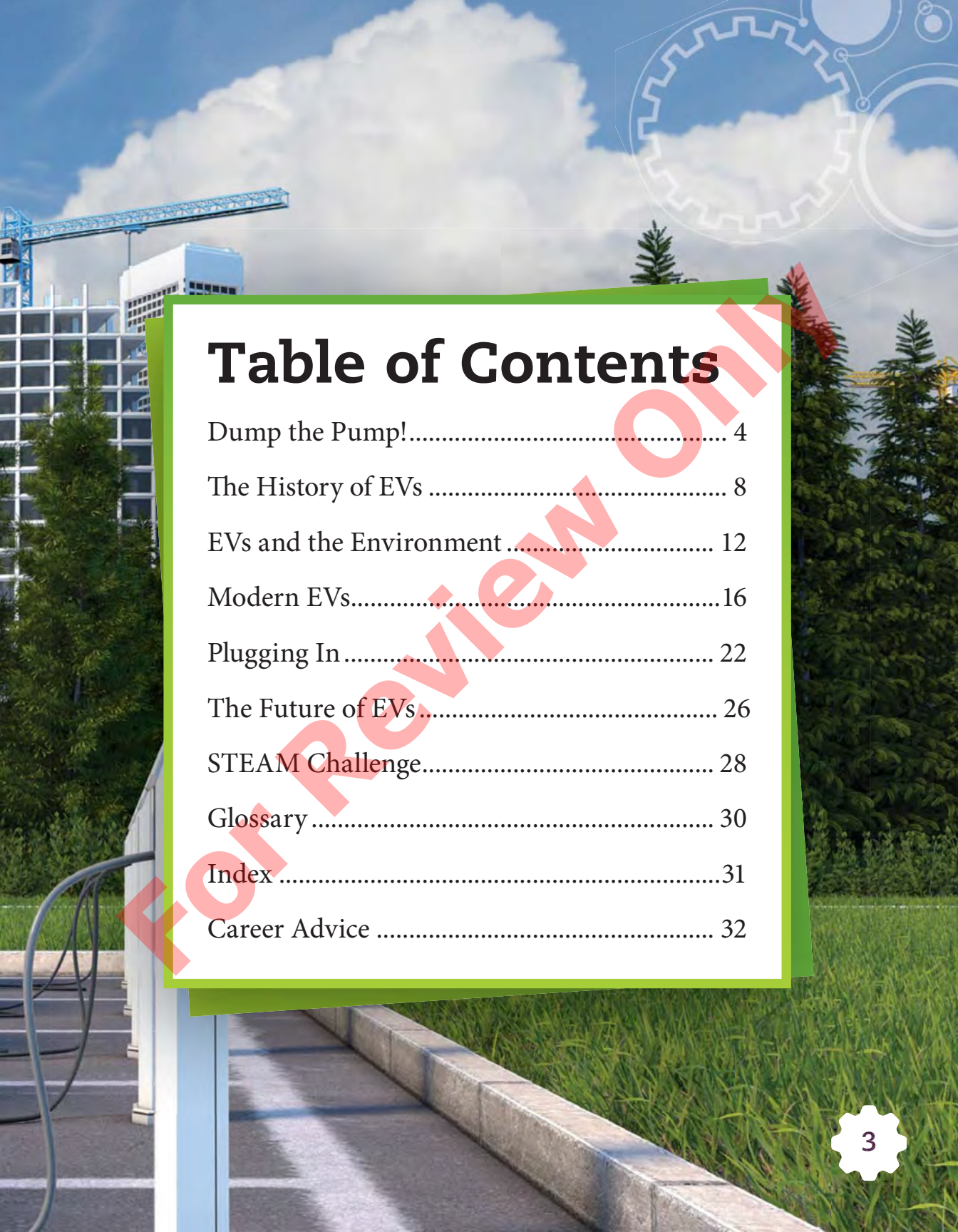


Table of Contents

Dump the Pump! 4

The History of EVs 8

EVs and the Environment 12

Modern EVs 16

Plugging In 22

The Future of EVs 26

STEAM Challenge 28

Glossary 30

Index 31

Career Advice 32

Dump the Pump!

Your family's car is running low on fuel. You need to head for the nearest gas station—and quick! Right? Nope. Instead, your parents drive to your house, pull into the garage, and park. They grab the big plug attached to the charging station by a cord and insert it into the **port** on the car.

After about six to eight hours, the car's battery is fully charged, and your family is ready to get back on the road. No need to buy expensive gasoline or waste time in line waiting for the next available pump. Why? Because you have an electric vehicle, or EV!

EVs are a common sight on the road today. Just like a cell phone, an EV runs on a lithium-ion battery that can be charged over and over. Early EVs were easy to spot. But today, many EVs are luxurious vehicles that drive just like gasoline-powered cars. It's hard to tell them apart, just as carmakers planned.

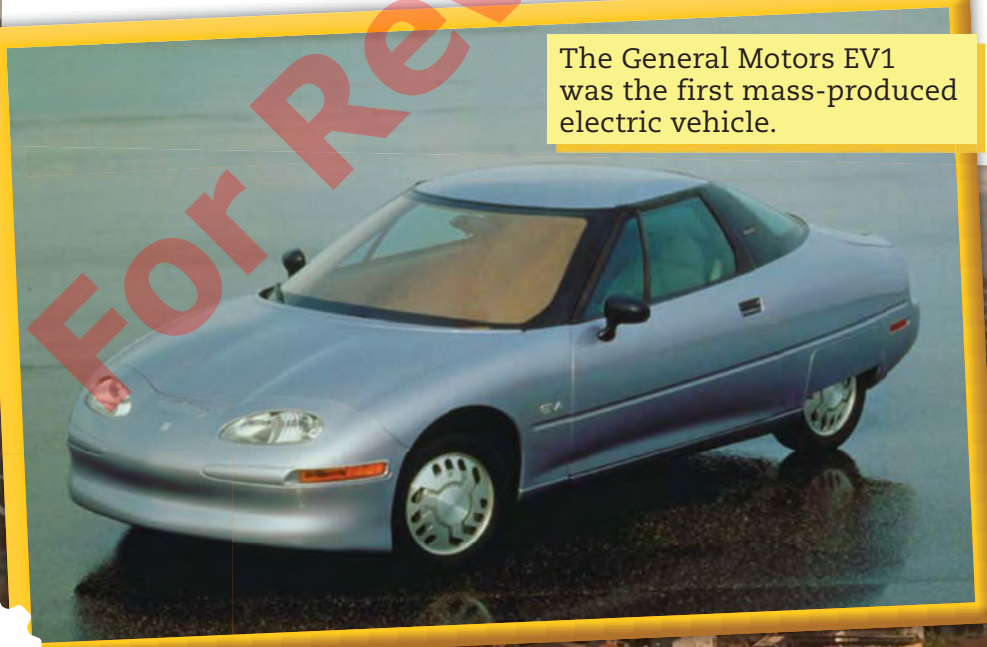
The Rimac Concept One is one of the most expensive EVs in the world. It can be yours for only $980,000!

EVs are becoming popular with drivers around the world. EV owners don't worry about the rising price of gasoline. They don't take their cars to repair shops to change the oil. EVs are cheaper to drive than cars that use gasoline.

EVs appeal to people who are concerned about climate change. They are **emission**-free vehicles. They don't **spew** smelly exhaust from their tailpipes. In fact, EVs don't even have tailpipes!

Car exhaust is made of gases that create smog and air pollution. It also contains carbon monoxide, a greenhouse gas. Greenhouse gases cause a buildup of heat in the atmosphere. Scientists have found that this heat results in global warming. Global warming is the big change in Earth's weather patterns. It has a negative effect on Earth's **ecosystems**.

A lot of people want to protect the environment. They are switching to EVs to do just that. There are many EVs for people to choose from.



The General Motors EV1 was the first mass-produced electric vehicle.

Greenhouse gases from cars that run on gasoline stay in the air for years after they are released.

The History of EVs

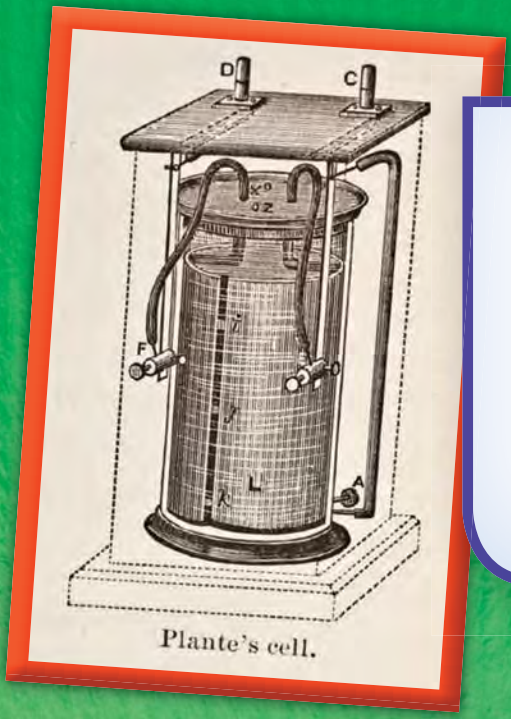
The main mode of transport in the early 1800s had four legs, a mane, and a tail. It was a horse! Horses carried riders. They pulled carts. Horses were strong, but they had their limits. They also needed to be fed and cared for. People knew there had to be a way to power a cart without using a horse.

In 1800, batteries were invented. They created power in the form of an electrical current. Scientists thought that battery power could be used to replace horsepower.

Robert Anderson, a Scottish inventor, built one of the first EVs in the 1830s. He attached a battery to a motor. The motor turned the wheels of a cart.

Anderson's "horseless carriage" was **crude**. It rolled just a few feet. The battery could only be used once. But his work inspired many inventors who heard of his work.

One of the first successful American EVs was built in 1890. A chemist named William Morrison designed it. It ran on 24 batteries that could be recharged. Morrison showed the car at the 1893 World's Fair in Chicago. He used it to give rides to **VIPs**. It was a big hit with the crowds.



Plante's cell.

SCIENCE

Lead-Acid Batteries

Gaston Planté (gas-TAHN plan-TAY) was a physics professor in France. He invented an electric storage battery in 1859. His battery could be recharged. He separated two sheets of lead with rubber. The lead was rolled into spirals. He connected the spirals to metal terminals. Then, he put the spirals into a glass container with sulfuric acid. The battery made a charge of two volts.

Morrison's 1890 electric carriage

STEAM CHALLENGE

Define the Problem

Engineers often try to make products work in new ways. Your task is to build a model car that can drive 2 meters (6.5 feet) along a flat surface without being pushed.

Constraints: You may use no more than five of the following items to build your car: cardboard, pencils, rubber bands, paper clips, straws, craft sticks, balloons, plastic bottles, plastic bottle caps, glue, and tape.

Criteria: Your model car must move forward at least 2 m (6.5 ft.) along a flat surface without being pushed.

1 Research and Brainstorm

What are some ways a car can be powered to move forward? What parts does a car need to have?

2 Design and Build

Sketch your design. What materials will you choose? Why did you choose these materials? Build the model.

3 Test and Improve

Mark two lines on the floor 2 m (6.5 ft.) apart. Place your car on one line and test whether you can get it to drive over the second. Did it work? What changes might improve the car's performance? Revise your model and try again.

4 Reflect and Share

Would your car be successful if the lines were 3 m (10 ft.) apart? Can your car drive up an incline?