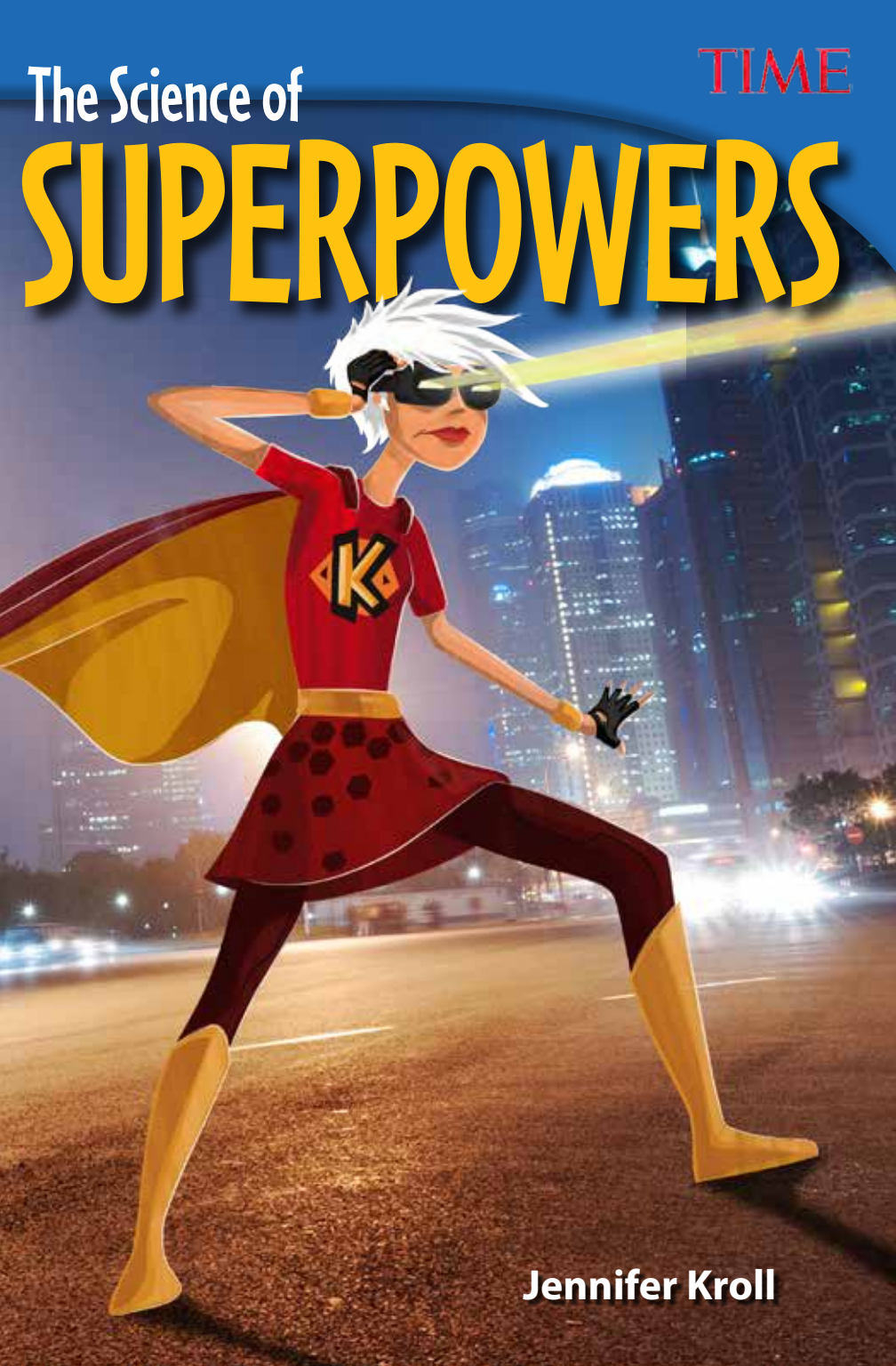

TIME
The Science of
SUPERPOWERS
Jennifer Kroll

For teachers' inspection ONLY

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Superheroes and Science

Superheroes have thrilled readers for decades. The first superhero comics appeared in print before the start of World War II. Today, graphic novels about superheroes still fly off library shelves. Kids, teens, and adults flock to theaters to watch these heroes save the day. Spider-Man! Batman! Avengers! We can't seem to get enough of superhero stories. And it's no wonder. These fun fictions are chock-full of action, suspense, good, evil, and … *science?*

Elements of a Superhero

Superhero storywriters like to make up imaginary metals and other **elements**. The Marvel® character Wolverine has claws and bones that are coated with "adamantium." Wonder Woman's bracelets are made from "amazonium." Captain America's shield is made with "vibranium."



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A Form of Sci-Fi

Superheroes and science? Sure! With gamma rays, black holes, and mutants, superhero stories are full of ideas borrowed from science. These stories imagine what the technology of the future may be like. Story characters own and use amazing vehicles, weapons, and gadgets. They travel through space and time. With so many science and technology elements, superhero fiction is really a form of **science fiction**.



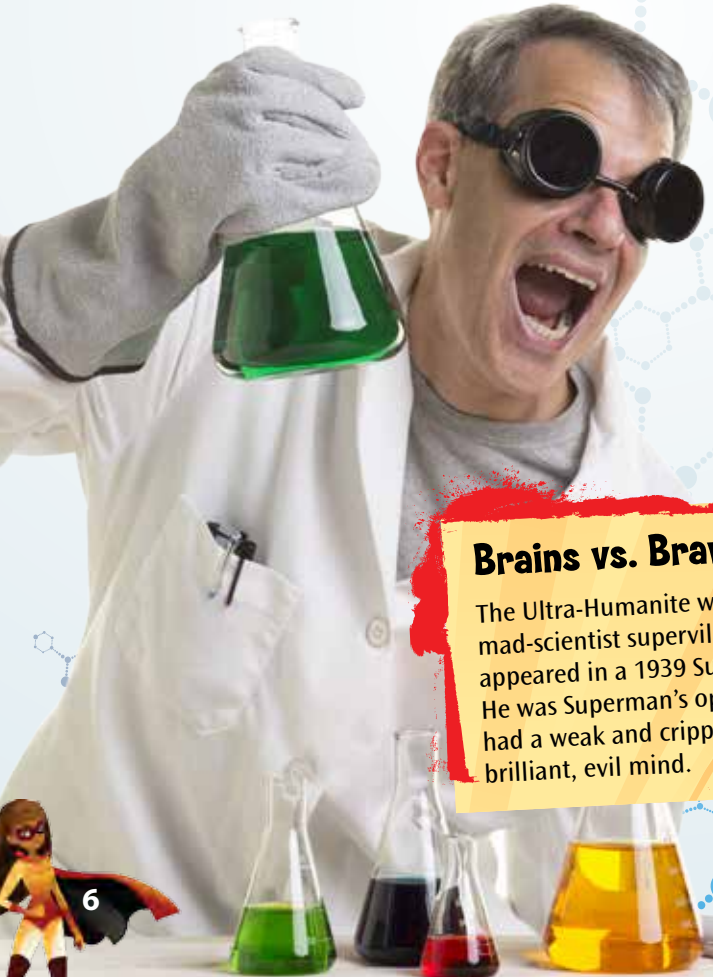
A Super Alien

Science fiction stories sometimes tell of beings from other planets. The comic book hero Superman is from the planet Krypton. He travels to Earth as a baby.

Mad Scientists and Mighty Mutants

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He's testing out his new freeze ray. He's laughing as he pours smoking liquid into beakers. His evil experiments turn people into mutants. Who is this **sinister** character lurking in the lab? It's a mad scientist, of course! And it will take a superhero—or maybe a team of rebel mutants—to stop this kind of evil genius.



Brains vs. Brawn

The Ultra-Humanite was an early mad-scientist supervillain. He first appeared in a 1939 Superman comic. He was Superman's opposite. He had a weak and crippled body but a brilliant, evil mind.

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Scientists Gone Bad

Mad scientists appear in many superhero stories. These characters crave power, and they want knowledge. They don't care who gets hurt along the way. One of Spider-Man's biggest enemies is a mad scientist named Dr. Otto Octavius. "Doc Ock" has mechanical tentacles attached to his body. In the Batman stories, the hero must face off against Mr. Freeze. This villain was once a scientist who worked with frozen bodies in a **cryogenics** lab. He suffered a lab accident and now must wear a refrigerated suit. He seeks revenge on Batman, whom he blames for his misfortunes.



- Mad scientists in stories sometimes go too far with their experiments. How might a science experiment "go too far"?
- What kinds of experiments are controversial in society right now?
- Who should have the power to decide what types of scientific experiments are okay and not okay?



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Mighty Mutants

Some superheroes—and super villains—are mutants. These characters have special abilities that no ordinary human could have. The members of the X-Men are all mutants. Wolverine has the ability to heal rapidly. Jean Grey has telepathic and telekinetic powers. She can read thoughts and move objects with her mind. Storm is a mutant who can control the weather.

The stories about these mighty mutants are pure fiction. Yet the concept of mutants comes from the world of science. The cells of living things contain something called DNA, and it is DNA that determines how organisms will look and act. Parents pass DNA to offspring. Each DNA strand is made up of genes. When a gene or group of genes changes from what has been normal in the past, this is called a **mutation**. The changed organism is sometimes called a *mutant*.

In some superhero stories, an accident causes a character's mutation. A character gets exposed to powerful rays or chemicals. This is how Dr. Bruce Banner becomes the Hulk. Some mutants are created by the military or by scientists. In Marvel Comics, cosmic beings called the Celestials give some people special "X-genes." The people born with these genes have mutant superpowers.

A Magnetic Personality

Magneto is a mutant character who can create and control magnetic fields. Is it possible for a human to have this power? Scientists don't think so. But some people have claimed to be human magnets like Magneto.



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From Pets to Ninjas

The Teenage Mutant Ninja Turtles have been kid favorites for decades. The heroes began as ordinary pet turtles. Then, they were exposed to radiation and mutated into human-like forms.



Raphael and Michelangelo

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Reader's Guide

1. What superpowers are possible or may become possible in the near future? How might society change if people had access to these powers?
2. This book describes how scientists are altering DNA in plants and animals for research and other purposes. What impact might this practice have on society?
3. When thinking about strength, do you tend to think in terms of absolute strength or relative strength? Is one more useful than the other?
4. Using evidence from this book, describe which superpower is the best.