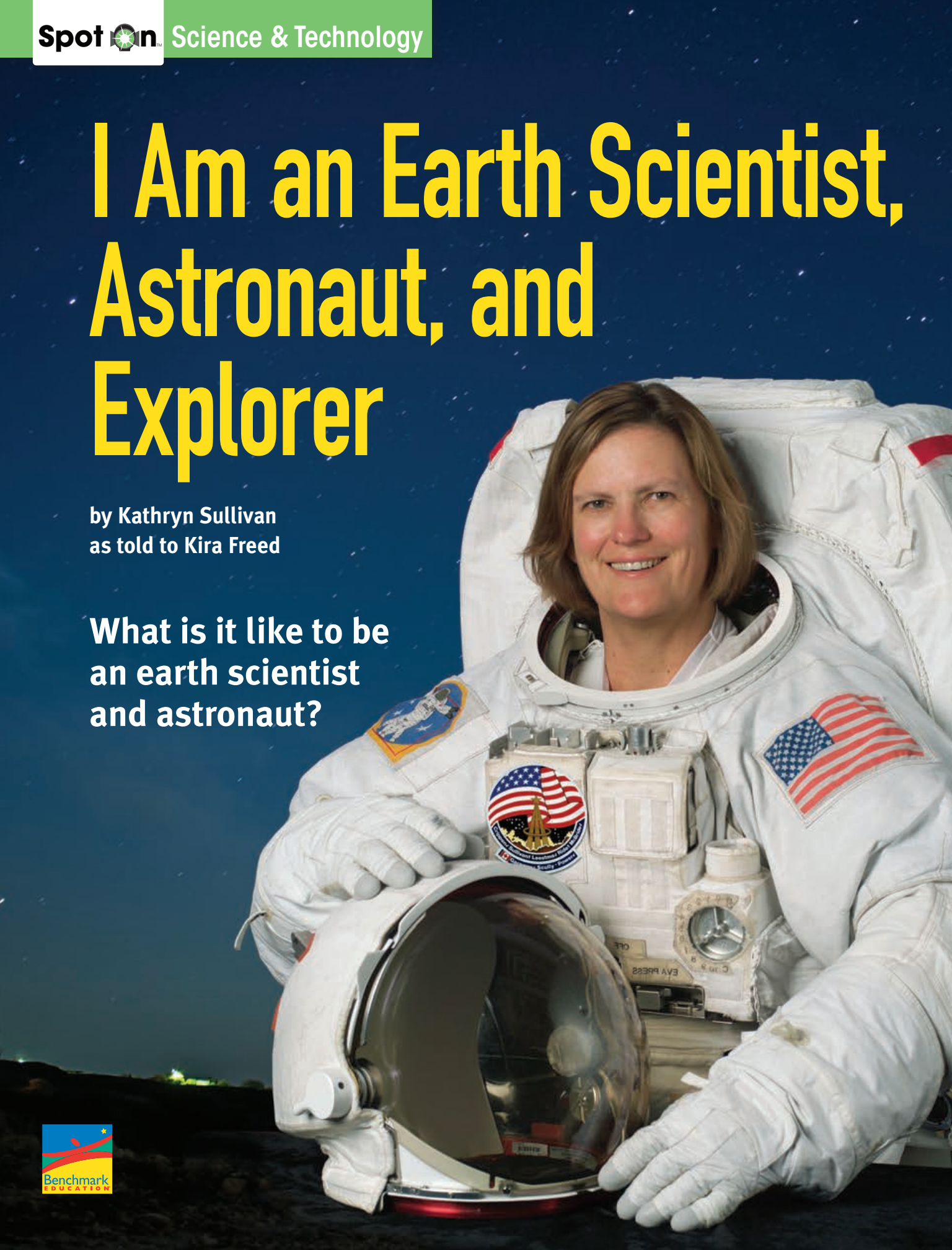
Spot On Science & Technology

I Am an Earth Scientist, Astronaut, and Explorer

by Kathryn Sullivan
as told to Kira Freed

What is it like to be an earth scientist and astronaut?



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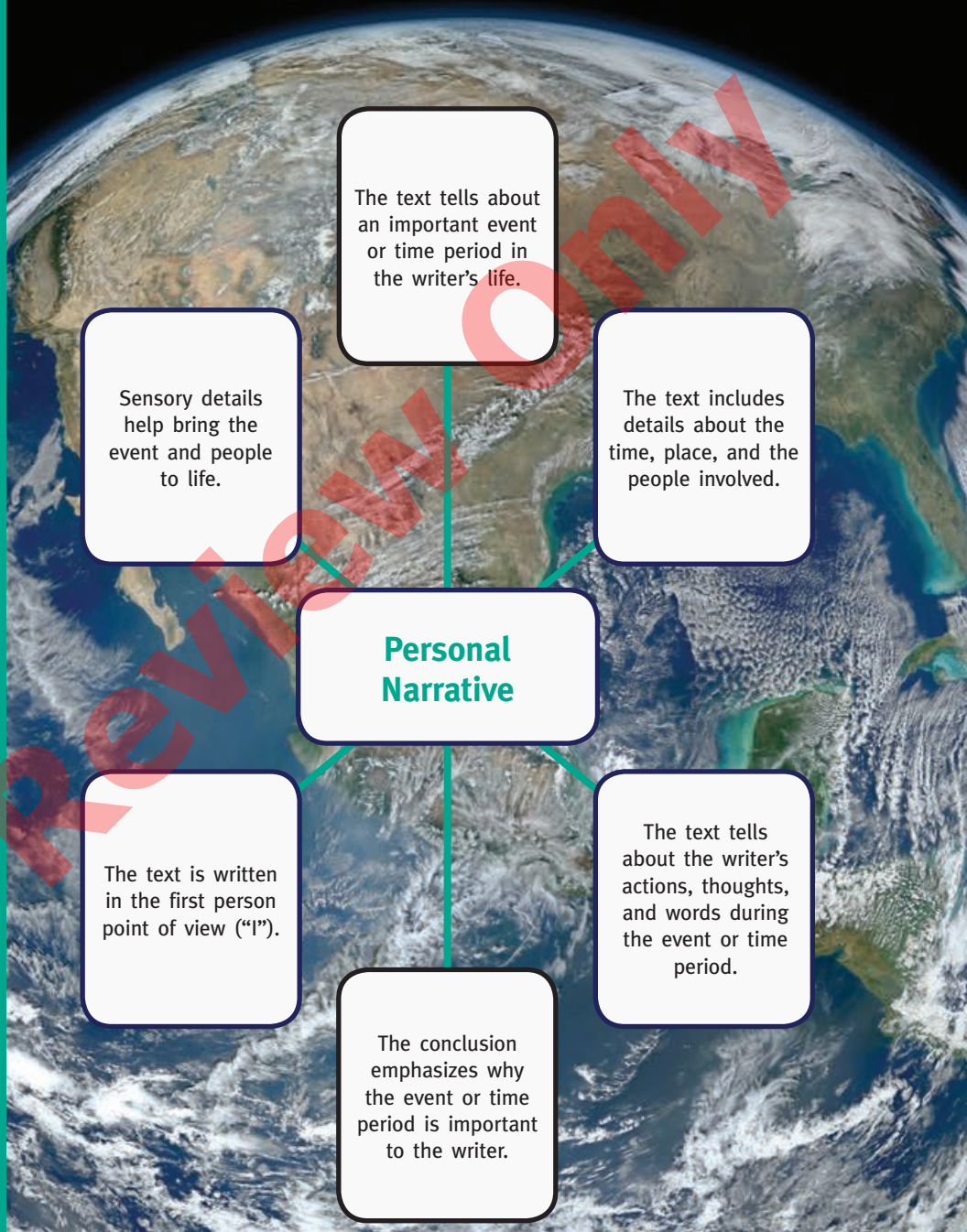

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Exploration, Excellence, and Service

Kathryn Sullivan blazed a trail in space exploration as the first woman from the United States to perform a space walk. She has flown to space three times, logging more than 532 hours in space.

As a member of the National Aeronautics and Space Administration's (NASA) first class of **space shuttle** astronauts, Sullivan was at the forefront of the space shuttle era. She and her crewmates developed the building blocks that allowed space shuttles to fly. Sullivan was also a founding member of the Hubble Space Telescope team. She helped put it into **orbit** and laid much of the groundwork for making repairs.

In 1986, the Space Shuttle *Challenger* broke apart just after liftoff, killing the entire crew. After the accident, Sullivan worked closely with June Scobee, widow of the spaceflight's commander, and the other *Challenger* families. She helped launch the Challenger Center for Space Science Education, which supports young people pursuing science careers.

For her entire life, Kathryn Sullivan has been fascinated with Earth and everything about it. Throughout her career as an astronaut and earth scientist, she has distinguished herself through her passionate commitment to exploration, excellence, and service.

▼ **suited up for a NASA research flight at 18,288 meters (60,000 feet)**

CHAPTER 1

A Firm Foundation

I never planned to be an astronaut or an earth scientist when I was young. However, I've always been intensely curious about the world around me—what it's made of, how it works, its history, its people—everything about the planet I live on. I've pursued my interests with a hunger for adventure and a persistent desire to be an explorer, along with a good dose of luck (and lots of hard work). As an astronaut and earth scientist, my adventures have far exceeded my wildest dreams. My curiosity and sense of exploration ensure that I'll always have interesting and worthwhile things to do.

I was born on October 3, 1951, in Paterson, New Jersey. When I was six, my family moved to Woodland Hills, California, a suburb of Los Angeles. My father worked as an engineer and was interested in aviation and photography. My mother, a stay-at-home mom and an avid reader, was fascinated with people, politics, and global culture.

> *I'VE PURSUED MY INTERESTS WITH A HUNGER FOR ADVENTURE.*

Inquiry, discussion, and self-expression were highly valued in my family. The typical response to challenges was, "That's interesting. Let's figure it out." That attitude fostered curiosity and resourcefulness—qualities that laid a firm foundation for my career in science.

▲ **This photo reminds me of how much my mother encouraged my adventurousness and helped build my self-confidence.**

When I was young, I dreamed of being an explorer and living a life filled with adventures. My brother, Grant, and I grew up understanding that every person has unique interests and talents worth pursuing.

▼ **Astronaut John Glenn and sea explorer Jacques Cousteau were among those who inspired me when I was growing up.**

After I graduated from high school, I went to college at the University of California, Santa Cruz. I planned to study foreign languages, thinking they would be a good steppingstone to a career in global exploration. However, it wasn't long before I changed my direction. During my freshman year, I took two earth science courses, in marine biology and general oceanography. The science was fascinating, and my professors were having just the kinds of adventures I'd been longing for. The book *Great Waters* by marine biologist Sir Alister Hardy was required reading in one of my classes. I realized that the life of an oceanographer was a perfect match for my childhood dream.

▲ **Sir Alister Hardy wrote *Great Waters*—an adventure story, a travel account, and an introduction to doing science at sea.**

▼ **Marine biology is the study of living things in the ocean.**

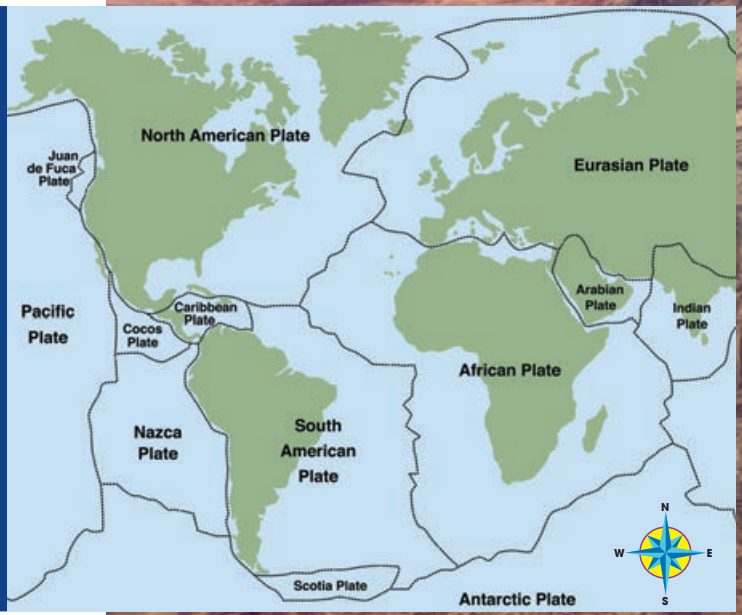
I spent a year studying at the University of Bergen in Norway. I wanted to see different aspects of the world and its geology. The field of plate tectonics was picking up speed at the time, and a new understanding was emerging about how our planet works. Evidence of that was discovered on the seafloor right off my doorstep in Norway.

I graduated from UC Santa Cruz with a bachelor of science in earth sciences in 1973. While in Norway, I'd read scientific papers by a research group based in Halifax, Nova Scotia (Canada), and became intrigued. I fell in love with the geology of the North Atlantic and decided to attend Dalhousie (Dal-HOW-zee) University in Halifax for graduate school.

The movement of Earth' s tectonic plates is constantly reshaping the Earth's surface.

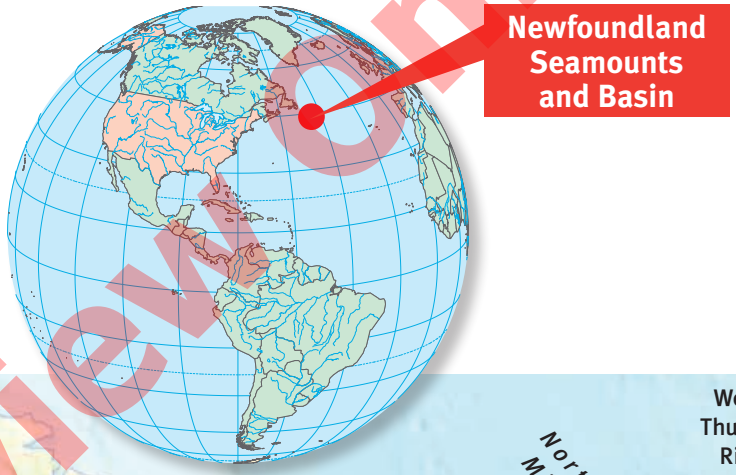
PLATE TECTONICS

Plate tectonics is a widely accepted scientific theory about Earth's structure. It explains how pieces of Earth's rocky crust move as hot magma underneath moves. Plate movement explains why earthquakes happen and accounts for features in Earth's crust such as volcanoes and other mountains. It also helps explain long-term changes in Earth's surface, including the geography of continents and oceans.



When people hear the word *geology*, they often think of the study of rocks. Geologists do study rocks, but they also study much more. *Geo* means "earth," so geologists really study Earth. While I was in college and graduate school, scientists were coming to understand that Earth's oceans, atmosphere, and rocks are all parts of a connected system. My graduate school research included both approaches. I studied rocks, while also keeping in mind the big question "How does Earth work?"

A part of the seafloor off the east coast of Canada had never been properly mapped. It contained a group of small underwater volcanoes. No one knew when they formed or what part of the Atlantic Ocean's story they tell. I took ships out there for several summers to get enough depth measurements to make a good map.



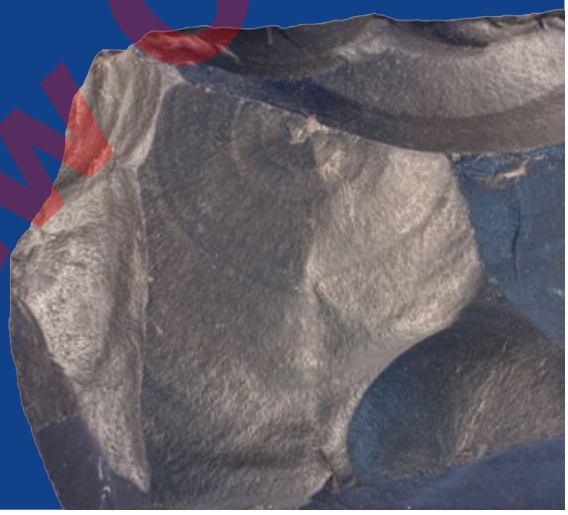
▼ **I mapped the area of Newfoundland Seamounts and Newfoundland Basin.**

I also dredged up some basalt. This type of rock makes up the part of Earth's crust along the seafloor. Studying the magnetic signal of the rock provided clues about its origin. Measuring patterns in the gravity and magnetic field helped me answer questions about the geologic history of this bit of seafloor.

This corner of the ocean played an important role in Earth's history. Millions of years ago, the Atlantic Ocean formed as Earth's landmasses broke apart and moved to where they are today. The section of seafloor I studied was the place where the direction of movement shifted. It was exciting to contribute to an understanding of Earth's history. After earning my **doctorate** in geology in 1978, I was ready for my next adventure.

BASALT

Basalt is a rock that begins as lava. Basalt contains iron-rich minerals that orient themselves in the magnetic field just like a compass needle. Using a magnetometer, scientists can measure the magnetic signal recorded in basalt. That signal helps them figure out when the rock formed and whether it was in the same place when it formed. Studies of basalt help support the scientifically accepted theory of plate tectonics.



CONTINENTS ON THE MOVE

Earth's continents are constantly moving as the plates of Earth's crust shift. For example, the North American and Eurasian plates separate at a rate of about 1 centimeter (0.4 inches) per year. Scientists think that all the continents were once joined together in one huge landmass. The shifting plates of Earth's crust caused this landmass to separate and drift apart over time.