

# Where Are We Going and Why?

## Focus questions

Where are we going and why?

How did the Isthmus of Panama form and what were the local, regional, and global effects?

How has human history shaped the geography of Panama?

The sun is rising on Barro Colorado Island (BCI), a small tropical island in Panama. Many of the scientists who live on the island are already awake and making their way into the tropical rainforest. Others will not begin their research until the sun goes down. BCI bursts with life, from its treetops down to its forest floor. Even though BCI is small (only 15 square kilometers or 3,700 acres), at least 1,316 plant species, 381 bird species, 102 mammal species, and tens of thousands of other organisms, including fungi, bacteria, and insects, have been found on the island! Join us on our JASON XV adventure, *Rainforests at the Crossroads*, as we work with researchers in Panama to understand tropical rainforest systems and the role they play in maintaining life on Earth.

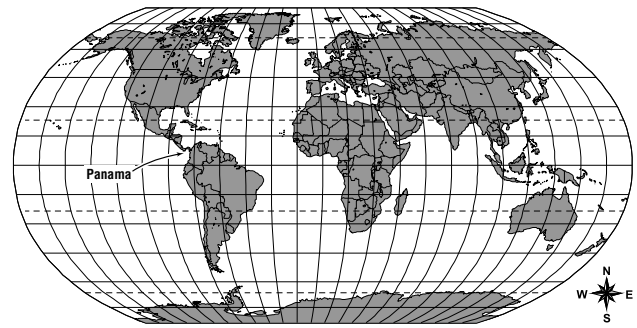
## Where are we going and why?

BCI is located in the Panama Canal, one of the most famous transportation routes on the planet (see JASON Atlas Map 2). Each year, thousands of ships use the canal to travel between the Atlantic and the Pacific Oceans. In the midst of this bustling activity, BCI stands peacefully, protected as a wildlife preserve and covered with tropical forest. Scientists are drawn to BCI for many reasons. They come to the island to research tropical forests in an environment that is free of human activities, such as farming, hunting, and development. They also come because they want to learn more about Panama, a place that holds clues to understanding not only tropical forests, but also the history of our planet as we know it.



Barro Colorado Island.

STRI archives



Where are we going?

The research station on BCI is managed by the Smithsonian Tropical Research Institute (STRI), whose well-equipped facilities in Panama, long history, and reputation as a leader in tropical forest research attracts scientists from around the world. The seeds for STRI were planted about 90 years ago, when the United States was building the Panama Canal. In 1910, U.S. scientists were sent to Panama to conduct the Smithsonian Institution Biological Survey of the Canal and Panama. The goal of this survey was to learn about Panama's plants and animals. Another group of biologists arrived from the U.S. to help wipe out tropical diseases (yellow fever and malaria) that had to be controlled before the Canal could be built. In 1923, impressed by the fascinating and largely unexplored forests of Panama, scientists from a variety of institutions set up a permanent research station on BCI and laid the groundwork for STRI. The Smithsonian began to manage the station in 1946.

What makes STRI so special? For starters, it provides scientists with comfortable, well-equipped, easily accessible research facilities where they can interact with other researchers. STRI is also unique because some of its research and environmental monitoring projects have been going on for decades. STRI's scientists use these long-term **data** sets to determine how tropical forests work and to understand how forests respond to environmental changes. BCI is like a natural laboratory. Discoveries made on this small Panamanian island may help scientists and policy-makers make better decisions about the way tropical forests around the world are managed and conserved.

To learn more about the JASON XV host researcher team, visit the "Meet the Researchers" section of the curriculum (on page 3). Each of JASON's host researchers investigates specific questions. Their discoveries help us gain a deeper understanding of tropical rainforests.

### How did the Isthmus of Panama form and what were the local, regional, and global effects?

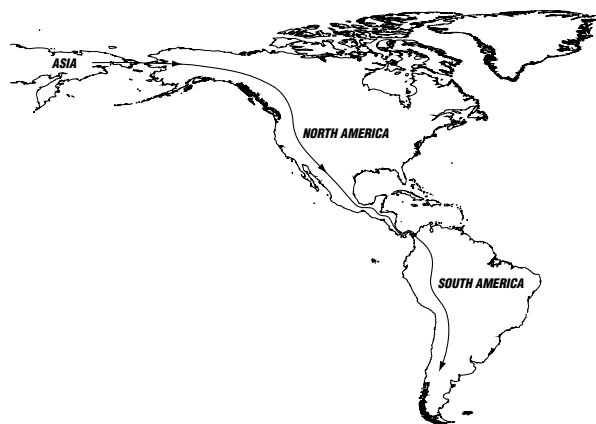
Take a step into JASON's time machine, go back 20 million years, and look at the spot where you think Panama should be. What do you see? Nothing but water! 3 million years ago, you would have seen a completely different picture. By that time, a slender strip of land had formed. This land, called the **Isthmus** of Panama, formed a continuous land bridge between North and South America and a physical barrier between the Atlantic and Pacific Oceans. How did the isthmus form? It is a dramatic story of collisions, upheaval, and volcanic eruptions. You'll learn more about it in Exercise 1.1.

Some scientists call the formation of the Isthmus of Panama the most important natural event in the past 60 million years! Even though the isthmus represents only a small portion of the land on Earth, its formation has had enormous regional and global consequences. The isthmus changed how animals were distributed throughout the Americas. For **terrestrial** (land-based) animals, the new isthmus was a bridge that allowed migration between North and South America. For marine animals, though, the isthmus was a barrier. Before it formed, marine animals could travel back and forth

between the Atlantic Ocean and the Pacific Ocean. They could not do this once the isthmus formed. The formation of the Isthmus of Panama also caused changes in wind and moisture patterns and in the direction of ocean currents. All of these changes played an important role in establishing the ocean circulation and climate patterns that exist on Earth today.

### How has human history shaped the geography of Panama?

Panama's cultural history is as fascinating as its geologic history. The first people arrived in Panama more than 10,000 years ago. Their ancestors, who came from Asia, traveled to the Americas over the Bering Strait and then traveled southward through North America and parts of Central America before reaching Panama. The first Europeans arrived in Panama about 500 years ago. People from all over the world followed them. Some people came to Panama in search of treasure, such as **conquistadors**, pirates, and gold prospectors. Others arrived against their will, such as enslaved people from other parts of the Americas and from Africa. Many others came to build transportation routes across the Isthmus of Panama: workers from the Caribbean Islands, China, France, Germany, Greece, India, Ireland, Spain, and the United States. People from all over the world still come to Panama today.

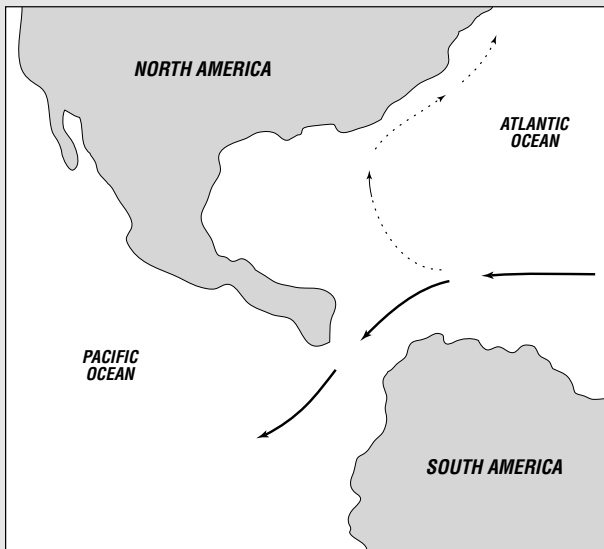


The first migration route to Panama.

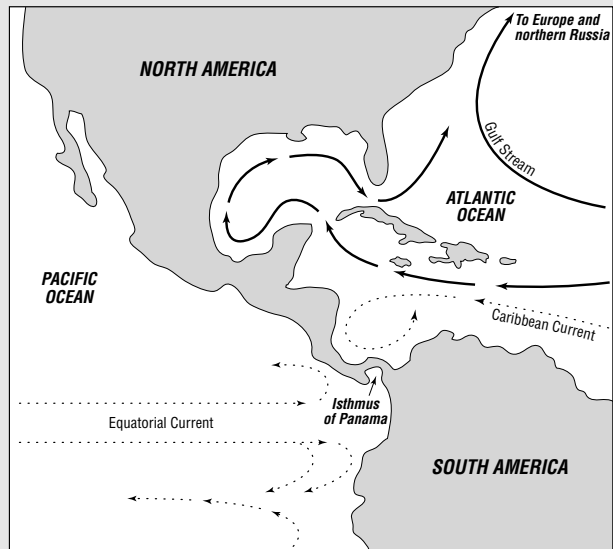
**How Did the Isthmus of Panama Affect Ocean Currents?**

Before the isthmus existed, a strong ocean current flowed east to west from the Atlantic Ocean to the Pacific Ocean. Once the isthmus formed, the current was blocked off and forced northward. This strengthened a current that we now call the Gulf Stream. The Gulf Stream carries warm water northward past the east coast of North America and past the coasts of Europe and northern Russia. This warm Gulf Stream water heats up the climates of these coastal areas. If the Gulf Stream did not exist, these places would be a lot colder than they are today.

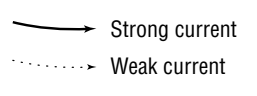
**Ocean Currents before the Isthmus Formed**



**Ocean Currents after the Isthmus Formed**



Adapted from *The Story in the Stone*, Tom Gidwitz



Research article

Panama’s landscape has changed dramatically since the first people arrived. Forested areas have been turned into farmland and many large cities and towns have been established. Extensive transportation systems have also been built across the country. The Panama Canal is the transportation system that has had the most dramatic effect on the area’s geography. To build the canal, engineers dammed the Chagres River. In the process, new lakes were formed, a valley was flooded, and towns and forests were covered with water. But a jewel was created in the process. As the waters rose, the top of a large hill was surrounded by water and became an island. That island is none other than BCI. Now that you know how BCI came to be, you are ready to continue your exploration of the island and its tropical forests!



Ilana Schoenfeld, JFE

Howler monkeys perch in the trees on BCI.

**Other Famous Transportation Routes**



Otis, F.N., Illustrated History of the Panama Railroad

Early in the 1500s, the Spaniards built a road system that followed rivers across the Isthmus of Panama. They used it to transport gold and silver (extracted from South America) across the isthmus to boats destined for Europe. At the time, as much as 60 percent of the world’s gold and silver supply was transported over this road and river system! In 1850, a company from New York City won a contract to build a railroad across Panama. The railroad was completed in 1855. It was built during the California Gold Rush to help people in the eastern part of the United States get to and from California quickly. At the time, the United States did not have a **transcontinental** railroad, and crossing the country on horseback was time-consuming and dangerous. If you had lived in the eastern United States during this time, it would have been easier for you to get to California by taking a steamship (a coal-powered boat) to Panama, riding a train across the isthmus to get to the Pacific Ocean, and then traveling the rest of the way to California by another boat.

**Fact or Fallacy?**

The Americas (North America, Central America, and South America) form a land barrier between the Atlantic and Pacific Oceans. The barrier is at its narrowest in Panama.



*Fact: If you look at a globe, you will see that the Americas separate the Atlantic and the Pacific Oceans. Between Alaska (in the north) and Tierra Del Fuego (in the south), Panama is the place where the land separating these two oceans is at its narrowest. This is why so many famous transportation routes have been built across Panama.*



**Journal Question**

*How have humans changed the geography of Panama over time? View the JASON XV Expedition Field Notes Video and add your thoughts to your online journal!*

**Vocabulary**

**Conquistador** *n.* A Spanish word meaning “conqueror.” Usually refers to the leaders of 16th-century Spanish military expeditions that discovered and conquered vast territories in the Americas.

**Data** *plural n.* Observations and measurements about the real world. In science, data are used to support or disprove hypotheses.

**Isthmus** *n.* A narrow strip of land that has water on either side and connects two larger bodies of land.

**Terrestrial** *adj.* Living on land.

**Transcontinental** *adj.* Extending across a continent.