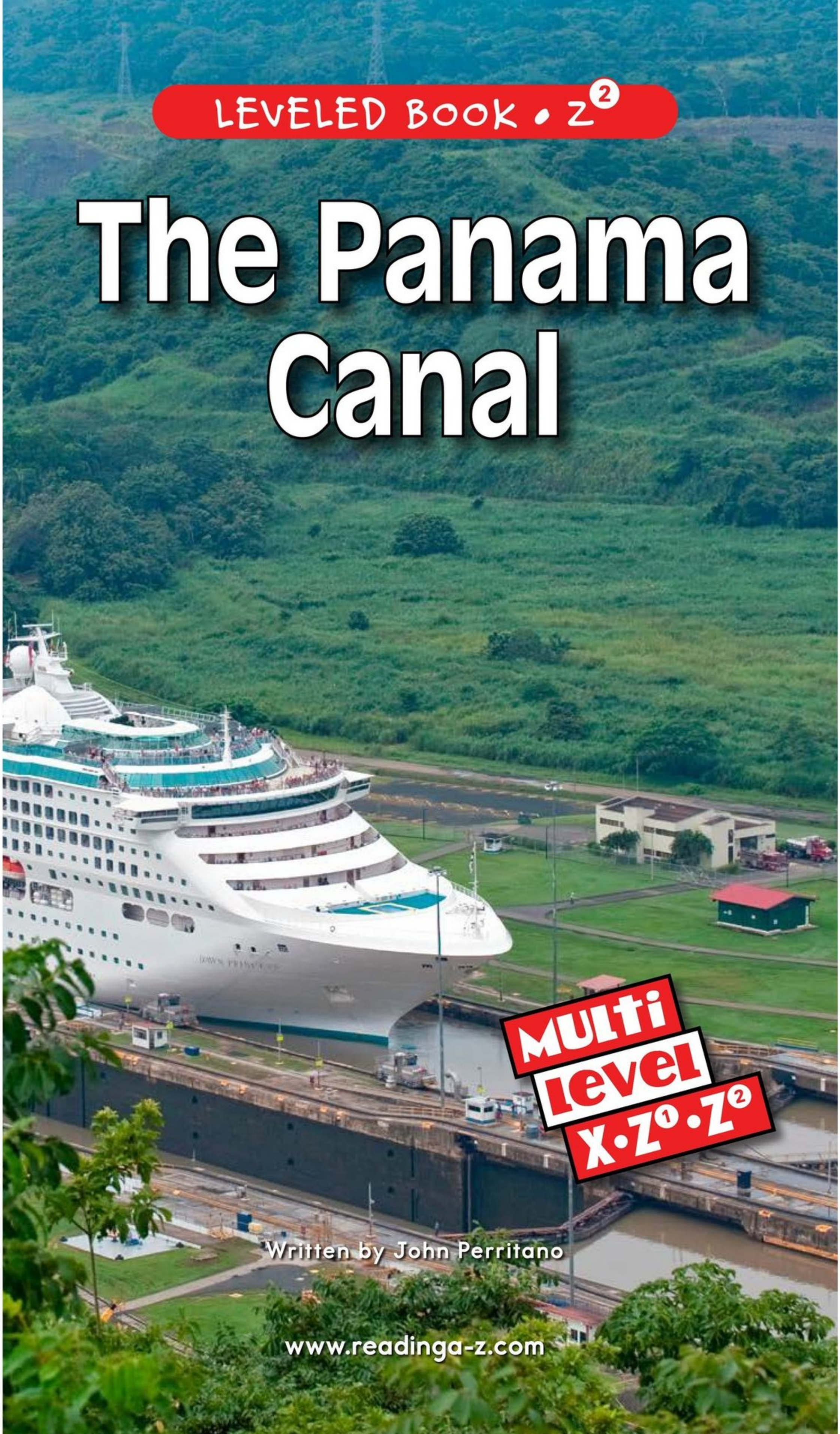
LEVELED BOOK • Z²

The Panama Canal



Multi Level X•Z⁰•Z²

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Focus Question

Why is the Panama Canal considered a colossal engineering feat?

Words to Know

accommodate
canal
commerce
contracted
coup
engineering
ingenuity
isthmus
locks
malaria
marine
morale
naval
perished
refurbishing
scale
stalled
transcontinental

Front and back covers: The luxury cruise ship *Dawn Princess* moves through the Pedro Miguel locks in the Panama Canal.

Title page: Workers construct a lock and lock gates in a section of the canal in 1913.

Page 3: Ships pass through the Gatun locks on the eastern side of the Panama Canal.

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Level Z2 Leveled Book

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Correlation

LEVEL Z2	
Fountas & Pinnell	Y–Z
Reading Recovery	N/A
DRA	70+

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Ancon makes the first trip through the newly built Panama Canal in 1914.

Introduction

It was a modern marvel that began as a seemingly impossible dream. Yet that dream became reality on August 15, 1914, when the cargo ship *Ancon* eased through narrow **locks** and around towering mountains on its journey west via the newly opened Panama **Canal**.

For so many, the *Ancon*'s voyage was a day of triumph. A journey that in prior years had taken months to complete could now be accomplished in a matter of days, thanks to a combination of human **ingenuity**, American technology, and the sweat of thousands of laborers.

The construction of the fifty-mile-long canal was a colossal **engineering** feat the likes of which the world had never before witnessed. Workers spent ten years gouging earth from the **isthmus** and beating back countless obstacles in an effort to create a new water route for commercial, military, and recreational **marine** traffic between the Atlantic and Pacific Oceans.

The opening of the Panama Canal not only spurred global **commerce** but also helped establish the United States as a world power. Nearly one hundred years later, thousands of ships, from yachts to aircraft carriers, use the canal to cross from one mighty ocean to the other.

Treacherous Crossings

The idea of linking the Atlantic and Pacific with a canal was born well before the twentieth century. Early Spanish explorers were the first to envision a waterway between the two oceans, but the Spanish lacked the engineering ability to undertake such a venture in the 1700s. In the early 1800s, the British and French governments independently developed their own plans for building a canal but did not follow through.

It was not until 1848 that the notion of a "cross-isthmus" canal secured itself in the public imagination. That was the year gold was discovered in a streambed at Sutter's Mill in California, sparking a great westward migration of hopeful fortune seekers from the East. When the gold rush began, the country was still young, with no **transcontinental** railroad or stagecoach route connecting the East and West Coasts. Much of the area west of the Mississippi was wild and unsettled. Those who ventured west found the overland trek across mountains, plains, and deserts dangerous and long. Many travelers instead chose to make the somewhat less hazardous sea journey.

Traveling from New York to San Francisco by boat was far less dangerous but took much longer than the overland route. Seagoing prospectors had

two route choices. They could sail to Panama, travel by land across the isthmus, then board a second vessel and sail to California. Otherwise, they had to make the whole journey by ship and round Cape Horn at the southern tip of South America. The second choice was longer and more hazardous due to heavy winds and rough seas encountered on the way.

The journey across the isthmus took about a week, but it was far from comfortable or pleasant. Travelers were transported first by dugout canoe on the Chagres River, then by mule on an old Spanish trail. In the mid-1800s, a group of Americans decided to construct a railroad across Panama to make the journey easier. Construction began in 1850, and by 1855 trains were running regularly along the 47-mile (75.6 km) rail line connecting the Atlantic and Pacific coasts of the narrow isthmus.

Although the rail line had improved speed and ease of transport, many people felt that a canal would be the best way to travel across the isthmus. A Frenchman, Ferdinand de Lesseps, had successfully supervised construction of the 102-mile (164 km) Suez Canal in Egypt. Who better to oversee construction of a shorter canal across the isthmus?

A Land Called Panama

Panama is a curved ribbon of land connecting Central and South America. Panama is the narrowest strip of land that separates the Atlantic and Pacific Oceans.

Hot, humid, and often rainy, Panama is a diverse land with thick jungles and many types of plants and animals.

The French Take Charge

In 1879, a group of French businessmen formed a company to dig a canal across Panama, with the experienced de Lesseps at the helm. De Lesseps was sure that the shorter Panama Canal could be completed in half the time—ten years—it had taken to build the Suez Canal. First, France had to sign a treaty with Colombia, which owned the

isthmus at that time. Then de Lesseps and his assistant, Philippe Bunau-Varilla, moved armies of workers and heavy machinery to the isthmus to begin digging.

While de Lesseps was an enthusiastic project manager, he was not much of an engineer. He failed to recognize the very different challenges that the Panamanian mountain jungle presented compared to the flat, sandy lands of Egypt. Digging started slowly as workers carved out tiny slices of the jungle. Day after day, week after week, workers labored through steady downpours in stifling heat. Many workers **perished** in mudslides, while countless others died in accidents or from tropical diseases spread by mosquitoes.

In spite of seven years of effort, the French project made little progress and eventually went bankrupt. De Lesseps, the hero who had conquered the desert, left Panama disgraced. An investment of more than $287 million—over $7 billion today—had yielded little more than a muddy mess and the loss of over twenty thousand lives.

For the next ten years, the project **stalled**. Having witnessed the difficulties encountered by the French, most countries were reluctant to take

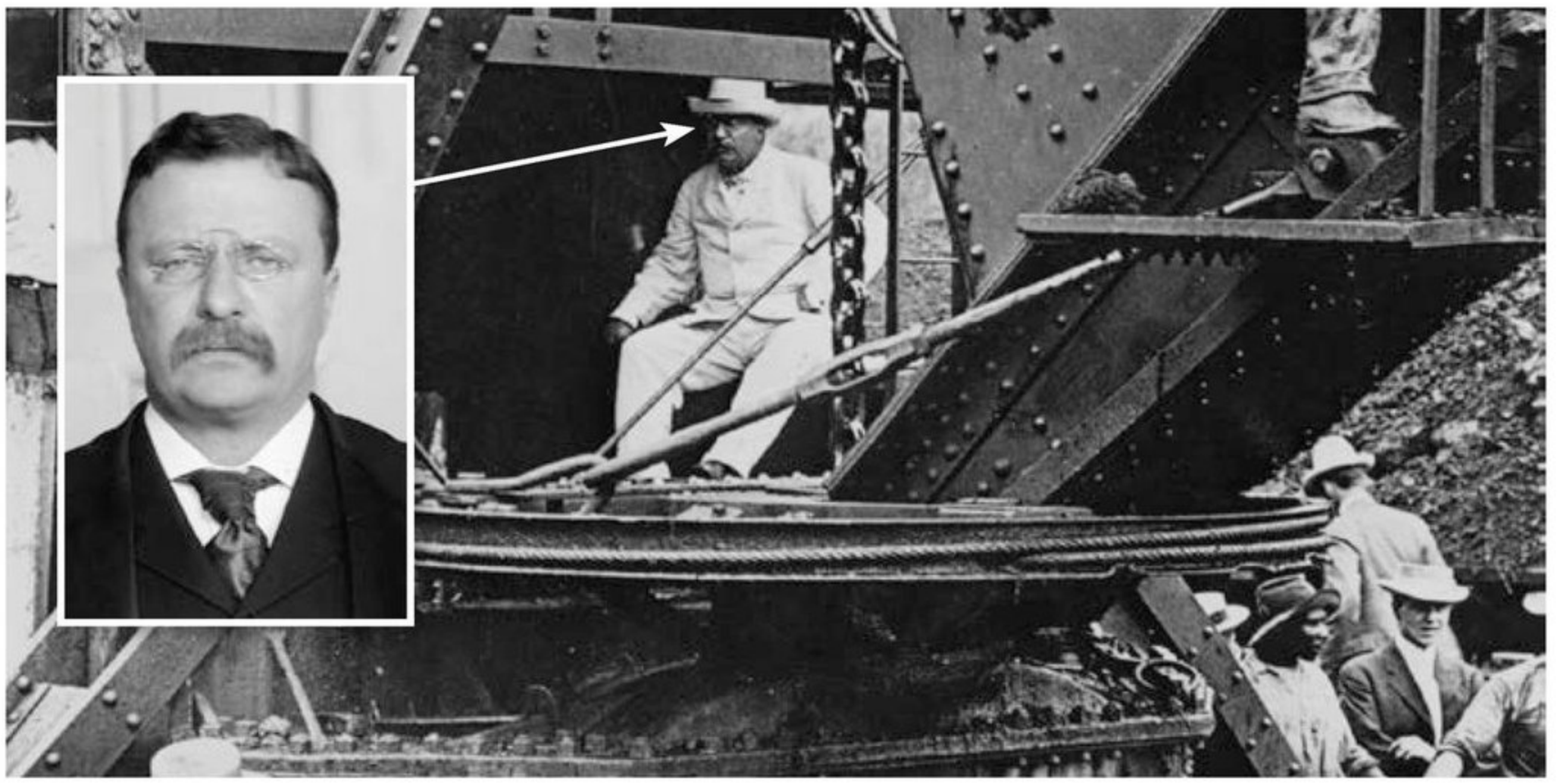
Panama Canal: A Timeline

Nov. 18, 1903:	United States signs treaty with the newly independent Republic of Panama to begin work on the canal
June 28, 1904:	First American workers arrive in Panama
Nov. 12, 1904:	First steam shovel arrives
Nov. 21, 1904:	First documented case of yellow fever among workers
July 26, 1905:	John Stevens arrives to take charge of the project
Aug. 15, 1914:	Canal officially opens
Jan. 1, 2000:	Panama takes over control of the canal

on the task of building a canal in Panama. Still, while many nations saw the region as a miserable swamp of death and disease, the United States recognized the opportunities a canal across the isthmus presented.

The Americans Take Over

The dawn of the twentieth century was also the dawn of America's expanded role on the world stage. When President Theodore Roosevelt took office in 1901, he believed a Central American canal was the path to America's future. He saw the channel as a highway for American commerce and a way to link businesses in the eastern United States to new markets in Asia. The canal would



U.S. President Theodore Roosevelt tests a steam shovel during the construction of the canal in 1906.

also be a strategic military asset during **naval** combat. Roosevelt's administration was committed to building a canal, but its efforts met with new obstacles, the biggest of which was Colombia.

The original American plan called for starting a new canal farther north, in Nicaragua, but Bunau-Varilla, who had worked with de Lesseps, advised against it. He convinced officials to resume work on the original French site. However, Panama was still part of Colombia. The United States signed a treaty with Colombia, but the Colombian congress rejected the treaty as unfair to their country.

Not one to take no for an answer, Roosevelt decided to help Panamanian revolutionaries overthrow the government that had refused him. On November 3, 1903, rebels staged a **coup** to

seize control of the region. The coup was over by sundown, and the United States formally recognized Panama's independence from Colombia three days later.

Soon, thousands of workers flocked to the new country, bringing with them the latest technology and massive excavation equipment. Engineers set teams to work digging the almost 50-mile (80.5 km) canal from Colón to Panama City, on the Pacific coast.

Battling the Mosquito

Just as for the French, **malaria** and yellow fever were constant problems for the Americans. By 1906, more than 85 percent of canal workers had been treated for these and other diseases carried by mosquitoes. The threat of sickness took a mental as well as physical toll.

Roosevelt asked Dr. William Gorgas, an army doctor, to come up with a plan to combat the spread of mosquito-borne diseases. Because mosquitoes lay their eggs in water, Gorgas organized teams of Panamanians to roam the streets and empty barrels of standing water. He sent an army of fumigators to spray homes with insecticides and demanded that workers drape netting over their beds to protect them from being bitten as they slept.

Gorgas's ideas worked, and by August 1906 the number of yellow fever cases was reduced to just twenty-seven. By November, the number of cases **contracted** dropped to one—the last yellow fever victim Gorgas would see. Malaria proved a greater challenge, but even there Gorgas's efforts saw results. The death rate from malaria had fallen to less than 1 percent by early 1910.

"Make the Dirt Fly"

The world watched as construction began in 1904 under the experienced eye of an engineer named John Wallace. Roosevelt ordered Wallace to "make the dirt fly," but that proved a difficult order to obey. The dirt excavated by the steam shovels was not dry—it was thick, sticky mud. Almost as soon as a shovelful was removed, more mud slid back down into the freshly dug trenches. By June 1905, most American workers had left Panama, overwhelmed by the seemingly endless and trying work.

Workers use steam-powered machines to cut through the mountains in the middle of Panama in 1913.

With the project in peril, Wallace resigned. His replacement was a hard-driving engineer named John Stevens. Stevens came to Panama as **morale** sagged, his seventeen thousand workers anxious for a new leader to provide direction and motivate them to carry on.

Stevens, well aware of the problems that plagued the project, took time to survey the situation and plan carefully. He knew the mightiest steam shovels were no use if the dirt they excavated was not immediately hauled away, so he stopped all digging. He began organizing systems that would support the massive excavation project, constructing roads and **refurbishing** parts of the old Panama Railway.

Stevens also recognized the importance of maintaining a skilled and motivated workforce. He built churches, hospitals, mess halls, and schools to improve worker morale. Housing for skilled U.S. workers and their families was provided rent-free, and dances and band concerts were held every weekend.

When Stevens took charge, he also changed construction plans for the canal. The original plan called for workers to dig the canal at sea level. To do that, they would have to dig through the mountains, which would have added years to

the project. The Chagres River, which ran high along the mountains, was also an obstacle.

To solve these problems, Stevens proposed building a series of locks—each more than three football fields long—over the mountains. Stevens also decided to dam the Chagres River and create a huge lake that would receive and deliver the waters from and to the locks. The locks would function as staircases, allowing ships to **scale** the mountain, cross the new lake at the top, and descend the other side.

Stevens directed workers to dig from both ends of the lock site and meet in the middle. Each lock was 70 feet (21.3 m) deep and 110 feet (33.5 m) wide. Building these monster locks took four years.

Stevens, although highly successful, unexpectedly resigned from the project in 1907. Roosevelt then sent Major George Washington Goethals of the Army Corps of Engineers to Panama. Goethals took over as supervisor and oversaw the building of the canal.

Much of Stevens's work up to that point had involved setting up systems, fixing problems, and starting to excavate the landscape. Under Goethals's command, construction could begin on the canal's three sets of locks. Work crews

also began building Gatun Dam across the powerful Chagres River. The dam would hold back the waters of Gatun Lake, the largest artificial lake in the world at that time.

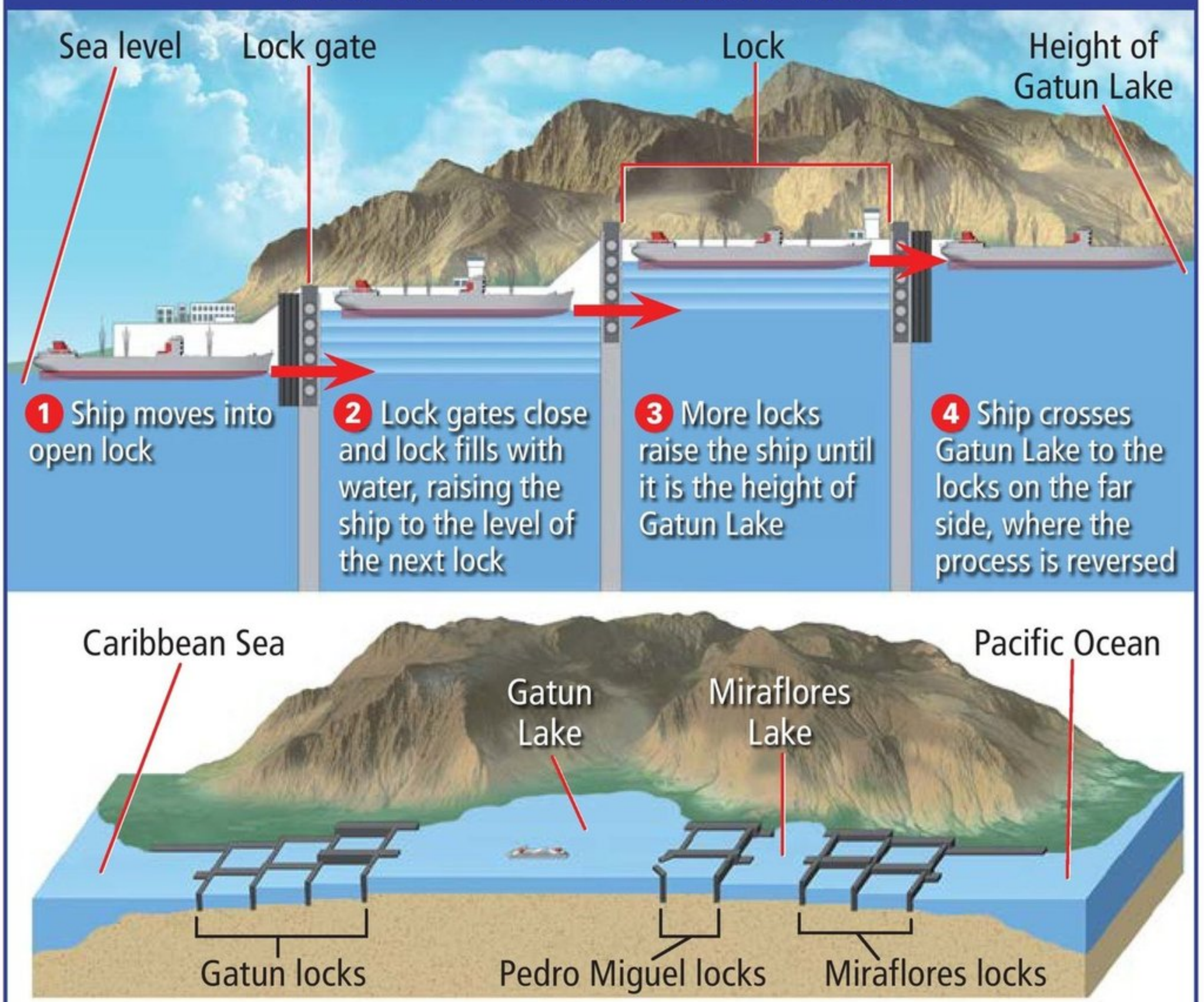
When workers finished the canal in 1914, the locks worked just as planned. The Panama Canal soon became an important navigation route.

The canal solved one transportation problem but created another. The canal split Panama and made it difficult to move people and goods across the country. For years, people relied on barges and ferryboats to cross the canal. Eventually, narrow swing bridges were built at the Miraflores and Gatun locks, but these could be used only when no ships were passing.

The best solution was a permanent bridge that would always be open to traffic. In 1962, the four-lane Bridge of the Americas at the Pacific entrance to the canal was completed. A second bridge was built 9 miles (14.5 km) north of the Bridge of the Americas in 2004 to help reduce traffic jams on the Pan-American Highway.

Bridge of the Americas

How the Panama Canal Works



Side view of the lock system as seen from the north. (not to scale)

Locks are watertight chambers with huge steel doors at each end. In a lock, engineers can raise and lower the water level.

When a ship wants to pass through a lock, the front door opens, allowing the ship to sail into the chamber. Once inside, the chamber door closes. Engineers then open valves, which allow water to flow into the compartment from the lock above the ship. As a result, the water level increases, raising the ship up to the level of the next lock.

The ship rises through three locks until it reaches the inland lake. At the other end, the reverse happens. Instead of adding water to a lock, engineers drain the water. When that happens, the ship is lowered to the level of the next lock.

Old Timer

The United States controlled the canal until the end of 1999, when Panama took it over as part of a treaty agreement.

By the early twenty-first century, the canal was showing its age. More than fourteen thousand ships and three hundred million tons of cargo were passing through its locks annually. It badly needed a makeover to allow it to handle larger ships and resolve the problem of traffic jams. In 2006, the people of Panama voted to build two new sets of locks and two new navigation lanes to connect those locks to the existing channels.

In 2016, forty-thousand workers completed the $5.4 billion, ten-year construction project. The new locks allow the canal to **accommodate** modern sailing vessels, effectively doubling the amount of cargo it can handle each day. Since the new locks are wider, they also allow tugboats, rather than mule locomotives, to guide ships through the system. The expansion is yet another marvel of engineering in the canal's long history.

Glossary

accommodate *(v.)* to have or make enough room or space for someone or something (p. 18)

canal *(n.)* a waterway dug across land and used for transportation (p. 4)

commerce *(n.)* the buying and selling of goods; business or trade (p. 5)

contracted *(v.)* caught or developed an illness or disease (p. 13)

coup *(n.)* the sudden overthrow of leadership, usually of a government or business, by a small group (p. 11)

engineering *(n.)* the work of designing and building things using science and math (p. 4)

ingenuity *(n.)* cleverness or skill in solving a problem or challenge (p. 4)

isthmus *(n.)* a narrow strip of land connecting two larger landmasses (p. 4)

locks *(n.)* gated sections in rivers or canals in which the water level is raised and lowered to allow ships and boats to pass (p. 4)

malaria *(n.)* — a dangerous tropical disease spread by mosquitoes (p. 12)

marine *(adj.)* — of or relating to the sea (p. 4)

morale *(n.)* — confidence or enthusiasm of an individual or a group when working toward a goal (p. 14)

naval *(adj.)* — of or relating to a navy (p. 11)

perished *(v.)* — died, especially in a sudden, violent, or unexpected way (p. 9)

refurbishing *(v.)* — changing or repairing something to improve it (p. 14)

scale *(v.)* — to climb something high or steep; to reach the highest point of something (p. 15)

stalled *(v.)* — stopped moving forward or suddenly stopped working (p. 9)

transcontinental *(adj.)* — extending across a continent (p. 6)

The Panama Canal

A Reading A–Z Level Z2 Leveled Book
Word Count: 2,166

Connections

Writing

Consider the pros and cons of building the Panama Canal. Write an essay explaining whether the benefits gained from the project were worth the sacrifice and cost.

Social Studies

Research President Roosevelt's visit to Panama. Write a summary explaining the reasons Roosevelt thought it was important for the United States to become involved in the building of the Panama Canal.