Niagara Falls spans the border of New York State and Canada. **3,160 tons** of water pour over its cliffs every second!

Water Power!

A scientist built a miniature river to investigate how waterfalls can form

You can hear the roar of a waterfall before you spot it. Up close, you may have to crane your neck to see it from top to bottom. Mist sprays your face as water pours over a cliff edge, then crashes into the rocks below.

Joel Scheingross is fascinated by waterfalls. He's a geologist who studies Earth's landscapes. Scientists had long thought that waterfalls form when forces, like earthquakes or moving glaciers, create cliffs that rivers flow over.

Scheingross didn't think those forces could explain some waterfalls he'd seen. He wondered: Can a river flowing over **bedrock** create its own waterfalls? He designed an investigation to find out.

Making a Model

Studying waterfalls isn't easy. They form over thousands of years—too long to observe in a lifetime. Plus, scientists can't control factors like earthquakes. So Scheingross decided to use a **model**, or simplified version, of a river for his investigation.

Engineers built the model inside a three-story warehouse. Pumps poured water down a 7.3 meter (24 foot) ramp. For bedrock, Scheingross used a material similar to Styrofoam. The foam **erodes**, or wears away, about 100,000 times faster than real rock. "We could observe thousands of years of erosion in a few hours in the lab," says Scheingross.

Real rivers carry rocks and sand that grind away bedrock. Scheingross mixed gravel into the water rushing down the ramp. Every 15 minutes, he paused the water to note how the foam bedrock was eroding. He spent the next month starting and stopping the river and recording what changed.

Joel Scheingross's model river *(right)* showed how waterfalls like California's Seven Teacups *(left)* may have formed.

MICHAEL NEUMANN (SEVEN TEACUPS WATERFALL); JOEL SCHEINGROSS (MODEL RIVER)

BOB PARDUE/NORTHEAST/ALAMY STOCK PHOTO (NIAGARA FALLS)

A New Waterfall

In the model waterfall, the landscape transformed quickly. A canyon formed as gravel wore away the foam. Next, pools appeared where waves slammed into the canyon's walls. If a pool got deep enough, gravel settled on the bottom, protecting the foam.

Scheingross noticed that sometimes a pool collected gravel while one below it kept eroding. That created a steep cliff. As water poured over the cliff, a waterfall formed. The river had created it—no earthquake needed!

Waterfalls are clues that help geologists understand an area's history. Scheingross thinks a waterfall in California, called Seven Teacups *(above, left)*, formed the way his model showed. Next, he wants to study how often the phenomenon occurs in nature. "This is how science moves forward," he says.

—Mara Grunbaum

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Scientists often follow a set of practices to find things out. First they ask questions. Then they plan investigations to answer those questions. They collect data to inform their research. Then they analyze the data and draw conclusions.

Think about how Joel Scheingross followed these practices. Then answer the questions below.

1. **What question did Scheingross want to answer?**
2. **Why did he use a model to study waterfalls?**
3. **Why did he stop and start the flow of water in his model?**
4. **What conclusion did he reach about his question?**