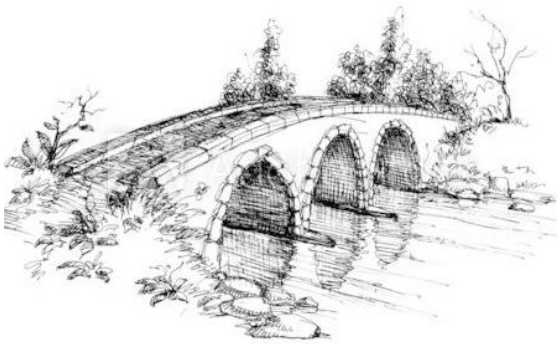
Galileo's Leaning Tower Experiment (*part 1*) by Wendy Macdonald



Massimo threw a stone off the bridge and watched it fall—*plop*—into the river.

"Hey, Massimo! Why don't you come with me?" called a boy herding a flock of goats across the bridge.

Massimo waved. "Thanks, but I have to wait for my uncle's boat."

Massimo threw another stone. *Plop*.

"That looks like a good game:' a stranger said.

"It's not a game, sir." Massimo replied. "I'm watching how fast the stone falls."

"Why does that concern you?" the man asked.

"Because I'm waiting for my uncle," Massimo explained. "Every market day I have to drop this food for him to eat." He looked up the river. "Here comes his boat now!"

Massimo picked up a wheel of cheese and a loaf of bread. Just before the boat passed under the bridge, he dropped them. They landed on the boat with a single thud.

"Strange how the two things landed at the same time," the stranger said.

"Of course they did," replied Massimo.

"I wouldn't let my uncle's food fall into the river."

"But the cheese is heavier. It should have fallen faster and landed first," the man said. He stroked his beard. "Could Aristotle be wrong?"

"Good morning, Professor Galileo!" a group of noisy students called out, laughing and pushing each other as they crossed the bridge.

Massimo stepped away from the man. "You're a professor?" he asked.

"I am," the man said. "But this morning it seems I am your pupil?" As Galileo walked slowly away, the rowdy boys followed.

Massimo walked to the marketplace to meet his sister, Angela. As they packed up the donkey cart, Massimo said, "I just met a professor from the university. He was very interested in how I dropped the bread and cheese onto Uncle's boat."

"And why should he be interested in that?" Angela asked. "Those professors, they waste their time thinking!'

"Perhaps they do," admitted Massimo. "He didn't even know how to drop food from a bridge!"

All week Massimo was busy with his chores on the farm.

At the end of the week, he went to the bridge again. He smiled shyly when the professor walked up to him.

"Are you dropping more food for your uncle?" Galileo asked.

''Yes, sir," Massimo answered. "Here he comes." The boat moved swiftly down the river. Massimo waited for just the right moment. Then he dropped the bread and cheese.

Galileo listened carefully as the packages again landed with one thud. He shook his head and asked, "How could Aristotle be so wrong?"

"Is this Aristotle a friend of yours?" asked Massimo as they walked to the marketplace.

The professor laughed. "Hah! I wish I had such a friend," he said. "Aristotle lived almost two thousand years ago. Many people believe he was the smartest man who ever lived. He explained how and why things happen!"

"Like how things fall?" Massimo asked.

"Exactly," Galileo replied. "He said that heavy things fall faster than light ones do. For the second time, you have shown me that they do not."

"I will tell you what I think," Galileo said, stopping at a fruit seller's cart. He picked up a pear and let it fall to the ground.

"That pear fell because it had to," Galileo said. "The earth has a force that pulls all things toward it, unless"—he threw a grape in the air and caught it in his mouth—"unless something stops it as it falls."

"Why did Aristotle say that things fall at different speeds?" asked Massimo.

“I don't know,” Galileo said, "but we know that the bread and cheese fell the same distance to the boat, and we heard them land at the same time, so the speed of the fall must have been the same, too."

Galileo said good-bye, and Massimo walked over to where his sister was packing up to go home. "Who was that?" asked Angela.

"That was Professor Galileo, the man I told you about," Massimo said.

"He looks too young to be a professor,” she said, frowning. "Don't believe everything he tells you. Everyone knows that people only gain wisdom with age.”

That afternoon Massimo told his donkey all about it. "People say Aristotle was very smart, but I wonder if he ever tested his ideas. Then he would have seen what really happens!”

The donkey shook his head and snorted.

“Hmm..,” said Massimo. "I've only tried dropping bread and cheese. Maybe other things fall differently!”

He found a hammer and a broken buckle. He held them up and let them go at the same time. "I think they landed together, but I couldn't really tell," he said. "Maybe I need to be higher up.”

Massimo climbed up onto the roof and dropped the hammer and buckle again. They still seemed to hit the ground together.

Angela came out to feed the chickens. "What are you doing?" she asked. Massimo told her about Aristotle and the speed of falling objects.

Angela shook her head. "If you ask me, this Aristotle was right. You know how slowly a feather falls."

"Let's try it;' Massimo said. He picked up a chicken feather and dropped it with the hammer. The hammer fell straight to the ground, but the feather drifted lazily down.

"You're right,” Massimo said, bowing his head. “Things do fall at different speeds. Aristotle was as wise as everyone says. I must tell Galileo."

To be continued. . .

1. Galileo says that since the bread and cheese fell the same distance to the boat, *and* landed at the same time, the speed of their falls must have been the same. What makes him say that they landed at the same time—how does he know?

   Why must the cheese and the bread have fallen at the same speed? (What would have happened if one had fallen faster than the other?)

2. After watching the bread and cheese fall at the same speed, it looks like Aristotle was wrong and that heavier things do not fall faster than lighter ones. Why does Massimo decide to drop other objects and see how they fall?

   Why does Massimo climb onto the roof to drop the hammer and the buckle? (How might dropping them from higher up make a difference?)

3. When Massimo drops the hammer and the feather, the hammer drops to the ground much faster. Does this mean that Aristotle was right after all? If not, how do you explain what happened?