

From Marbles to Machines

by Kerrily Sapet

People have dropped marbles into baskets, drawn X's by names, colored in dots, and pulled levers to elect their leaders during the past 2,000 years. Early voters used simple, inexpensive objects to cast their votes. Ancient Greeks, the first known voters, placed black and white pebbles into pots. Roman soldiers tossed small clay balls into their helmets. Early colonists in the Americas used colored beans and kernels of corn. Today's elections and terms have ancient roots. Voters now often mark ballots, or pieces of paper, to cast their votes. The term comes from the Italian word *ballotta*, meaning "little ball."

Today, people in countries around the world vote in many different ways. Some methods resemble early elections, while others are highly technical. Whether voters use beans or machines, the process is designed to be fair. Each person gets to cast only one vote, which must be accurately counted. Also important is the idea that a person's vote is private.

Ancient Romans sometimes voted out loud, or *viva voce*. In some areas, like Appenzell, Switzerland, people still gather in the town square to voice their votes, as they have done for hundreds of years. But some feel it can be intimidating to state your choices aloud, and therefore the individual may not express his or her true opinion. The idea of voting privately by paper ballot is said to have originated in Australia and is sometimes called kangaroo voting. Most people around the world, though, use secret ballots, marking their choices behind curtains or screens or inside voting booths.

4

Whatever method voters use to make their choices, they want to know that their vote counts and that no one can change it. Many different styles of voting machines have been invented to make counting more accurate. They've featured mechanical levers, switches, buttons, and hole punchers. Today, computers can scan the voter's marks on a ballot and record the vote. Machines are often used because they are faster and more precise than counting votes by hand.

5

Mechanical voting machines can cause problems, though. Sometimes voters get confused by the directions. If they fill out the ballot incorrectly or even use a pen instead of a pencil, the machine won't count it. Machines can break down or jam, leaving the

final vote count unknown. People also worry that machines can be tampered with or illegally adjusted to change the results of the election.

Just as voters want to know that their vote counts, they also want to know that everyone has an equal say. Each person gets only one vote. For years, election officials around the world have devised ways to make sure no one votes more than once. In ancient Rome, voters walked one at a time across a narrow bridge. In many countries today, poll workers check off the voter's name before handing out a ballot. Other methods rely on sight and sound. Voters in a recent election in southwestern Africa had their arms painted green after they voted. Iraqis dipped a finger in a jar of purple ink. Gambian voters dropped a clear glass marble into a colored drum. When the marble fell, a bell sounded so officials could hear if a voter dropped in more than one marble. Because the bell sounded like a bicycle bell, they banned bikes near the polls.

Election officials around the world consider the needs of their voters when choosing a voting system. In many areas of the world, people can't read or write, so officials use more traditional methods. In Afghanistan, officials paste stamp-sized pictures next to the names of candidates. Indonesians vote by piercing a picture of the candidate with a nail. In many countries, voters make ink thumbprints or draw the letter X beside a candidate's name. Braille ballots, audio ballots, and ballots printed in different languages also help voters.

Election officials also consider where voters live and how easily they can get to polling places. Many communities around the world provide transportation to the polls. In rural Brazil, instead of taking voters to the polls, officials recently brought the polls to the voters. They canoed voting machines powered by car batteries up the Amazon River to reach voters in remote villages. Today, soldiers and other citizens overseas can vote by sending in special absentee ballots. Some countries are experimenting with voting over the Internet.

Whether a voter drops a marble into a drum or points and clicks on the Internet, voting is an important process all around the world. By giving people the opportunity to vote, countries make sure that their leaders reflect the people's true choice.

- 23 Which quotation summarizes the central idea of this selection?
- A "Early voters used simple, inexpensive objects to cast their votes."
 - B "Many different styles of voting machines have been invented to make counting more accurate."
 - C "Many communities around the world provide transportation to the polls."
 - D "Whether a voter drops a marble into a drum or points and clicks on the Internet, voting is an important process all around the world."
- 24 What is the reason the selection is named "From Marbles to Machines"?
- A to show how voting is done in America
 - B to show how voting has changed over the years
 - C to show how people vote in Australia and Switzerland
 - D to show how many countries remind their citizens to vote
- 25 What is the purpose of the first paragraph?
- A It helps the reader understand the humor in the topic.
 - B It gets the reader's attention by asking thoughtful questions.
 - C It creates a mood of suspense by introducing a conflict.
 - D It provides a brief history of voting practices in different cultures.

- 26 According to the selection, why is voting privately by paper ballot called "kangaroo voting"?
- A It is the type of voting used by children.
 - B It involves putting the vote in a pouch similar to a kangaroo's.
 - C It started in Australia, which is where kangaroos live.
 - D It is the way people voted in ancient Rome.
- 27 In the sentence below from paragraph 4, what does the word *precise* tell the reader?
- "Machines are often used because they are faster and more precise than counting votes by hand."
- A People want the votes counted exactly.
 - B People want the votes counted quickly.
 - C People want the votes counted repeatedly.
 - D People want the votes counted slowly.
- 28 In paragraph 5, what does the phrase "tampered with or illegally adjusted" mean?
- A Some workers might tell others how a person voted.
 - B Some workers might help a person with their voting process.
 - C Some workers might cheat by changing a person's vote.
 - D Some workers might record a person's vote for them on the ballot.

- 29 In the selection, how are green paint, narrow Roman bridges, and purple ink similar?
- A They help voters find polling places.
 - B They make the voting process safer.
 - C They are tools people use to vote.
 - D They ensure elections are fair.
- 30 In the selection, why do ballots in Afghanistan have stamp-sized pictures next to the names of candidates?
- A The voters need to see what the candidates look like.
 - B The voters need to see which candidate is the best looking.
 - C Many voters are unable to read the candidates' names.
 - D Many voters prefer to paint their arms.
- 31 Which sentence summarizes the election officials' solution to the issue of voting rules?
- A Each person votes by voice so the choices are known.
 - B Voters traveling long distances must be provided food and shelter.
 - C Even in distant locations, each person is allowed to vote only once.
 - D Only healthy, educated people are allowed to vote.

The Unexpected Swimming Lesson

by Aure Sheldon

"Boy, we are early," said Craig sleepily. "There's not another person on the beach."

"Let's go out to that bar and look for sand dollars," Matt suggested.

3

At low tide, the sandbar was easy to get to and seemed much closer than it really was. Craig followed his cousin as he threaded his way between the shallow tide pools on the exposed sand flats, stopping from time to time to examine strange forms of sea life stranded by the tide. There were sea urchins, jellyfish, and a dozen different kinds of sea snails.

4

As the dunes dropped farther behind them, Craig became more uncomfortable, yet he dared not admit it for fear that Matt would think him babyish. He was not at all sure of himself here. Although he had taken swimming lessons last winter, a swimming pool was one thing and the ocean was another. Secretly, he envied Matt, who was a strong swimmer and liked nothing better than to romp in the surf and ride the big waves into the beach. Craig began to wish that he had stayed in bed this morning instead of letting Matt coax him out to the water.

"Here's one . . . two . . . three!" shouted Matt. "Look, lots of them!"

The discovery of the sand dollars went far to dismiss Craig's fears. "Let's pretend they're real dollars and see who can find the most."

"I'll be a millionaire before breakfast time!" Matt laughed.

8

Absorbed by the race to "get rich quick," Craig followed Matt still farther out onto the sandbar. "Come and see this starfish," he called. "It has only three arms."

Matt stared at the wiggling starfish. "It's been in a fight. Got a couple of them broken off."

"He can grow new ones though. That's some trick."

With so many fascinating things to see, time passed quickly. After a while, Matt dropped to his knees and said, "Let's count our dollars now and see who won."

"My shirt is almost full. I must have a million of them." Craig dumped out his sand dollars and began to count.

Another half hour or more passed as they counted their "money" and made rows of sand dollars in the wet sand.

Finally Matt sighed. "I'm hungry. Let's go back to the cottage and see if the others are up yet."

"It's getting hot anyway and . . ." Craig stopped abruptly. "Matt, look!" There was nothing but water between them and the shore.

"Sure, the tide's coming in," answered Matt matter-of-factly.

Craig wondered how Matt could be so casual. "What are we going to do?" he cried excitedly.

"Just get to shore before the water gets any deeper, that's all," Matt replied calmly. He gathered up his sand dollars and waded out from the sandbar toward the shore.

"Wait! Wait a minute. I . . ."

Matt turned and said firmly, "No, don't wait. Come right now while you still can. I'll help you."

Craig was frozen to the spot. "I . . . I can't."

"Yes, you can," Matt reassured him. "Look, it isn't even knee-deep. But the longer you wait, the deeper it will be."

Try as he would, Craig couldn't bring himself to wade out into the water. "Matt, get my dad," he pleaded. "He can carry me across."

"What? By the time he gets here, that sandbar will be underwater too."

"Hurry, Matt!" Craig's voice cracked. "Please. I'm scared."

"All right, I'm going." Matt moved easily toward the shore, stopping only once to call back, "See? It's not even over my waist at the deepest part!"

Craig saw Matt reach the beach and set off on a dead run for the cottage, which nestled behind a low dune to the south. A flock of gulls flew low overhead, their hoarse cries sounding like mocking laughter.

He struggled for the courage to do as Matt had done. It had been so easy and so right. Yet he couldn't. If time seemed to stand still, the tide didn't. Anxiously, Craig watched the sandbar grow narrower. He cupped his hands around his mouth and shouted desperately for help, but there was no one to hear him.

As he scanned the shore, a thin column of smoke above the cove to the north caught his eye. Rapidly, it thickened and grew dark.

"The boathouse is on fire!" he gasped. "Oh my gosh, there are gasoline storage tanks and lots of boats in there. I've got to get to a phone."

Without hesitating another moment, he waded off the sandbar and made straight for shore. At the deepest stretch, where the water came up to his chest, he kicked off strongly with his feet and swam. His father and Matt, running down the beach, saw him.

"You're swimming!" shouted Matt happily. "That's great. Keep it up!"

Craig came stumbling and sputtering out of the surf. "Call the fire department! The boathouse is on fire!"

One glance in that direction told them there was no time to lose. "Both of you run to the house and telephone for help," cried Craig's father. "I'll get over there and see what I can do."

The boys sped up the beach, Craig in the lead. He had always been a good runner, and he ran faster than ever now, for he knew he could do something else. He could swim. Anywhere.

- 32 Which is a summary of the selection?
- A Two boys out exploring for sand dollars get trapped on a sandbar when the tide comes in.
 - B A young boy, on a hunt for sand dollars, overcomes his fear of swimming in reaction to an emergency.
 - C A houseboat fire strands two boys in the ocean while they are out looking for sand dollars.
 - D A young boy, looking for sand dollars, panics when the tide comes in, and is too afraid to swim to shore.
- 33 In paragraph 3, what does the phrase "stranded by the tide" mean?
- A The water withdrew from the sand.
 - B The waves washed the creatures into the sea.
 - C The water drowned the sea creatures on the beach.
 - D The waves crashed roughly into the sand.
- 34 In paragraph 4, what is the meaning of the word *romp*?
- A to dive deeply
 - B to run slowly
 - C to splash lazily
 - D to play excitedly

- 35 According to the selection, why does Craig withhold his fears of swimming from his cousin, Matt?
- A He wants Matt to think he is an expert swimmer.
 - B He thinks that Matt is afraid of the animals in the ocean.
 - C He is worried that Matt will ridicule him.
 - D He thinks that Matt will want to leave him alone.
- 36 In paragraph 8, what does the word *absorbed* tell the reader about Craig?
- A He used his shirt to collect sand dollars.
 - B He was excited to be on the sandbar.
 - C He used a towel and had dried himself.
 - D He was focused on what he was doing.
- 37 In the selection, why was Matt frustrated with Craig?
- A He knew he would be late if he waited for Craig.
 - B He could not understand why Craig was scared.
 - C He did not want to go look for more sand dollars.
 - D He knew that Craig was the better swimmer.

- 38 In the selection, why does Craig enter the ocean and head for shore?
- A He thinks the tide will overpower him if he remains where he is.
 - B He realizes he must warn people of a nearby danger.
 - C He fears his father will arrive too late to help him.
 - D He convinces himself it will be similar to swimming in a pool.
- 39 How does the setting affect the selection?
- A The setting causes Craig to become fearful.
 - B The setting causes Matt to become fearful.
 - C The setting causes Matt to learn to swim.
 - D The setting causes Craig to learn to swim.

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The Hottest Soup in New York

by Stephen Ornes

This winter has been a season of breaking records. Last month, athletes at the winter Olympic games in Vancouver broke sports records. A few weeks before that, record-breaking amounts of snow fell on the eastern and southern United States. And on February 15, scientists announced in Washington, D.C., that they had broken another record—for the highest temperature ever reached in a laboratory.

That new record is 4 trillion degrees Celsius (that's 7.2 trillion degrees Fahrenheit). By doing experiments at that temperature, scientists hope to study what happened just after the universe was born. Four trillion degrees Celsius is 250,000 times hotter than the hottest part of the sun, and probably close to the temperature of the universe right after the Big Bang, the birth of the universe.

3

The hot stuff is called a quark-gluon plasma, and scientists found it at the Brookhaven National Laboratory on Long Island, N.Y. Using a giant instrument called the Relativistic Heavy Ion Collider, or RHIC, the scientists zoomed two gold atoms through a ring that is 2.4 miles around and smashed the atoms together—and then watched to see what came out. There was so much energy in the crash that the atoms, in a way, melted.

As temperatures climb, most solids melt into liquids, and then the liquids become gas. (Some solids may go straight to gas if the conditions are right.) Ice becomes liquid water at 0° Celsius (32° Fahrenheit). At 100°C (212°F), liquid water boils into water vapor. Compared to other substances, water's melting and boiling points are mild: Tungsten, a material used in light bulbs, doesn't melt until 3,410°C (6,800°F).

That temperature is freezing compared to 4 trillion degrees C. At that temperature, atoms can break apart—and parts inside an atom can break apart—and then the tiny particles inside those parts can break apart. Think of an atom as a set of nesting dolls. When the largest, outer doll breaks apart, there's another, smaller doll inside. And when that doll breaks apart . . . surprise! There's another doll inside.

Similarly, at the center of every atom is the nucleus. Inside the nucleus are particles called protons and neutrons. And inside protons and neutrons are even smaller particles called quarks. Quarks are held together thanks to another kind of particle called gluons. (Gluons help to "glue" the particle together.)

The hot stuff produced at Brookhaven is a quark-gluon plasma, and it spills out like a soup made of quarks and gluons. The quark-gluon plasma is a new type of matter that's unlike solid, liquid, or gas—but it kind of behaves like a liquid.

8

"We are extremely anxious to find out how this works," Barbara Jacak told *Science News*. "Why is it a liquid?"

Jacak works at Stony Brook University in New York and is one of the scientists working on the project at Brookhaven. She helped take the plasma's temperature. That was a difficult task because it's hard to measure things that small. The plasma only existed for about one-trillionth of a trillionth of a second, and it was tiny, about one-trillionth of a centimeter across.

It was a very small piece of space that was super hot for a very short amount of time. In other words, you can't just put a thermometer in it, Jacak says.

11

To take the temperature, the researchers watched it glow. A hot iron rod changes color from red to yellow to white as it heats up. In a similar way, the colors of light coming from the plasma changed. Based on what colors of light the soup emitted, the team figured out that the substance had reached the 4-trillion-degree record.

By studying these kinds of super-hot temperatures, scientists hope to learn more about how the universe formed. The quark-gluon plasma may look a lot like the hot and heavy goo that existed in the universe right after the Big Bang.

Experiments such as those at Brookhaven may help us understand what happened at the very beginning of the universe. But there's a lot of work to be done, says scientist Chris Quigg of the Fermi National Accelerator Laboratory in Batavia, Ill. "These are very early days," he told *Science News*. "Like many good observations, this opens up many questions."

- 40 In paragraph 3, what does the word *zoomed* suggest happened to the atoms?
- A They were blasted to pieces.
 - B They were magnified to appear larger.
 - C They were moved rapidly.
 - D They were viewed closely in focus.
- 41 According to the selection, what is the purpose of gluons?
- A They bind the quark particles together.
 - B They separate the protons from the neutrons.
 - C They form the boundary of the nucleus.
 - D They help the quark particles to duplicate.
- 42 In paragraph 8, how is the word *anxious* used?
- A to convey fear
 - B to convey excitement
 - C to convey fury
 - D to convey boredom

- 43 Which summarizes the information about quark-gluon plasma in paragraph 11?
- A Its temperature is the lowest on record.
 - B Its temperature is indicated by color.
 - C It glows when heat is applied to it.
 - D It emits different colors of light.
- 44 What challenges hindered the researchers in measuring the temperature of the plasma?
- A The plasma was too large to measure and too slow to demonstrate movement.
 - B The plasma was moving very fast and was too small to catch.
 - C The plasma was extremely small and only existed for a fraction of a second.
 - D The plasma was very thin and covered a small area of the thermometer.
- 45 In the last paragraph, why did the author include the quote from Chris Quigg?
- A to support the claim that there is still much work to be done to understand the beginning of the universe
 - B to hook the reader into wanting to read more about the Brookhaven laboratory
 - C to help sell more issues of *Science News* magazine
 - D to outline future experiments that need to take place