THE BALLPOINT PEN AND WHY IT WAS SO HARD TO INVENT

These two ballpoint pens use different types of ink to write.
Credit: *IntellectualRunoff, Wikimedia*

WHY IT MATTERS

- Ballpoint pens changed the way we write and made pens affordable and easy to use.

DID YOU KNOW? Cutting the steel ball into the exact shape to fit a ballpoint pen tip is no simple matter. Only three countries in the world have the know-how and machinery for making a ballpoint pen that works well. These countries are Switzerland, Japan, and, since 2017, China.

Imagine traveling back 450 years to see William Shakespeare in action, writing his nearly 40 plays. Using a leaky quill pen with a bird feather at one end and a nib at the other, it must have taken Shakespeare days to write out a full script. Nowadays, the average typist can key about 40 words per minute. That means it would take the average person just over 12 hours to type up Shakespeare's longest play. But in between the invention of the quill pen and the keyboard came a groundbreaking invention that changed writing forever. It is a simple tool that you probably use daily—the ballpoint pen.

FROM FEATHER TO FOUNTAIN

The first "modern" pen that appeared on the scene, the quill pen, was invented about 1,500 years ago. The hollow inside of the feather could hold ink after the user dipped it into an inkwell, and the **nib**[1] at the end ensured that the ink dripped out in a slow and controlled manner.

These pens were better than anything that came before, but the feathers only lasted about a week. Inkwells were prone to spilling, and fresh ink could easily be smudged. Also, writing could be slow and tedious. Shakespeare, with his quill pen, couldn't achieve anywhere close to the 40 words-per-minute modern typing speed because he had to keep dipping his pen in the inkwell to refill it every few words.

1 **nib** – tip of the pen that puts the ink on the paper

Lewis Waterman, an insurance salesman, thought there must be a better method. Legend has it that once, Waterman worked for hours to pen an insurance contract for a customer. However, just as he finished, Waterman's quill pen leaked all over the paperwork. The customer was not pleased by the delay and found a new insurance salesman.

After missing out on the contract because of his pen, Waterman decided to invent a new and better one. Waterman's invention, the fountain pen, included a **cartridge**[2] of ink inside that slowly dripped out onto the nib due to gravity. That saved users from having to dip and redip the pen while writing.

But Waterman ran into some challenges when running trials of his invention. The ink **viscosity**[3] had to be just right. Too thin and watery, and the ink could drip out too fast, staining the page. Too thick, and it wouldn't drip out at all.

In 1884, Waterman finally got the mixture exactly right. He also invented the famous pen clip and the click system that allows pens to be opened or closed. But his pens still had issues. Not only did they tend to crack and leak, but they were also expensive. Additionally, the ink that Waterman's pens used was watery. This allowed it to flow out of the capsule and onto the paper. However, the watery ink smudged easily. There had to be a better solution.

EIGHTY-FIVE DOLLARS FOR A PEN!

Laszlo Biro, a Jewish journalist living in Hungary, believed he had the answer. One day, while working, some ink spilled on Biro's paper. He watched some **ball bearings**[4] in his desk roll through the ink and became fascinated by the trails they left. Biro was also inspired by how quickly the newspaper ink that his company used dried. Maybe he could combine the ball bearings and the quick-drying ink to make a better pen.

Biro spent the next seven years experimenting with inks and pen designs. He eventually created a nib with a tiny metal ball inserted into a **socket**,[5] allowing it to rotate as the user dragged it along the paper. The ink, exactly the right consistency, dripped out of the cartridge and made marks along the paper as the metal ball rolled in its holder. Biro had invented the ballpoint pen!

In this close-up of a ballpoint pen, you can see the tiny metal ball that rotates to apply ink to a paper.
Credit: *Daniel Schwen, Wikimedia*

As Biro experimented, the Nazi party rose to power in Germany and persecution of the Jews began. Biro fled to Argentina, where he was welcomed because of his invention. Although Biro's pens were quite expensive, the equivalent of $85 in today's currency for a single pen, his business took off in Argentina.

As the war progressed, Biro's pens started to sell like hotcakes, although they still leaked at times. Why did they sell so well? Because militaries bought cases of Biros. They needed them for pilots to use to fill out flight logs. Regular fountain pens didn't work at high altitudes, but Biro's pens did the job.

2 **cartridge** – hollow container, often cylinder-shaped, that holds something
3 **viscosity** – a liquid's resistance to being poured
4 **ball bearings** – small metal balls used as a tool in a variety of items
5 **socket** – hollow space that holds something that can move or revolve

BIC BUYS BIRO

After the war, ballpoint pens were popular but still quite expensive. For example, Milton Reynolds, credited with bringing the ballpoint to the United States, sold his pens for the modern-day equivalent of $180 per pen! Can you imagine spending $180 on a pen?

Finally, a new player entered the pen business who would change the market forever and whose name is now **synonymous**[6] with the pen industry. Baron Marcel Bich had an idea for how to mass-produce Biros at lower prices. He bought the patent and design from Biro for $2 million and named his company Bic.

Bich made a few design changes. For example, instead of giving his pens a circular shape, he shaped the barrel with flat edges like a pencil so it couldn't roll off a table. He created a pen cap that could clip onto clothing. But most important, Bich was able to use the brand-new material, plastic, to keep the pen's price cheap. Instead of Biro's $85 pen, Bic's pens cost only 15 centimes (the American equivalent of 18 cents) apiece.

People loved Bic's product because these cheap pens worked much better than any fountain pen ever had. Only three years after it opened, Bic sold 40 million pens per year in Europe alone. A decade later, in 1958, Bich decided to market his pens in the United States as well. He did so by purchasing Waterman's fountain pen business (this time for $1 million) and using the Waterman name to sell Bic pens. He also sold expensive fountain pens, mostly as collectors' items. Bic's pens became so popular that the Guinness Book of World Records gave Bic's Crystal pen the record for most pens sold ever. According to Bic, they sell 57 pens every second, and if all the pens sold by the company were lined up tip to end, they would reach from Earth to the moon!

After Bic pens started selling for 25 cents in the United States, nobody was willing to spend up to $12 on a ballpoint. Penmakers were forced to find ways to lower their prices.

A look inside a click ballpoint pen
Credit: *Pavel Krok, Wikimedia*

The iconic Bic Crystal is the world's best-selling pen.
Credit: *Carlos Delgado, Wikimedia*

CLICKING PENS

Bic's cheapest pens are **transparent**[7] and have a cap to keep the ink from drying out. These pens rely entirely on Biro's rolling ball technology to catch ink and spread it on the page. But some modern ballpoints use other technology. Instead of caps, these ballpoints use a "click" mechanism to open and close the pen. The click mechanism uses two springs and a mechanism called a cam body that can rotate inside the pen when the top is pressed down. As it rotates, the cam body knocks into other parts of the inside of the pen—the plunger and the stop members. That's what makes the "click" sound. When locked into different places, the pen's tip either **extends**[8] or **retracts**.[9]

6 **synonymous** – name associated with a certain meaning or item
7 **transparent** – see-through
8 **extend** – stick out
9 **retract** – withdraw; pull back

Retracting the tip keeps the pen from leaking and the ink from drying out. Plus, some people think clicking the pen is fun!

It's so easy to take the simple, cheap, and small things in our life for granted. But the pen isn't really so simple. After all, it took centuries to invent and perfect. So, when you use your Bic Crystal to finish your homework assignment, you can thank Laszlo Biro that you don't have to use a quill!

SPACE PENS

Biro's pen became famous in part because fountain pens leaked at high altitudes. John Fisher is another pen inventor who became rich and famous for inventing a pen for specific situations.

When NASA first started sending astronauts into outer space, they faced a dilemma. Ordinary ballpoints work when the ink drips down the cartridge and onto the ball. However, there is no gravity pushing the ink down in a space capsule.

After an astronaut sneaked a sandwich on board and his crewmates had to deal with the crumbs floating around in the capsule for the rest of the trip, NASA banned pencils. Just like the sandwich crumbs, little bits of pencil could break off. Astronauts could breathe in those tiny pieces, and they could be a fire hazard in the gravity-free environment.

In response, NASA developed a space pencil that spacesuit gloves could hold. However, their invention cost $986 apiece in today's money. Inventor John Fisher saw a market. He spent millions of dollars of his own money researching and developing a pen that didn't need gravity to work. Instead, the pen used pressurized nitrogen gas to push the ink onto the ballpoint.

Today, the Fisher space pen, which also works underwater, in a vacuum, in freezing cold and scorching hot temperatures, and even upside-down, is found in several industries, not only in space capsules.

QUESTIONS

1. *The first "modern" pen that appeared on the scene, the quill pen, was invented about 1,500 years ago.*
As used in this sentence, *"appeared on the scene"* most nearly means:

A. came into existence

B. was created during a play

C. was described from the viewpoint

D. arrived at the location

2. In which sentence is the word *"retract"* used correctly?

A. I gently retract and place the toddler's long red hair into a ponytail that stuck out of the back of her head.

B. To avoid a burn, I was forced to retract my hand quickly from the hot stove.

3. Number the following events in the order in which they took place.

_____ According to legend, Lewis Waterman's contract got ruined by an ink mishap.

_____ William Shakespeare wrote his plays using a quill pen.

_____ The Bic company started selling millions of pens per year.

_____ Laszlo Biro began experimenting with ball bearings.

_____ Milton Reynolds brought the ballpoint pen to the United States.

4. How did the war help Biro's pen business?

A. Laszlo Biro was forced to flee to Argentina because of the war.

B. The war created a demand for ballpoint pens that would work for pilots flying at high altitudes.

C. The war gave Biro the chance to experiment with ball bearings and create his pen.

D. Because of the war, Biro was able to lower the cost of his pen from $85 to 15 centimes.

5. What is the author's purpose in including the following sentence? *According to Bic, they sell 57 pens every second, and if all the pens sold by the company were lined up tip to end, they would reach from Earth to the moon!*

A. The author is giving a reason why Bic pens are so popular.

B. The author is trying to convince the reader that Bic pens are superior.

C. The author is illustrating how popular Bic pens have become.

D. The author is giving an example of how Bic markets its pens.

QUESTIONS

6. What is the author's point of view regarding the ballpoint pen?

A. The author's point of view regarding the ballpoint pen is that it was messy and tedious to use.

B. The author's point of view is that Laszlo Biro was more talented than Lewis Waterman because he made a more functional pen.

C. The author's point of view is that Baron Marcel Bich spent too much on the design and patent for his pen.

D. The author's point of view is that the ballpoint pen is a more complex invention than it seems to be at first glance.

7. Which choice provides the best evidence for the answer to the previous question?

A. *He bought the patent and design from Biro for $2 million and named his company Bic.*

B. *Inkwells were prone to spilling, and fresh ink could easily be smudged. Also, writing could be slow and tedious.*

C. *But the pen isn't really so simple. After all, it took centuries to invent and perfect.*

D. *Maybe he could combine the ball bearings and the quick-drying ink to make a better pen.*

8. How did writing change over time?

9. If the ballpoint pen had not been invented, what would be different today?

10. Imagine you could invent a new pen. What features would you give the pen?