



# Joseph Plateau


*Why aren't bubbles square?  
How were movies invented?*

From childhood, we look at delicate soap bubbles and marvel at their beauty. We love blowing them, popping them, running after them, catching them on our wand, and guessing how long their fleeting journey will last. With the light dancing off their evanescent film, they drift towards the sky full of shimmering color, energy and wonder.

But why are they always round?

A Belgian physicist, Joseph Plateau experimented to figure out the answer to this question using mathematics. Today, we understand that rainbow patterns reflecting off a bubble's surface are created by light bouncing off the front and back of the thin soap film, and mixing together to form shifting rainbow colours. However, what Joseph wanted to understand was something deeper. He wondered: if he made a wire frame of different shapes, would the bubbles he blew still be round?

And so began Joseph's fun, soapy, bubbly adventure. He is said to have created over



80 wire frames of all sorts of shapes and sizes. Joseph noticed that bubbles floating in the air always eventually form the shape of a perfect sphere. He observed that larger bubbles might wobble a bit (or even pop) before achieving this shape, whereas smaller bubbles reached their sphere shape quickly.

He figured out bubbles behave this way because soap films on a wire frame (or modern-day bubble wand) are tense—stretched taut like a thin, elastic skin. When the bubble leaves the wand, regardless of whether it is shaped like a star, rhombus, or something else—equal pulls in every direction make the bubble assume the shape with the least surface area possible. Joseph called this minimal area. Without edges, corners, or stress points (such as a rectangle, triangle or square) the soapy film is able to stay in a sphere shape without extra force. In other words, a bubble wand can be a triangle, but the bubble is destined to be a sphere.

Today, Joseph is remembered for his scientific discoveries leading to cinema and film. On October 14, 2019, on Joseph's 218<sup>th</sup> birthday, Google honored his whimsical creation, the phénakistiscope, which created the illusion of a moving image. Long before we watched movies, Joseph used his understanding of how images are formed on the retina to create two discs rotating in opposite directions. One disc was lined with small, evenly spaced windows, while the other showcased a series of images of a dancer. Spun at the right speed, the dancer seemed to come alive! Unfortunately, Joseph lost his eyesight later in life, but he continued to work as an experimental physics professor.

Perhaps Joseph saw beauty all around him because his father specialized in painting flowers. Perhaps he asked the right question at the right time. But the next time you see a beautiful, smooth bubble drifting hopefully in the sunshine, remember, someone once looked at the glistening orb and thought it was worth studying scientifically. And that someone—Joseph—was right.

## Discussion Questions

**Why do soap bubbles show rainbow colors?**

Light bounces off both the outside and inside of the thin soap film, and the overlapping light waves mix to create the rainbow patterns we see.

**Why are soap bubbles always round, no matter the shape of the bubble wand?**

Because the soap film pulls equally in all directions, forming the shape with the smallest surface area—a sphere.

**How was the first moving picture created?**

On two disks rotating at opposite directions Joseph drew a series of pictures that when spun looked like they were moving!

