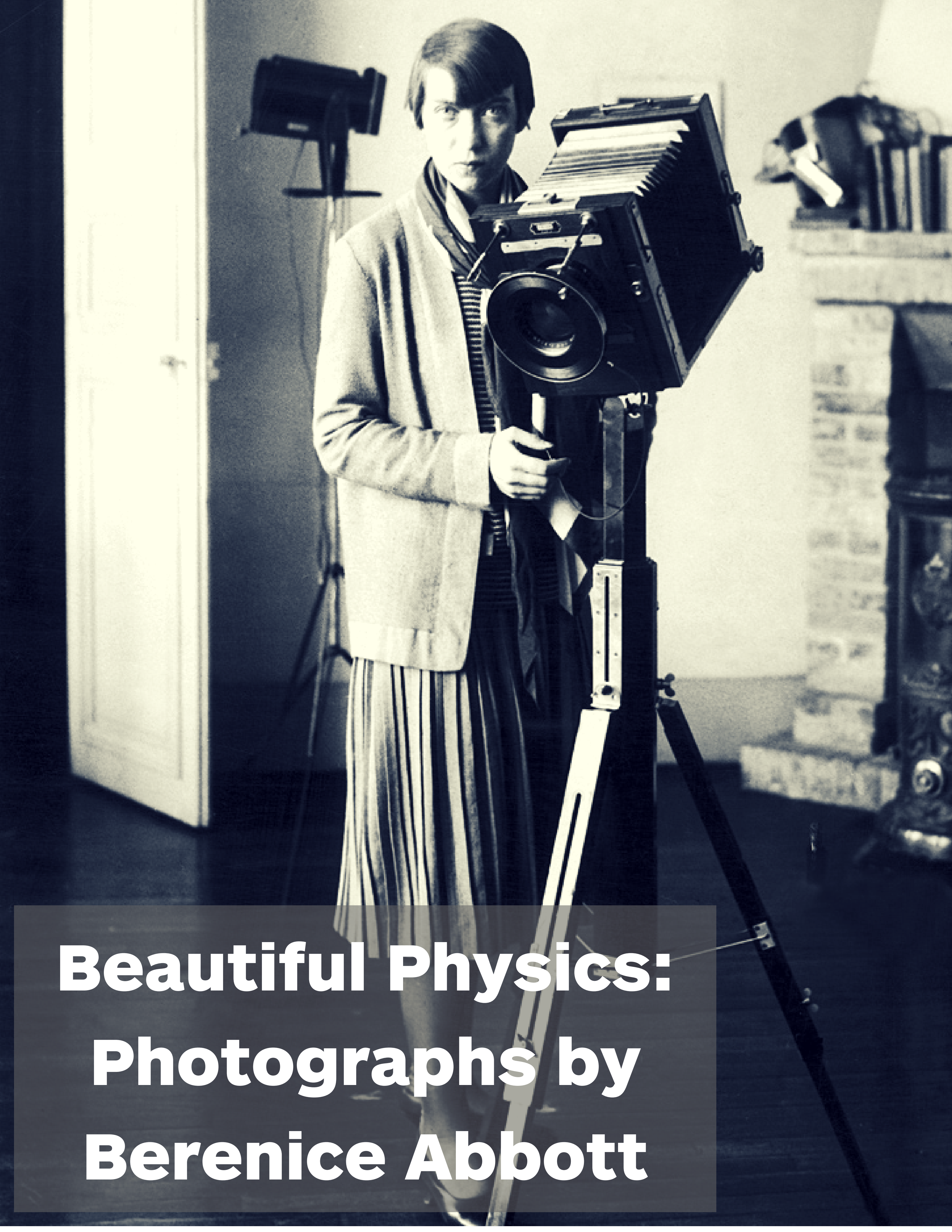


Beautiful Physics: Photographs by Berenice Abbott

Beautiful Physics: Photographs by Berenice Abbott

Berenice Abbott (1898-1991) was one of the great photographers of the twentieth century. After mastering the art of portraiture in the 1920s in Paris and documenting the changing landscape of New York City in the 1930s, she turned her attention to scientific subject matter, which she described as "the most thrilling" of her era. Abbott believed in the potential of her medium to make the seemingly mysterious accessible. In 1939, she set forth a manifesto declaring the need for "a friendly interpreter between science and the layman," a calling that would define her artistic trajectory for the next two decades.

The photographs on view were taken during Abbott's work with the Physical Science Study Committee (PSSC) at MIT to illustrate a new physics textbook. Phenomena such as acceleration due to gravity, wave interference, and magnetism are not only accurately represented but also give definitive form to abstract concepts such as energy conservation and the inexorable increase of disorder (entropy). Each starkly beautiful image draws on Abbott's mastery of lighting, composition, and timing to bring the underlying physics into focus, while simultaneously creating a visual poetry of arcs, staccato imprints, and subtly varied patterns. As a result, Abbott helped inspire a generation of scientists and left behind iconic images that still influence physics education today.

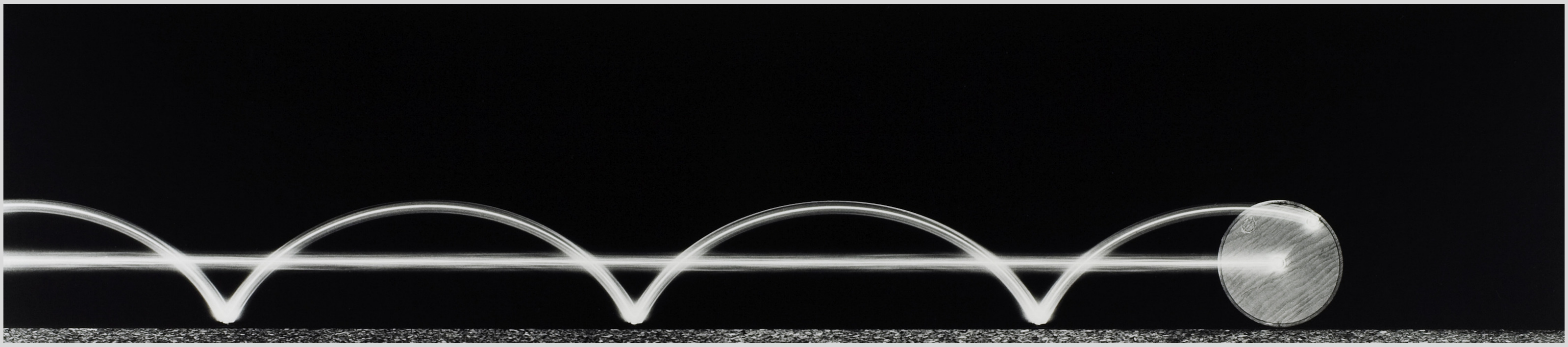
-Spencer Smith, Guest Curator and Assistant Professor of Physics, Mount Holyoke College

All works in the exhibition are gelatin silver print photographs captured between 1958 and 1961 and printed for The Science Pictures portfolio in 1982. The portfolio was a gift to the Mount Holyoke College Museum of Art by Joseph R. and Ruth Lasser (Ruth H. Pollak, Class of 1947), 1983.21.1-12.

During the run of the exhibition, members of the Mount Holyoke Society of Physics Students will develop written analyses of Abbott's photographs and the physical laws they represent.

This exhibition is made possible by the Natalie Hofheimer Program Fund.

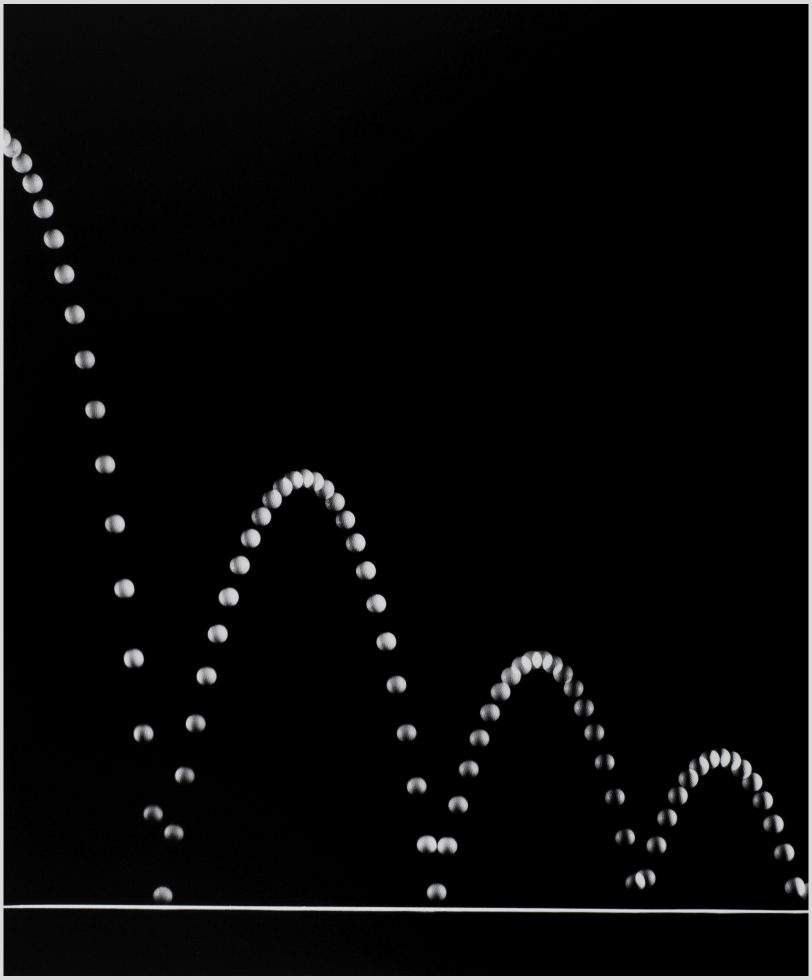
Photo: Berenice Abbott, 1927, Paris, France.



Cycloid

A process that seems simple at first sight is hardly ever simple by nature. Think of a coin rolling off a table. It appears to be moving in a straight line, but in fact, it needs to constantly rotate to move at all. In this picture, two light bulbs attached to a rolling disk create two bright traces that reveal the unexpected complexity of how a familiar object moves. The light on the rim seems to be hopping: it hesitates at the bottom each time before soaring up again. The central line of light becomes its visual axis, maintaining the stable motion of the disk. Viewing this photograph reminds us that without ups and downs it is impossible to make one's way forward.

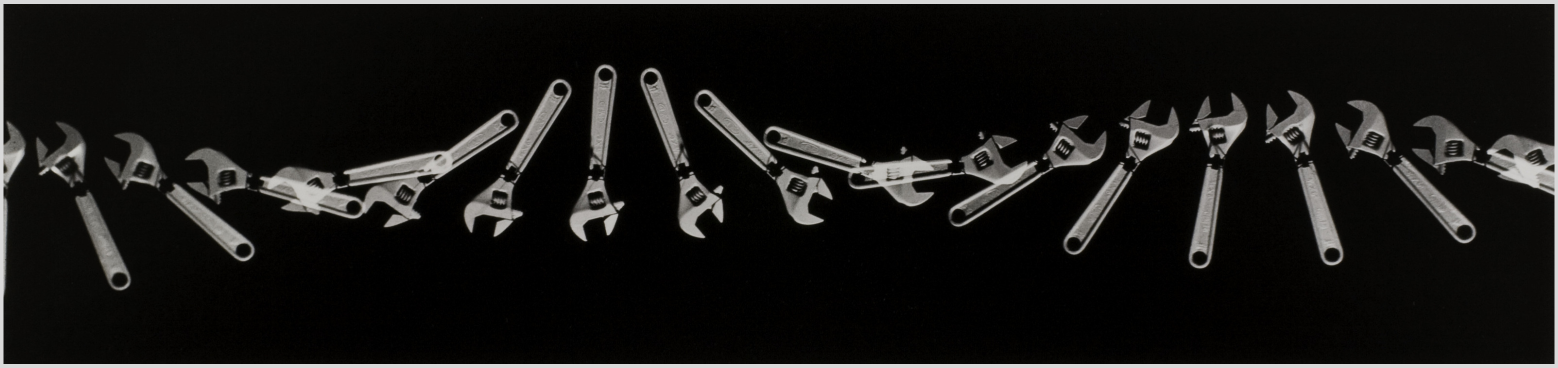
– Sofia Lis '20



Bouncing Ball

The force of gravity on a dropped object pulls it towards the Earth, causing it to accelerate until it hits the ground and bounces back up. Bernice Abbott’s *Bouncing Ball* captures this effect on a ball falling through the air. The spacing between each captured moment of the ball's trajectory demonstrates its speed; as the spacings get farther apart, the ball begins to move faster. As the spacings get closer together, the ball slows down until it reaches the apex and begins to fall back to the Earth. Each bounce causes the ball to lose energy and rebound to a lower height. Eventually it will lose all of its energy and come to a complete stop on the ground.

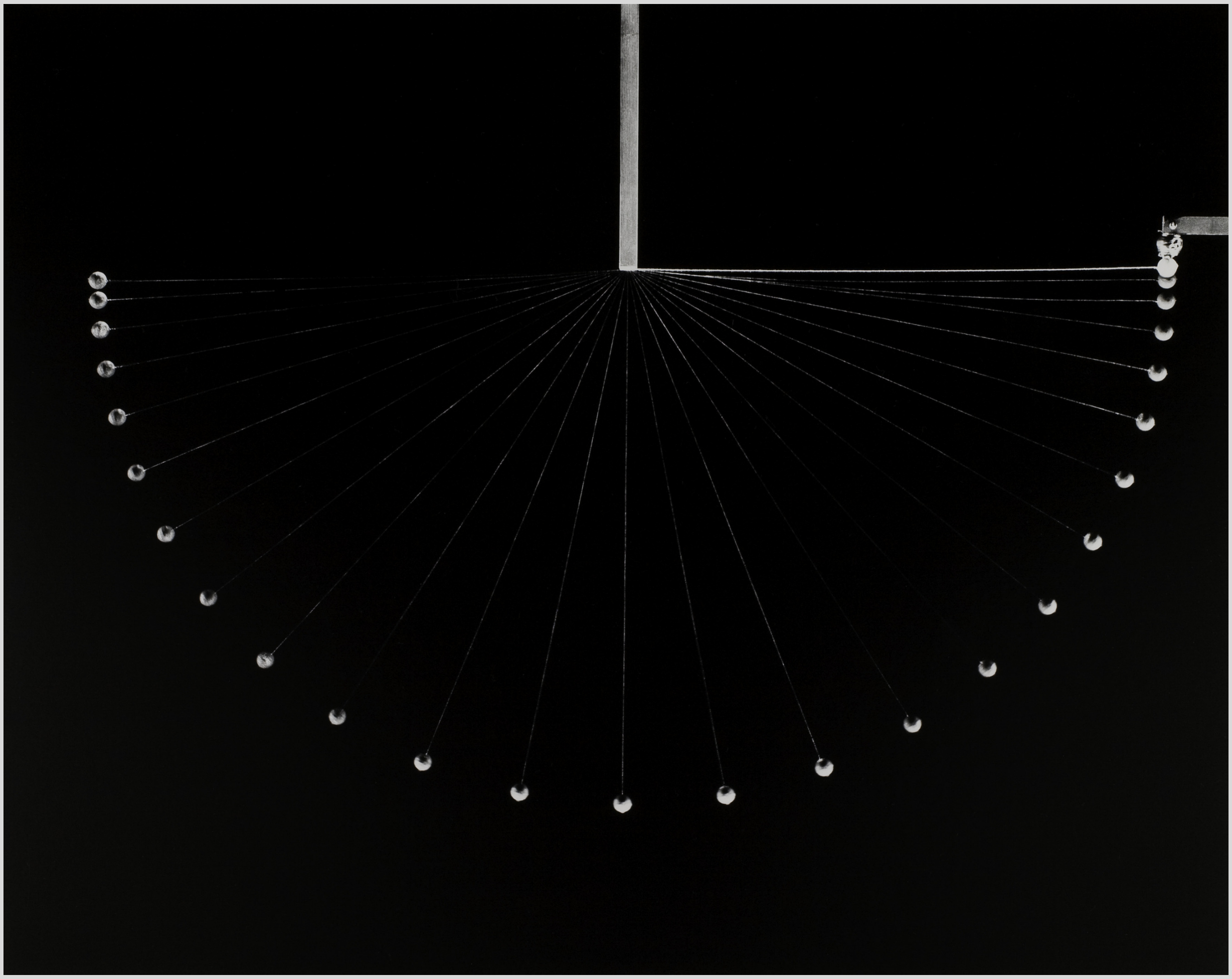
– Ashley Cavanagh ’19



Spinning Wrench

Spinning Wrench disrupts the sense of symmetry that dominates many of Abbott's other images. The wrench does not seem to move with a direct, purposeful manner but appears to flutter or wobble. Closely following the neck of the wrench as it travels across the frame, we see a row of evenly spaced points (each marked by a black "x"). This is the wrench's center of mass—the spot at which the wrench could be placed on the tip of a finger and balance perfectly. The center of mass travels across the frame at a constant speed, while the rest of the wrench rotates about it. Physically, this motion is identical to that of a spinning wheel.

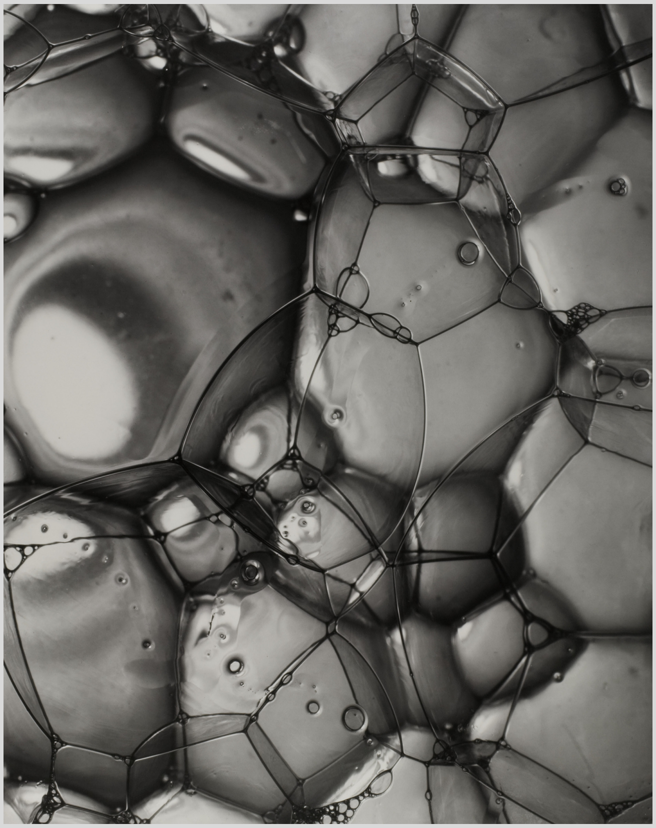
– Emma Thackray '18



Pendulum Swing

When one imagines a pendulum, one often thinks of the passage of time. Yet here the pendulum is timeless—all of its stages appear at once. As it reaches the highest point it slows, while at the lowest it rushes by. Anything that swings—from the pendulum of a grandfather clock to a child on a swing—follows this pattern of motion. The contrast of the white ball on a stark black background focuses our eyes on the movement, making us look back and forth as if the pendulum was truly in motion.

– Charlotte Schmaltz ’21



Soap Bubbles

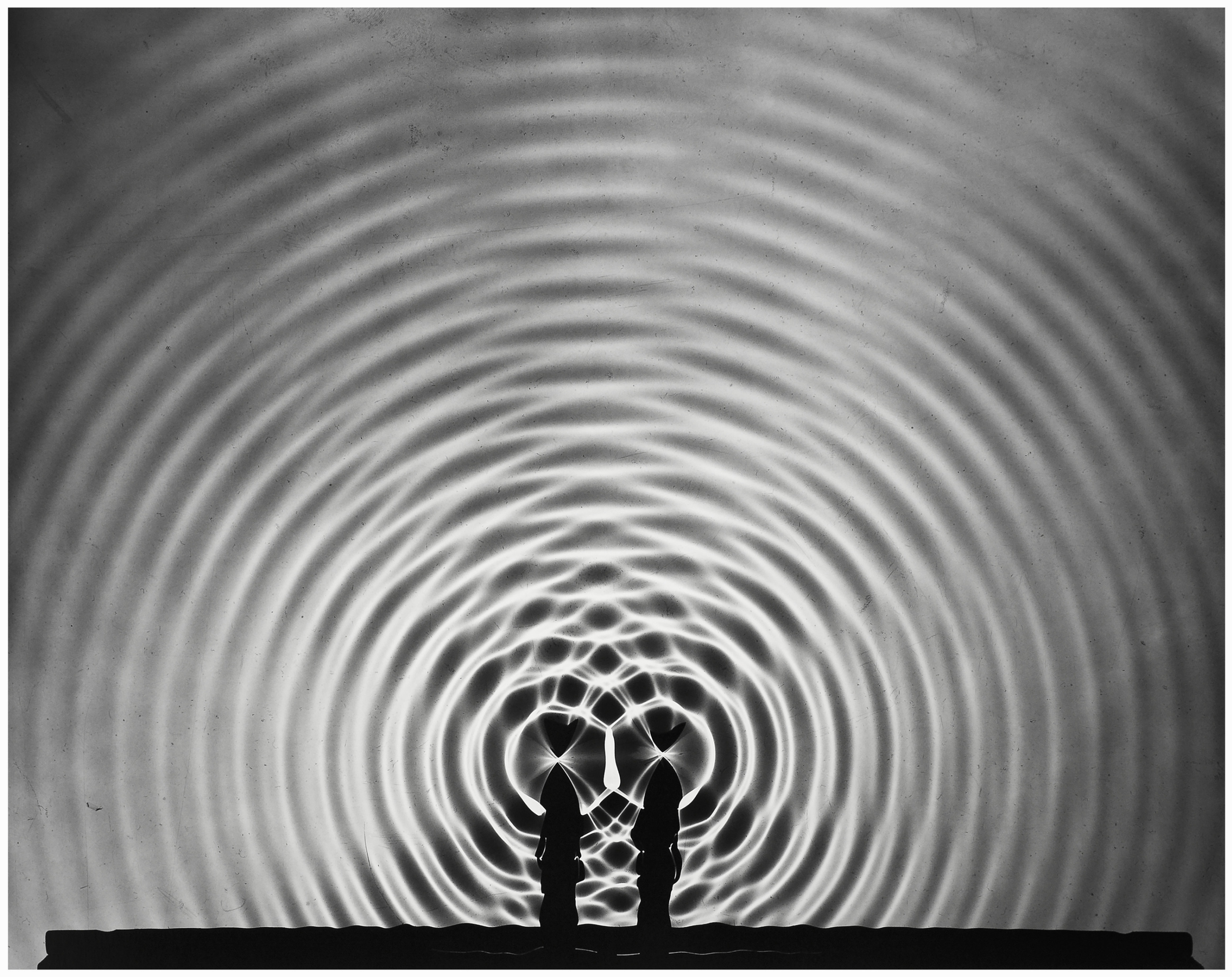
In the bath tub, in your hand, or in the laundry machine, bubbles are everywhere. This picture captures that breath-taking moment before bubbles pop—scientifically, when the air pressure inside the bubbles is just a bit higher than the pressure outside. The curvature of the bubble is achieved by surface tension, which tries to pull molecules of water and soap into the tightest possible grouping. When the internal pressure of multiple merging bubbles is exactly equal to one another, the surface tension creates a perfect flat surface between bubbles—seen in the straight lines in this picture. The fragility of bubbles can be interpreted as reflecting the vulnerability of life. When the bubbles of our life pop in this great universe, who will hear it?

– Shion Kubota ’19

Path of a Moving Ball

It’s all a matter of perspective. Imagine yourself throwing a ball directly upwards while standing on the smoke-stack of a moving train. You would see the ball moving up and down and right back into your hands. But a person observing this from the hillside would see the ball tracing an elegant arc. Which observation describes the true motion of the ball—your observation or that of the bystander? Both descriptions are correct, as the ball can be described from two different frames of reference. Berenice Abbott playfully evokes both viewpoints in this manipulated photograph, illustrating the foundation of special relativity.

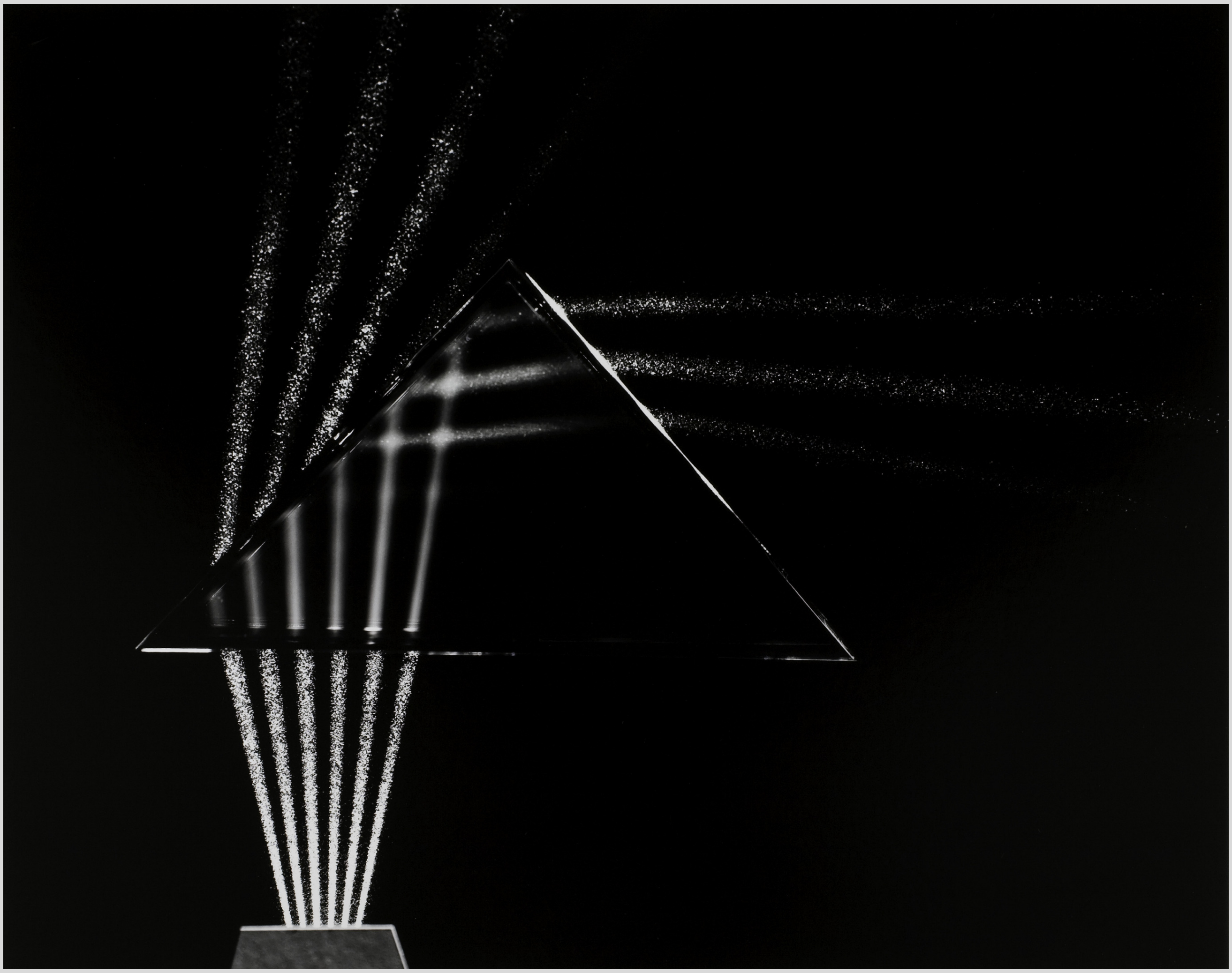
– Gillian Hagen ’20 and Sue Shi ’19



Water Pattern

Beneath the ripples of water lay many secrets. In this image, Abbott uses vibrations to create energy pulses through water. Tuning the wave frequency and controlling the light source amplifies the interference pattern produced by the overlapping sets of concentric circular waves. The key to the arresting beauty of the oscillating wavelike pattern is the elegance of its simplicity, making the abstract visible to the naked eye.

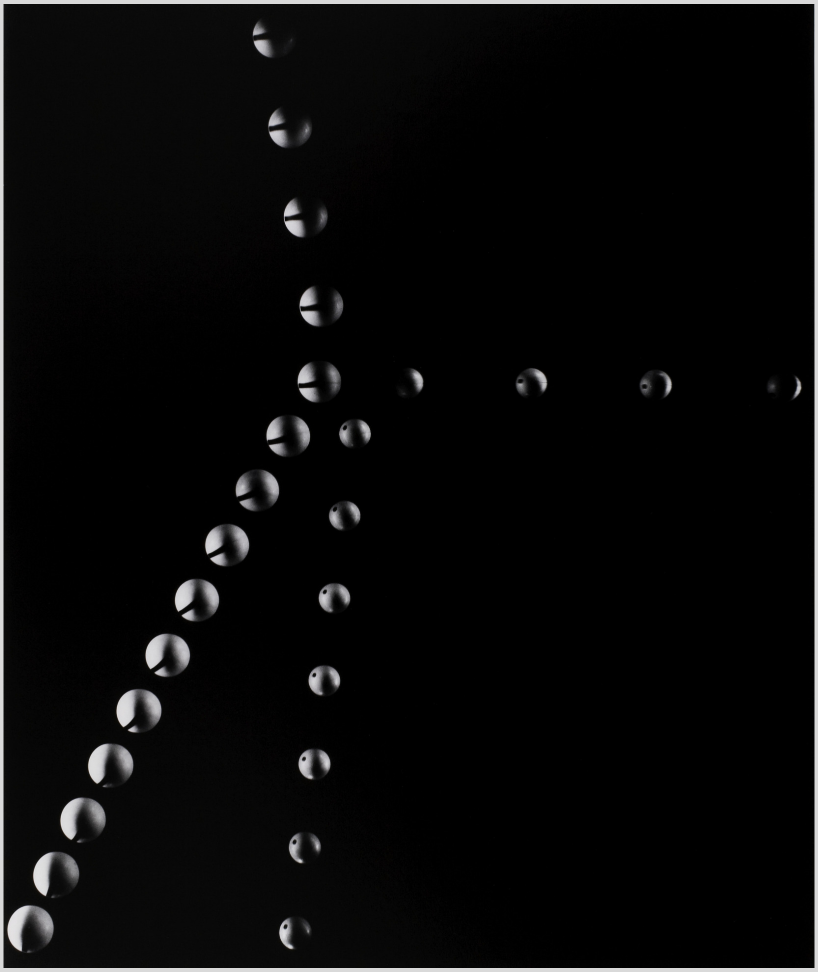
– Jem Guhit ’19



Beams of Light Through Glass

In front of a dark background, Berenice Abbott draws our eye to the precise geometry of refracted beams of light through glass. Using fine powder tossed into the air, she contrasts sharp lines against the shifting gradient of light. Although the trajectories may appear to be random, the direction and angle of each is set by the laws of physics. Through these beams of light, Abbott illuminates the order at the core of natural phenomena.

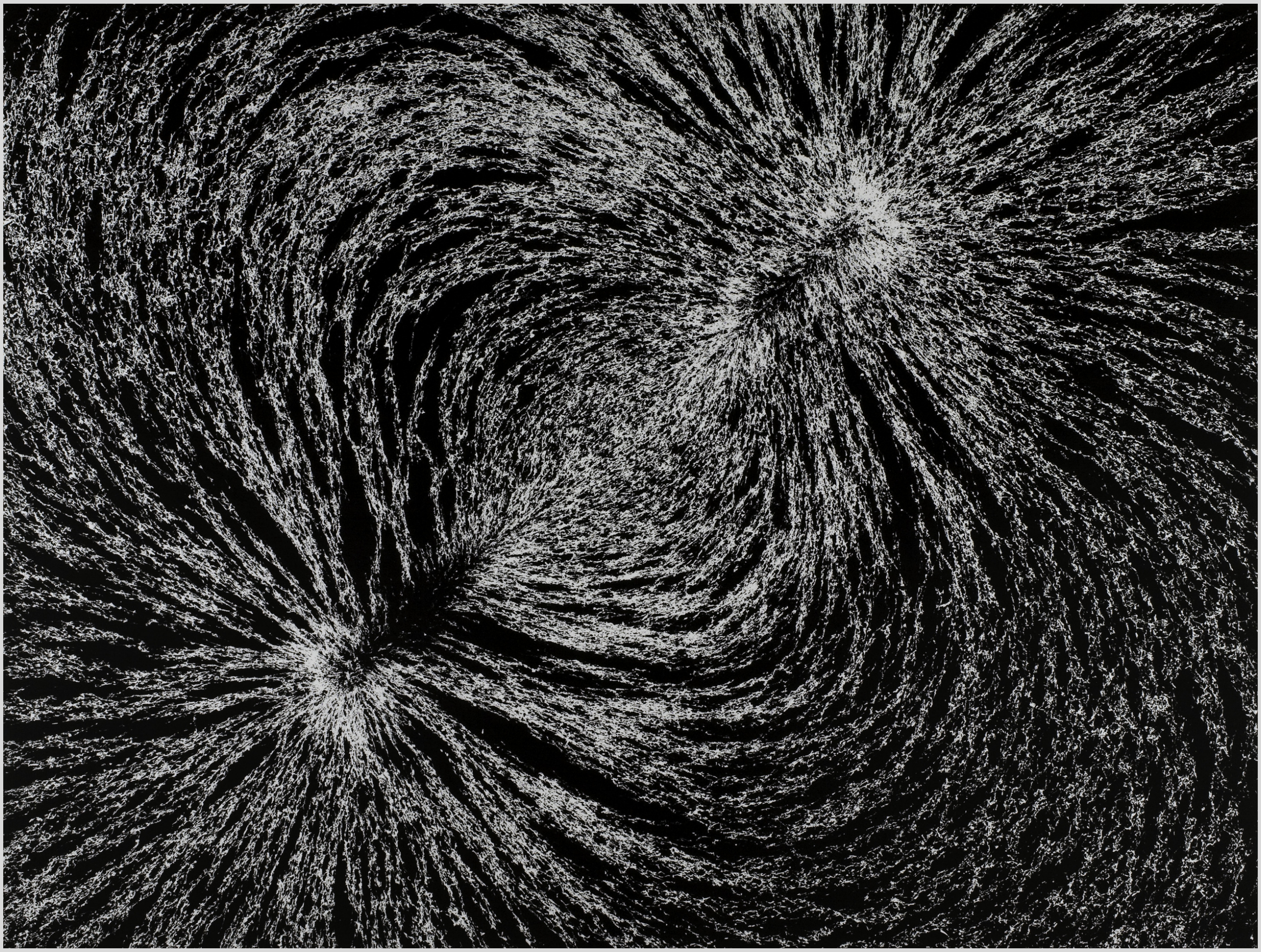
– Gillian Hagen ’20



Collision of Two Balls

In *Collision of Two Balls*, Berenice Abbott uses a stroboscopic camera to capture the momentum of two balls before and after they collide. Abbott ensured that each ball moved with a constant velocity, signified by the even spacing between shots. At the collision, the transfer of energy and momentum changes each ball's path forever. After the collision, the balls go their separate ways, but in what directions? Interestingly, we cannot know this, as the movie of this collision played in reverse would create the same stroboscopic image.

– Katie Cashin ’19



Magnetic Field

Using small iron filings, Abbott illuminates the magnetic field emanating from an unseen permanent bar magnet. The field interacts with each individual shard of iron, dictating its orientation. Collectively, they trace out the arching magnetic field lines connecting the north and south poles of the bar. This photograph shows us the beauty that we never see, but is always present.

– Elizabeth Post ’18