AAPT High School Physics PHOTO CONTEST WINNERS 2008

1st Place Natural

A Scattered Sun, Alexis Blanch
Academy of the Sacred Heart, New Orleans, LA
Teacher: Stephen Collins

Here, the sunlight is hitting a patch of fog, and the light is reflecting off the particles in the fog, allowing it to be seen. This demonstrates diffuse reflection, which happens when a wave hits an uneven surface and the reflected image is distorted. In diffuse reflection, rays that hit the surface parallel to one another are then reflected in an erratic pattern. This is what causes the reflection of the trees in the water to appear blurry.

1st Place Contrived

Paper Clip Peculiarity, Shilpa Hampole
Notre Dame High School, San Jose, CA
Teacher: Bill Whitney

This photo was contrived by placing a paper clip on the surface of some water in a bowl. The paper clip is supported by surface tension. It is illuminated by bright light coming through a window with blinds. The pattern seen in the reflected light shows the depression in the water around the paper clip.

2nd Place Natural

Sundog, Casey Brown
Northfield High School, Northfield, MN
Teacher: Rebecca Messer

Nature is filled with countless wonders. Some are happenings that take place everyday but are looked at in the right light. This photo shows a "Sundog." Generally, Sundogs happen when the Sun is near the horizon. The Sun's light passes through hexagonal-shaped ice crystals and is then refracted so that the observer sees a spectrum of light near the Sun.

2nd Place Contrived

Nighttime Cycloid, Charles Grimmett
Amherst Steele High School, Amherst, OH
Teacher: Charles Deremer

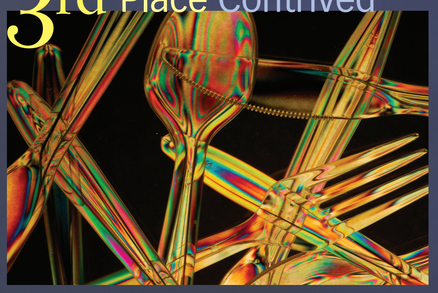
Named by Galileo in 1599, a cycloid is the path that a point on the edge of a circular wheel follows as the wheel rolls along a straight line. This photo is a long exposure taken at night. I attached an LED to the edge of the tire, opened the camera's shutter, then had my dad drive the vehicle in a straight line until it reached where I knew the edge of the frame was. In order for the vehicle to show up, I had to illuminate it for about 10 seconds with a spotlight.

3rd Place Natural

Drops of Sky, Mrinalini Modak
Fayetteville-Manlius High School, Manlius, NY
Teacher: Joshua Buchman

In this image, the blue reflection seen within the water droplets is actually a reflection of the blue sky above. The blue light is reflected because the water has a different index of refraction than its surroundings (the leaf and the air). The blue sky light is the result of the white light from the Sun being scattered by the molecules present in the atmosphere. Shorter wavelengths are scattered much more than longer ones, and so we perceive the sky as blue. The sphere-like shape of each droplet causes it to act as a lens, magnifying the leaf beneath it.

3rd Place Contrived



Cross-Polarization, Carly Sobecki
Convent of the Sacred Heart, Greenwich, CT
Teacher: John Paul Reid

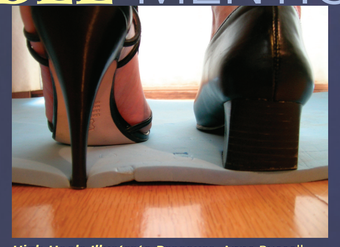
To contrive this effect, the objects were placed between two polarizing filters, one over the camera's lens and one above the light source. The two filters were oriented in perpendicular directions. Since the light is polarized in a single plane after traveling through the first filter, we expect it to be blocked by the second filter. For this reason, the bright background appears black. However, after the polarized light travels through the plastic silverware, some of it is able to pass through the second polarizing filter. This effect depends on the wave's frequency, as well as on the thickness of the plastic. This results in the brilliant display of colors observed in the photograph.

HONORABLE MENTIONS

Contrived Category

Thirsty Buddy, John Langmack
The Walker School, Marietta, GA
Teacher: Sandra Rhoades

In this photo, my dad tossed a glass of water at my dog, Buddy. When my dad jerked the glass and stopped it, the water, due to inertia, kept moving. It had an initial velocity that carried it forward and it was acted on by the downward pull of gravity. This resulted in a parabolic path typical of projectile motion, so that the water went into Buddy's mouth and quenched his thirst.



High-Heels Illustrate Pressure, Anna Russell
Tamalpais High School, Mill Valley, CA
Teacher: David Lapp

The high-heeled shoes in the photograph illustrate the nature of pressure — one shoe with a very thin heel, the other with a block-like heel. The left shoe's heel has a surface area about the size of a pinky nail, while the right shoe's heel has a much bigger surface area. Because the pressure applied on the mat by each shoe is defined as force divided by area, the heel with the smaller surface area will exert a much greater pressure. The difference in pressure is evident in the deep impression made on the mat by the thin-heeled shoe and the light impression made by the thick-heeled shoe.

The Triangle of Light, Sergei Finkler
St. Mark's School of Texas, Dallas, TX
Teacher: Steve Balog

In the picture, a concave spherical mirror is pointed in the general direction of the Sun. Light rays from the Sun are then reflected from the mirror and converge at the focal point. The matchstick is placed at the focus where the rays converge. This causes the match to burn and give off smoke. With the aid of the smoke, the "triangle of light" is more easily seen. This "triangle of light" is actually somewhat curved because the mirror is spherical and not parabolic.

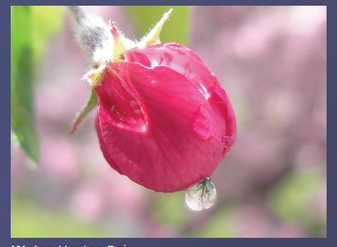
Witchcraft or Physics?, Emily Bruhl
Fairfield Ludlowe High School, Fairfield, CT
Teacher: Mr. Heiden

While my sister appears to be floating, her left leg is actually behind the door and her right one is being reflected in the mirror. This is an example of specular reflection; the angle of incidence is equal to the angle of reflection. The image produced is virtual and laterally inverted; it has the same size as the object.

Natural Category

Storm on the Shore, Kevin Shaughnessy
The Gunnery, Washington, CT
Teacher: Mr. Bailey

I took this photo while camping in Florida. We were all out in a boat one night while there was a thunderstorm back on shore. The large flash of light in the sky and the three lightning bolts in the center of the photo result from static electricity within the clouds. To take this shot, my camera's shutter setting was about five seconds. This is why there are candycane-shaped lights throughout the shoreline. Since the boat was floating on the water, it oscillated up and down with the waves. The camera captured a five-second time exposure of how the shoreline looked from my point of view on the boat.



Water, Yuntao Bai
A.Y. Jackson Lee School, Toronto, ON
Teacher: Sai Chung

A water droplet adheres to the tip of a flower. Dipolar attractions of water molecules induce a strong surface tension at the air-water interface. As a result, these molecules form a bead on the flower's surface. The droplet behaves like a convex lens, producing an inverted image of a tree behind it.

Specular vs. Diffuse Reflection, Jamie Bachman
The Walker School, Marietta, GA
Teacher: Sandra Rhoades

This photo depicts a reflection of car rims on asphalt, an uneven surface. Since asphalt is granular, diffuse reflection would normally occur, reflecting the light in many directions. Interestingly though, the reflection produces a mirror-like image, as from a smooth surface. Because the photo was taken when the Sun came out directly after rain, the asphalt was still wet. Water filled the uneven crevices of the pavement, creating a smooth surface. Therefore, when the Sun hit the rims and reflected off of the wet pavement, specular reflection occurred, producing the spiral image of the rim.

Goodnight Sun, Justin Duncan
Helios High School, Jefferson City, MO
Teacher: Matt Zeitz

In this picture, we can clearly see the Moon, but in the mirror we can also see the last few rays of a sunset. The reason we can see both in the same picture is because of the convex mirrors provided on the side of all vehicles. No matter where an object is placed, be it the sunset or a car passing you, the image is always smaller, upright, and virtual. The red-orange appearance of the sky in the mirror should also be noted. Sunlight is scattered by dust particles in the atmosphere. The sky appears red in the mirror because short wavelengths of light are scattered most effectively by the dust particles. This explains the phenomenon of a red-orange sunset.

SPECIAL RECOGNITION

Human Projectile, Joey Moro
Pickerington High, Pickerington, OH
Teacher: Doug Forrest

I took a photograph of a friend jumping over a gap, to illustrate the free-fall path of projectiles. It is not perfect free-fall because of air resistance, but in this case that is negligible. There is no horizontal acceleration and the only force is in the vertical direction, that of gravity. This causes the projectile to move in a parabolic path.

"Shoot the J! Shoot It!", Greg Gentile
West Forsyth High School, Clemmons, NC
Teacher: Ashley Reese

This photograph was created to display the path of a basketball shot by showing the ball's location every tenth of a second. The constant downward force of gravity and the ball's nearly constant horizontal velocity result in a parabolic path.

About the Contest

Each year, AAPT organizes a High School Physics Photo Contest. Physics students around the world are challenged to submit a photo illustrating a physics concept. The students are required to take the photo themselves and include a written summary of the physics occurring in the photo. The photos shown here were judged at the 2008 AAPT Summer Meeting in Edmonton, Alberta.

Check for upcoming information about next year's contest online:
aapt.org

Vernier

AAPT thanks Vernier Software & Technology, Inc. for their generous support of the photo contest.

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