AAPT High School Physics PHOTO CONTEST WINNERS 2007

1st Place

Natural Category

Cornea Acting as a Convex Mirror, Annacy Wilson
School: Tamalpais High School, Mill Valley, CA
Teacher: David Lapp

In this picture, one can see a girl's eye with an image of a doorway and a boy's figure. The cornea acts as a convex mirror. Such a mirror will always produce an image that is upright and smaller than the object. Because the human eye is so smooth, it produces a very clear image. The girl is standing inside of a doorway, looking out. The light coming through the doorway has created the virtual image of the doorway on her eye.

2nd Place

Natural Category

Virtually Floating, Justin Held
West Boca Raton High, Boca Raton, FL
Teacher: Maria Aparicio

I took this picture on Ouzel Lake in Rocky Mountain National Park. The still lake below the mountain acts as a plane mirror which produces a virtual image. This virtual image is the same size and distance from the reflecting surface as the actual clouds. I was standing in an elevated position relative to the lake and had to aim the camera at a downward angle in order to take the picture. So in the photo the clouds above the lake appear to be more elevated than they actually were, and the images of the clouds appear to be less elevated than they actually were, making it seem as though the virtual mountain is amongst the virtual clouds.

Contrived Category

Bending Attraction, Megan Kalany
The Walker School, Marietta, GA
Teacher: Sandra Rhodes

The heart shape that is formed on the book is due to the way the light passes through the lens (filter) and then hits the book. The light travels essentially in straight lines through the filter and then hits the two convex surfaces formed at the book's spine. The transmitted light and the filter itself appear yellow because the filter absorbs primarily blue light.

3rd Place

Natural Category

Small Scale Wave Diffraction, Colleen FitzGerald
Amherst Steele High, Amherst, OH
Teacher: Chaz Deremer

This photograph shows single-slit wave diffraction in a small stream. The reflection of the surroundings emphasizes the apparent difference in the waves at each position. Since the wavelength of the waves and the width of the opening are about the same, there is noticeable diffraction. A small dip in the branch allows water to pass over the barrier, causing the formation of a semicircular wave pattern centered at the gap in the branch. The wave spreads out and departs from its original direction of travel.

Contrived Category

Balanced Torques Demonstrated In Dogs With Different Weights, Alexander Kithas
Tamalpais High School, Mill Valley, CA
Teacher: David Lapp

In this photo, there are two dogs balanced on a wooden board that is suspended by a brick fulcrum. The bigger dog on the right side weighs three times as much as the other one; however, they are balanced perfectly because certain adjustments were made. The first of these adjustments is that the smaller dog is noticeably further away from the fulcrum than the larger one, and the second is that the majority of the board is on its side. The result is that the torques are balanced and the dogs are in equilibrium.

Contrived Category

Image Inversion, Phuong Ha
School: NUS High School, Singapore
Teacher: Yen Ling Lam

The background is clearly seen through the top part of the glass, with a clear region of black on the left and a clear region of white on the right. But when the glass was half filled with water, it now functions like a cylindrical converging lens and inverts the image. Light rays from the background converge beyond the focal point after passing through the convex lens to form the inverted image, which can be seen in the lower half of the glass containing water. The black half is now on the right side of the glass as the image is inverted.

HONORABLE MENTIONS

Natural Category

El Reflejo, Kate Roosa
Lancaster County Day School, Lancaster, PA
Teacher: Jim Ringlein

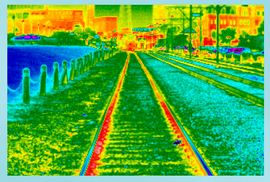
This picture was taken at the Alhambra Palace in Granada, Spain. The reflection pool has a very smooth surface, so the image of the palace is sharp. However, the cat drinking from the reflection pool causes small water waves. These water waves distort the image. The water waves are in the form of concentric circles with equal wavelengths; this proves that the reflection pool is the same depth throughout.

Hurricane Katrina Picture, Kate Brechtel
Academy of the Sacred Heart, Metairie, LA
Teacher: Stephen Collins

This is a photograph of a framed picture that was under contaminated water after Hurricane Katrina. The water contained gasoline from gas stations and over 300,000 flooded cars, spilling between one and two million gallons of gasoline. The glass of the picture frame has a thin film layer of oil from the standing water. The color on the glass is due to light interference of waves reflected off the top surface of the oil and the top surface of the glass.

Pitcher Picture, Elizabeth Owens
Golden West High, Visalea, CA
Teacher: Christopher Phillips

Since the pitcher is thicker in the middle than around the edges, it acts as a convex (converging) lens. The tree in the background is located beyond the focal point of the "pitcher lens," so light rays reflecting off the tree focus to form a real, inverted image that is much smaller than the actual object. Upon inspecting the image, though, one can see that the tree is not only inverted vertically, it is also reversed horizontally.



Thermographic Photo, Rachel Yates
Academy of the Sacred Heart, Metairie, LA
Teacher: Stephen Collins

This picture was taken with a thermographic or infrared camera. Infrared pictures can be used to understand the thermal patterns of the subject. This picture of a set of railroad tracks by the river was taken about thirty seconds after a train passed. The purples and blues indicate cool temperatures while the reds and oranges indicate warmer temperatures. At the bottom of the picture, the tracks are purple and blue. Farther down, the tracks are still red and orange from being heated by contact with the train's wheels. Once the train has passed, the tracks begin to cool because the surrounding air is much cooler. The tracks at the top of the picture have not had a chance to cool for as long, so they are still hot.

Longitudinal Wave Pattern on a Snowy Beach, Zachary Peterson
Ipswich High, Ipswich, MA
Teacher: Don Poranski

This photo was taken on a beach after a light snowstorm. As can be seen the snow isn't evenly distributed over the sand. The sand and snow have been heaped up in bands and form a wave pattern by the process of saltation. This is caused by wind blowing across the beach's surface and lifting the particles from the surface. As the particles rise up into the higher-velocity wind stream, they lose lift and fall back to the surface, being deposited in heaps. The ripples of sand and snow resemble a longitudinal wave with the wavefronts perpendicular to the wind direction.

Special Recognition

Light Up the Night, Brandon Gloss
Pickerington High, Pickerington, OH
Teacher: Doug Forrest

This picture was taken around midnight at Hilton Head Island, SC. It clearly shows the static discharge between highly charged clouds and the lesser-charged ground. Lightning is difficult to photograph because of its unpredictability and speed. It was dark and I used the long-term (four second) exposure on my digital camera. The bolt of lightning acted like a camera flash that illuminated the surrounding area, giving sharp silhouettes of the trees.

Contrived Category

The Eternal Rose, Jonathan Walker
Berkmar High School, Lawrenceville, GA
Teacher: IV Bray

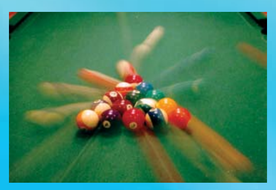
Even though flames engulf this flower, the rose itself is not burned or harmed by the flames. The darkened edges of the petal come from the natural coloration of the rose and not from the burning of the petal. The rose is coated with ether, a very volatile chemical. As the ether evaporates and combusts, it forms a thin layer of evaporated gas. The liquid itself is not burning because in a liquid state the ether cannot be easily mixed with oxygen. The gas state instead allows for thorough saturation of the evaporated ether with oxygen, making the gas highly combustible. The thin layer acts as a barrier, keeping the heat and the flame away from the surface of the rose. This effect is maintained only while some liquid ether remains on the surface of the rose. The gas evaporates so quickly that it is able to replenish the layer of gas being consumed from the flame. Without the liquid ether, the flame consumes the thin layer of shielding gas, exposing the rose the heat of the flame. In addition, the petal orientation of the rose prevents the flower from burning. The rose petals are relatively vertical in orientation, preventing the rising hot air from burning any part of the rose.

Brilliant Balloon, John Wanberg
Cherry Creek High, Greenwood Village, CO
Teacher: Jessica Olsen

This is a rare picture catching a water balloon in the process of popping. While the balloon itself has been removed, the water momentarily holds its form and still appears as a sphere. Because of the inertia of the water, it does not move immediately after the container it was in disappears. This photo was taken the moment after the balloon popped but before the water has been too affected by gravity. It is possible to see small droplets of water that have been accelerated away by the quickly retracting balloon. Because of their tiny mass it did not require much force to fling them away from the main mass of water. At the point where the needle pierced the balloon there is a small projection of water that stands out from the sphere of water. Because the hole in the balloon first appeared at this spot, a small amount of water was forced out there before the entire balloon retracted.

Dancing Liquid, Levin Nelson
Roosevelt High School, Seattle WA
Teacher: Eric Muhs

Have you ever seen liquid dance? We stretched a thin membrane over the top of a speaker. When amplified music is connected to the speaker, the bass causes the membrane to vibrate, and when water is placed on top of the membrane, it is forced upward and appears to jump with the music. The photograph was made using strobe lighting in a dark room. We left the camera shutter open for about six seconds while the music was playing. The strobe was triggered by the sound of the speaker, which was picked up by a microphone. The spires of water containing food coloring are held together by surface tension and this in what puts the droplets in such fascinating shapes.



Billiards & Momentum, Stefan Stercula
East High School, Glenn Mills, PA
Teacher: Ron Pedely

In this photograph, you can see the results of the impact made by the cue ball on a set of racked billiard balls. Both the conservation of energy and the conservation of momentum are at work in this picture, as shown by the dispersion of the balls after they are struck by the cue ball. When the cue ball strikes the first billiard ball at the top of the rack, its energy and momentum are transferred through all the other balls, from top to bottom.

Pennies Don't Float, Bobby Kanaly
Cherry Creek High, Greenwood Village, CO
Teacher: Jessica Olsen

My brother is a world champion Irish dancer; he needs to practice so much that my dad built him a dance floor in the basement. When I watch my brother, I notice little specs of dust and dirt that hop up next to his feet as he dances nearby. I decided to catch this action with my new camera.I laid pennies out on my brother's dance floor and had him stomp behind them; I took this picture with a flash and a fast shutter speed. The pennies hopped up because of the elasticity of the thin wood floor that my brother dances on. As my brother stomped, he pushed the floor down only about a millimeter, but that was enough to create a wave that moved quickly beneath the pennies. As the floor bounced back to its original height, it pushed the pennies upward; it did this with enough force to make the pennies hop upward. The pennies were then in free fall, and as they slowed down toward the top of their path, I took the picture.

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 here were judged at the 2007 AAPT Summer Meeting in Greensboro, NC.

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