High School Physics Photo Contest Winners

2009

1st Place Natural

Pinch Yourself!!!, Chase William Lampe
University High School, Tucson, AZ
Teacher: Pamela Tautz

The picture of the orange Camaro's tire as it takes off from the starting line shows quite a lot of physics in a single instant. Before the car leaves for the finish line, the driver does a "burnout," where he/she heats the tires so they get traction. As the car launches, the heated rubber in contact with the ground sticks in one place while the rest of the tire starts spinning around. The resulting shear stress causes the folds in the tire.

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

aapt.org

AAPT
PHYSICS EDUCATION

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 2009 AAPT Summer Meeting in Ann Arbor, Michigan.

1st Place Contrived

Where Sand Meets Sea, Kelsey Rose Weber
Wildwood School, Los Angeles, CA
Teacher: Tengiz Bibilashvili

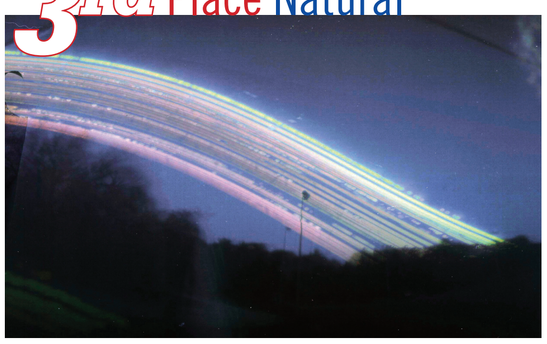
This photo was contrived by placing a transparent sphere against the beach horizon. The glass sphere in this photo acted as a lens, causing the inverted image. This photo was taken at the Venice beach in Los Angeles, California, and shows the beauty of combining physics with one's own natural surroundings.

2nd Place Natural

Physics Found in Snow Curls,
Bethany Jeanne Schmitkons
Amherst Steele High School, Amherst, OH
Teacher: Chas Deremer

This happened when, after a big snowfall and a lot of really cold weather, there was one very sunny, yet very cold, day. The Sun shining on the snow made the top begin to melt. The water sunk to the bottom and compressed the snow on the bottom to make it heavy and slippery. The angle of the roof, the gravitational pull of the Earth on the snow, and the reduced friction surface caused by the melting snow made the entire sheet of snow slide off the roof. The angle of the roof is perfect to give the snow a velocity that is slow enough that the pull of gravity warped the snow.

3rd Place Natural



Solargraphy, David Abraham Levine
Weston High School, Weston, MA
Teacher: Boris Korsunsky

This image was taken over a 45-day exposure using a paint-can pinhole camera. As the Sun moves across the sky, it burns an image into the photopaper placed inside the paint can. Each streak corresponds to a day, and the gaps, or incomplete streaks, are caused by overcast weather that day. This technique is called "solargraphy." Over longer exposures it is possible to see how the height of the streak changes in relation to the seasons. The streaks are not perfect arcs because of the warped nature of the photopaper while wrapped up in the paint can. All that is required besides a pinhole camera is black-and-white photosensitive paper. Oddly, not only is the final exposure in color, but it doesn't even have to be developed. The negative was scanned, horizontally flipped, the colors inverted, and here it is! The presence of color is due to the degradation of the chemicals in the photopaper.

2nd Place Contrived

Poolside Phenomenon, Samantha Nicole Gold
Plainview-Old Bethpage John F. Kennedy High School, Plainview, NY
Teacher: Jordan Pekor

In this photo, my friend dunked her head under the water with her hair down in front of her face. Then she flung her head back up. As her hair emerged from the pool, surface tension pulled some water along with it. The jerking back of her head caused the water to be released from her hair, after which it moves approximately in free fall.

3rd Place Contrived

O How Dandy, Christopher Michael Curti
Valley Central High School, Montgomery, NY
Teacher: Christopher Cozzolino

To obtain this photo, I started by spraying a stick with a mist of water on a beautiful spring afternoon. Then I placed a freshly picked dandelion behind a drop of water that settled on the stick. The light travels from the flower through the water drop, which behaves as a small lens. Even though the flower is much larger than the drop, its full image can be seen. I photographed it using a macro lens on my camera.

HONORABLE Mentions Natural

Snowy Landscape in a Spherical Icicle Covering a Dogwood Bud, Catherine Guenther
Columbus School for Girls, Columbus, OH
Teacher: Kevin Sweeney

This picture shows the snow-covered landscape of my backyard through a spherical casing of ice covering a dogwood bud. An ice storm had enveloped this entire tree in ice, covering every bud and branch. The icicle acts as a converging lens that shows the real, inverted image of the snowy landscape behind it.

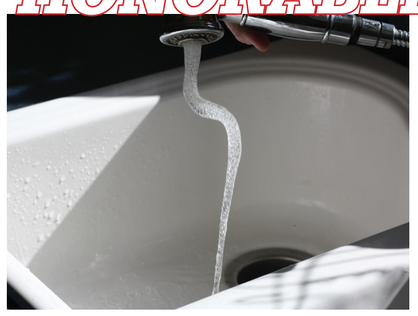
Superposition of Waves, Alexander Craig Norton
Marlborough High School, Marlborough, MA
Teacher: Robert McLeod

This photo shows the principle of superposition of waves. As waves cross each other, they are able to pass through without changing their direction or speed. Another property of superposition is the addition of amplitude. If you look closely where the waves intersect, you will see that the resulting amplitudes at the intersecting points are larger than the individual amplitudes of the intersecting waves. This phenomenon occurred on a windy day in the Gulf of Mexico where the water was very shallow, only three or four inches deep, over a sandbar. One set of waves came from the ocean heading toward the shore and the other set of waves was driven by a strong wind blowing parallel to the shore.

Falling Liquids Tend to Form Spherical Drops,
Austin Thomas Ferro
Mission College Preparatory, San Luis Obispo, CA
Teacher: Vickie Backman

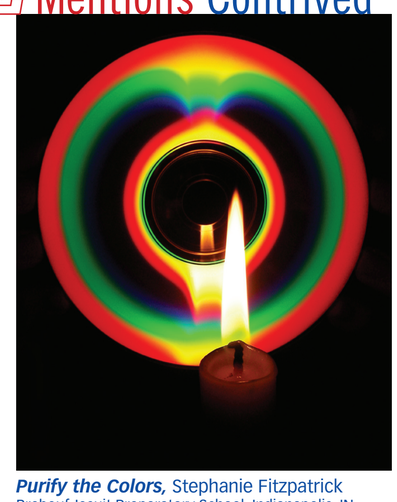
There exists a misconception that falling droplets of water are tear shaped, similar to a drop hanging from a faucet. This is not the case. When water free falls, surface tension causes the molecules to arrange themselves in such a way as to minimize the surface area of the droplet relative to its volume. The resulting shape is that of a sphere. While the droplets are elongated as they leave the faucet, they assume a spherical shape once they separate from the stream of water.

HONORABLE Mentions Contrived



Agua Loco, Jayme Lauren Littlefield
Apponequet Regional High School, Lakeville, MA
Teacher: Julie Mills

The unique 'stream' of water seen in the photograph demonstrates Newton's First Law of Motion. As the water exits the faucet, it begins to fall directly down toward the sink. When the 'source' of the water is quickly moved, the water already expelled from the faucet continues its straight, downward path. Water leaving the moving faucet is released at different horizontal positions, giving the appearance of a sideways flow. The stream of water remains unbroken due to surface tension. This phenomenon cannot be fully appreciated with the naked eye, yet a still photograph shows it clearly.



Purify the Colors, Stephanie Fitzpatrick
Brebeuf Jesuit Preparatory School, Indianapolis, IN
Teacher: Aaron Ellis

For this contrived picture a candle was lit and its light was reflected off of a compact disc. The picture was taken in a dark room to eliminate effects of other light sources. The result was a rainbow-like spectrum. This stunning visual is due to diffraction of the candlelight by the circular lines on the CD.

Liquid Lens, Katie Marie Thompson
Barrington High School, Barrington, IL
Teacher: Chris Smith

For this photo, a drop of water was released above a shallow pan of water with a checkered backdrop behind it. This photo of the back-jet – a column of liquid that shoots upward at a high speed – was taken right after the released droplet impacted the surface of the still water. Due to surface tension, the water drop forms a spherical shape. When it becomes too large, the droplet becomes unstable and must detach itself, as it is about to do in this photograph. In the spherical drop the image of the checkered backdrop may be seen. This happens because the drop of water acts as a convex lens. Rays of light pass through the lens to create an inverted real image. The out-of-focus image of the backdrop seen on the surface of the water is due to reflection.

SPECIAL RECOGNITION

Defying Gravity, John Stefan Kusiv
Lake Brantley High School, Altamonte Springs, FL
Teacher: Stan Cutler

Defying gravity in physics—a force is that which can cause an object with mass to change its velocity. In this picture, the subject puts a downward force on the skimboard in order to make it pop out of the water and spin, seemingly defying gravity. To produce this image, I took an eight-photo sequence of my friend doing this trick and combined the images using Adobe® Photoshop® software. Gravitation is a natural phenomenon that gives weight to objects. He is defying gravity by making this board come out of the water and spin.

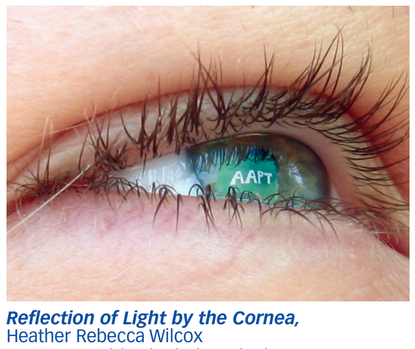
AAPT thanks Vernier Software & Technology, Inc. for their generous support of the photo contest.

Bands of Light, Cindy Cin Yee Law
Holy Trinity School, Richmond Hill, ON
Teacher: Nina Dolgovykh

This picture, taken in the hallway of a house, shows bands of light from a narrow opening between two doors. Sunlight streams in from a large bathroom window behind the double doors on the right. One door is slightly pushed back so that there is a 1-cm space between it and the other door. This opening acts as a vertical array of pinholes. Light from the window is imaged by the pinholes, each acting as a pinhole camera. The bright bands on the carpet and opposite bedroom doors are the superposition of all the images.

22-Degree Sun Halo, Ruijun Wang
West High School, Madison, WI
Teacher: Michael J. Lyman

A halo around the Sun may appear when the sunlight is refracted by hexagonal ice crystals in cirrus clouds. The picture shows a 22-degree halo. Light passing through the crystal is refracted so that it is deviated by 22 degrees from its original direction. A hand is blocking most of the direct rays from the Sun, allowing the halo to more easily be seen.



Reflection of Light by the Cornea,
Heather Rebecca Wilcox
West Geauga High School, Chesterland, OH
Teacher: Natalie Cooper

The cornea reflects about 3% of the light that falls on it. This is due to the considerable change in index of refraction traveling from air to cornea; it is a rather large percentage in comparison to the less than 0.3% of light reflected from other surfaces within the eye. The image formed when light reflects off of the cornea's curved, shiny convex surface is virtual, upright, and smaller than the actual object—letters written on a piece of paper. (Due to the "mirror image" aspect of the reflection, the letters had to be written in reverse.)

Squiggly Straight Stripes, Rachel Sarah Karten
Wildwood School, Los Angeles, CA
Teacher: Tengiz Bibilashvili

This photo is of two glasses, filled with water, acting like lenses. The glasses are exactly the same and are parallel to the background of diagonal stripes. The photo shows that the magnification depends on the distance between the lens and the background. It is evident that the stripes do not keep their linear shape because of optical distortion of the glass lens system.