ISPP REMINDER

April 2014

OUR NEXT MEETING…

…is at
Lake Forest College
Wednesday, April 9
6:30 – 9:00 pm

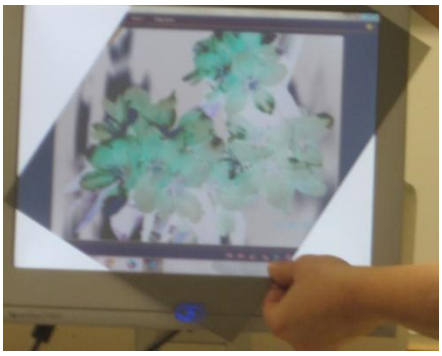
See below for a map and directions.

FUTURE MEETINGS…

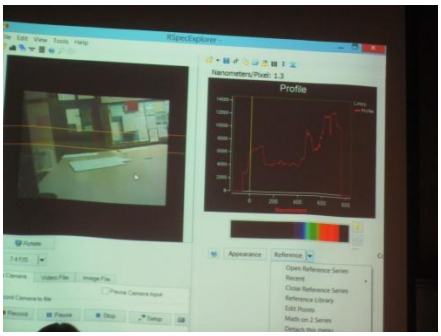
CSAAPT	Saturday April 26	Lake Forest College
ISPP	Monday May 5	Northwestern University

AT OUR LAST MEETING…

…we were greeted at **Lane Tech High School** by **Karlene Joseph** and **Katrin Machaj**. After some delicious refreshments, Karlene passed out 3-D glasses and showed us an image on a computer screen. We actually saw one of two images, depending on the orientation of a polarizer placed over the screen.



Julie Smallfield, also at Lane Tech, received a new teacher bag.

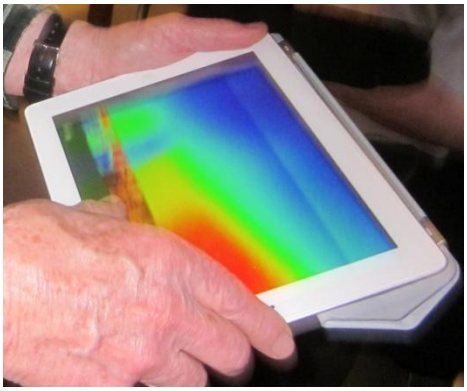


Katrin Machaj teaches physics and astronomy at Lane. She demonstrated two products they had recently acquired from Arbor Scientific, an LED Array that consists of 11 LEDs ranging in color from deep red to violet, plus a white LED, and an RSpec Explorer digital spectroscope that plugs into a computer USB port and displays a spectrum. ($79 http://www.arborsci.com/led-array), ($395 http://www.arborsci.com/rspec-explorer). Katrin said that students sometimes have trouble locating the spectral lines when using hand-held spectrum viewers, and that seeing the display on the computer screen is a help. Later in the meeting she set this up again and showed us "Colorflame Candles" that come in twelve colors and can be viewed with the spectroscope.

Debbie Lojkutz (Joliet West High School) mentioned the use of grating glasses to look at the straight filament of a showcase lamp. It is interesting to look at the filament when the lamp is connected to a dimmer.

Kevin McCarron (Oak Park & River Forest High School) brought an infra-red camera that he has used for multi wavelength astronomy. He hit two steel balls together with a piece of paper between them and we could both see the holes and burn marks they left in the paper and smell the burnt paper, illustrating the conversion of mechanical energy to thermal energy (and sound). We looked at the paper with the infra-red camera, and looked at other interactions: dropping a ball onto a board, dropping "happy and sad" balls. We could see the places where collisions had occurred.

Kevin put an opaque plastic bag over his hand and asked "How many fingers are up?" The camera did not show this, but we could see the thermal image of his fingers when he held them up inside a clear plastic bag. We could also see the thermal imprint on hands that had been rubbed or clapped together. **Bill Shanks** showed us an I-Pad app, photobooth, that gives an infrared image on the screen.



Pete Insley recalled the tantalus cup that was the giveaway at the De Paul meeting. He has constructed one using plastic tubing and drink cups. We were able to see how the tubing is connected to the inside and outside of one cup so that the cup starts to empty if the water level gets above the top of the tubing. A second cup then covers up the tubing.

John Milton told us his phenomenon was his eyes. He has had successful cataract surgery on both eyes and was able to put his bifocals aside. His distance vision is sharp without glasses, but he does need reading glasses for closer work ($11 from Walgreens!). The actual procedure took only 15 minutes. There are descriptions on You Tube. This one includes narration by the physician. https://www.youtube.com/watch?v=rUCoQzui704 Interesting optics.

Debbie Lojkutz brought a bag of hollow plastic Easter eggs. She pointed out that they are reduced in price after Easter. We were given a "Millikan Egg Lab". The student is a set of eggs and asked to find the number of 'chickens" in each egg without opening it. Deb puts items like marbles, gravel and tissues, in whole number quantities, inside the eggs. This is a nice model of Millikan's oil drop experiment.

Then Deb referred to a wave lab she had shown us that used a coiled phone cord instead of a slinky. She used a cord 25 ft long when fully stretched. Students vibrate one end until standing waves of one or more half-wavelength sections are formed. They should be able to produce up to six half wavelength sections. $v = f\lambda$ can be used to find the wave speed. Pete pointed out that they should be asked if the amplitude ("shaking harder") has any effect on the speed. Deb gave us student sheets for both labs.

Bill Shanks talked about books that interested him in science when he was in grades 5-7. They included *The Boy Electrician*, published in 1914, now available on the web. Also, *the Boy Chemist, The Boy Scientists,* and

The Dangerous Book for Boys. The "Boy" in the titles says something about expectations for girls in science not too many years ago. Also, these books did not contain many safety features.

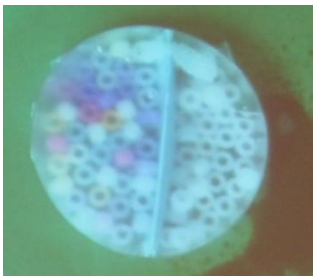
Bill liked to use physics toys when he taught at Joliet Central High School. One he picked up recently was a balloon helicopter, useful for teaching about Newton's 3rd Law. Air from the balloon is directed through funnels over the blades. The incorrect explanation sometimes given for helicopter or airplane flight is that the difference in air speed over the wing or blade top and bottom results in a pressure difference that provides lift (Bernoulli) – but this is insignificant. The air below the wing is pushed downward by the action of the airfoil, and the reaction force of the air against the wing surface provides lift. While the air was escaping from the inflated balloon the helicopter flew up and around the room.

Ruth Goehmann (Museum of Science and Industry) gave a push to a small can and it eventually stopped and rolled back towards Ruth. We saw what was inside the can, a nut tied to a twisted rubber band. As the can rolled, the rubber band wound up and then unwound, reversing the direction of the can. Ruth asks students to speculate about and draw the contents of the can before showing them what is inside.

Katrin Machaj gave us a set of instructions for an energy conversion lab. Students are given large and small "marbleized poppers" (Oriental Trading Company). They are inverted by compression and then "pop" into the air. For each popper students record maximum height reached and calculate gravitational potential energy, then use the kinematic equation to find the final velocity. From this they calculate final kinetic energy and compare it with gravitational potential energy. They also calculate the elastic constant for the popper and use conservation of elastic and gravitational potential energy to find the elastic constant. This is a nice application of energy conservation.

Sources:
http://www.orientaltrading.com/mini-marbleized-poppers-a2-39_1532.fltr?Ntt=popper

http://www.orientaltrading.com/large-marbleized-poppers-a2-16_454.fltr?Ntt=popper



Karlene brought out a dish of ultraviolet detecting beads (Educational Innovations http://www.teachersource.com/product/ultraviolet-detecting-beads/light-color). She asked the question: how well do sunscreen lotions block ultraviolet? The beads covered with plastic wrap were in a dish. One half was then covered with sunscreen. She illuminated the beads with a u-v flashlight in about 3 second intervals. When she used lotion with SPF 50, only the unprotected beads were colored. For SPF 5, both sets of beads became colored. The kit that accompanies the beads comes with transparent and opaque filters. Other materials tried were a brown jar for storing u-v sensitive medicines (this worked), a clear jar (beads changed color), u-v blocking contact lenses (slight color change), a dark tee shirt (worked pretty well).

Our giveaway was a bap of u-v detecting beads and some small poppers. Thanks to Karlene and her Lane tech colleagues, Katrin, Julie and Peter Smagacz for good company, good phood and good physics phun.

Reported by John Milton

Directions to Lake Forest College

From Chicago — Take I-94 (Edens Expressway) north toward Waukegan. When I-94 splits off toward Milwaukee, stay on the Edens, which becomes U.S. Route 41. Exit at Deerpath Road, turn right (east) onto Deerpath and continue through the town of Lake Forest and toward the College.

From points North — Take I-94 south from Milwaukee. Just south of the Wisconsin-Illinois line, stay left and follow U.S. Route 41. Exit at Deerpath Road, turn left (east) onto Deerpath, and continue through the town of Lake Forest and toward the College.

From points West & Southwest (including O'Hare Airport) — Take I-294 (Tri-State Tollway), which becomes I-94, north to Illinois 60 (Town Line Road). Exit and turn right (east) on Route 60. Continue east to Route 43 (Waukegan Road), turn left (north) for 1/2 mile to Deerpath Road. Turn right (east) onto Deerpath and continue through the town of Lake Forest and toward the College.