Winter, 2022

Issue 49

Long Island Physics Teachers Association Newsletter

Important Dates	
Physics Olympics	Fri Mar 18
Spring Conference	Sat Apr 9
AP Physics C Exam	Tues May 10
AP Physics 1 Exam	Thurs May 12
AP Physics 2 Exam	Fri May 13
AP Test Analysis	Wed May 25
Regents Physics Exam	Thurs Jun 23
End of year BBQ	Tues Jun 28

Check the LIPTA website ***www.lipta.org*** for any updated information.

President's Message

What's your favorite topic in physics? I've heard that question before, usually from a student. I suspect that my students just want to get me to talk off-topic for a while. And sometimes I do - who can resist rambling on about physics? But really, what is your favorite topic in physics?

Is your favorite topic what many of us cover at the very beginning of introductory physics courses: kinematics? Kinematics is so easy to grasp because we've all thrown, rolled, and bounced balls, and we know what a speed limit means, even if we don't initially know the difference between speed and velocity. Even if the algebra can get sticky for some students, many can find an aha moment when they finally understand acceleration; or when they can say whether the heavy blue ball will fall off the roof sooner than the lighter red ball; or when they know the meaning of, and value in, determining the slope of a best-fit line. It's great, too, when math classes reinforce what we've been saying in physics class.

In kinematics, there are so many accessible kinesthetic activities that reinforce the concepts. One of my favorites is an early one: determining whether a bowling ball, rolling along a horizontal hallway floor, will speed up, slow down, or remain at constant speed. My students have to graph the data (and then look at it with an open mind) to be convinced that the bowling ball continues at constant velocity. Another favorite activity is the competitive "hit the cup" horizontal projectile lab of rolling a ball off a table and predicting where to put the cup so that the ball will land in it. Many groups can determine, from measuring the table height and the ball's velocity at the end of the table, where the ball will land. Seeing a slo-mo replay of the ball hitting the center of the cup is very satisfying.

If you like the hands-on aspects of physics, maybe you like electrostatics and circuits, where there seems to be endless activities and labs. I always look forward to those topics. I try to time teaching the electrostatics unit so it will fall in the driest, usually dreariest, part of February. Just having a balloon hanging from the ceiling where the students pass as they come in to class can be endlessly amusing, and can lead to great discussions about why another balloon sticks to the (electrically neutral) wall.

Maybe your favorite part is digging into a challenging problem. Whether you're new to physics and learning the ins and outs of Regents Physics questions, trying to reach students in a Conceptual Physics class, or whether you're new to one of the AP courses or to IB, there's always

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something to think about. Or maybe there's another way to think about the same question. Some students do best with the help of a diagram (oh, how I wish I'd taken an art class somewhere along the way!). Some understand concepts using graphs and charts, some do best crunching equations and numbers. Everybody benefits from learning to explain the problems using words.

Or maybe your favorite part of physics is being able to explain how things work with real things, in the real world -- lucky for you if you are teaching a Conceptual Physics course! Isn't it wonderful how a tiny part of the universe follows the rules so well? Of course, sometimes that means that we need to make the right assumptions, which inevitably leads to a joke about spherical cows. I like the jokes, even if my students need to explain the punch lines to each other.

But I think my favorite topic is conservation laws, especially one not covered in Regents Physics: conservation of angular momentum. I love the beauty and simplicity of the law. If you know the angular momentum at one time, you know it for all times (if there is no external torque). How else can you explain figure skating at the Winter Olympics, where a skater can start a spin slowly, and then spin faster and faster, and then slower and slower, without any outside intervention causing the change in rotational speed? Or how else can you explain how the high divers in the Summer Olympics can summersault through the air and then seemingly hit the surface of the water perfectly vertically (with a hardly perceptible rotation)? Or how else can you explain the question of why, when going fast enough, a bicyclist or motorcyclist won't fall down even when their bike is tilted sideways? There is such beauty in the simplicity of the explanation. I won't pretend that I have ever "proven" that the conservation of angular momentum is real, but I've seen enough examples that are explained using the concept, so I do believe!

So I ask you, what's your favorite topic in physics?

LIPTA FALL CONFERENCE

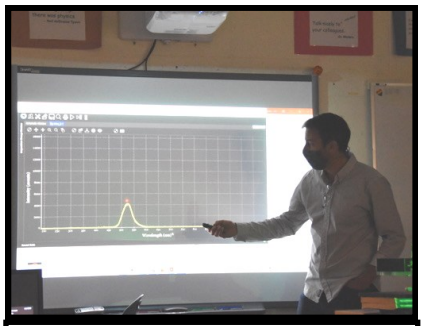
by Joanne Schwager

LIPTA was able to have its first in-person conference on Saturday, November 13, 2021 at Smithtown HS East. The day began with everyone having a chance to meet and greet while enjoying Tania's wonderful gourmet food. After that, Rich Gearns led a group discussion about teaching through the Pandemic. That was followed by a special guest speaker, Susan Pepper from BNL and then a lecture entitled *Light , Color and Vision* by Stony Brook professor, Thomas Weinacht. The day ended with a Make and Take by Justin King.

Rich Gearns created a discussion about what we encountered teaching during Covid. Some teachers had hybrid physics classes on A days and B days along with an online academy with students from home. Some of the tools that teachers used were *Near Pod* and *Edpuzzle*. The teacher that used *Near Pod* had both teacher-led and student-led independent assignments. *Go guardian* was also mentioned by a few teachers to keep students on task.

Susan Pepper discussing BNL programs.

Susan Pepper, from BNL, talked about a $1000 scholarship along with an internship program to encourage African American physics' graduates to stay on Long Island. Brookhaven is building a new electron ion collider and also has many opportunities for students including virtual field trip exploration labs for grades 5 to 12. You can find out about other programs in the article Susan wrote which can be found on the next page.



Prof. Thomas Weinacht discussing how light and color relates to human vision.

Thomas Weinacht, a professor at SUNY Stony Brook, spoke about the class he teaches for non-physics majors that focuses on light, color, and vision using many demonstrations including a spectrometer. At home during the pandemic, students were able to do many things with their cell phone, a lens and a ruler. This class is for students to engage in discussions as they learn about how our brain "sees": perceiving color, real and virtual images, and depth perception. For example, how we see yellow is a combination of red and green light. Shining two LEDs, red and green, on a white board creates yellow light. Placing the red and green light combined yellow light through the spectrometer reads red and green. On the electromagnetic spectrum, yellow wavelength is in between red and green values. In our eyes, we have three cones that recognize red, green, and blue. Our brain creates the yellow color. This is so interesting for the health profession to get excited about how our brain works in conjunction with physics.

An interesting demo Thom showed was with a "magic" box. Thom stood in a box on top of the lab table and it looked like he was levitating in the box and gravity was turned off as his legs disappeared from touching the table top. The empty box used a large mirror that was placed across the diagonal of the box and Thom's one leg was actually behind the mirror supporting him while his front leg and its mirror image were off the ground giving the illusion of floating.

Justin King had participants do two Make and Takes. One involved the classic projectile motion demonstration that shows that a horizontally launched projectile and a dropped projectile will land at the same time when released simultaneously from the same height. Justin used

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Justin King showing the projectile motion Make and Take.

chopsticks, a playing card, and two coins to demonstrate the principle. It's an easy thing for any and all students to make on their own. The second Make and Take demonstrated the conservation of energy. It consisted of a tube, simply made with rubber bands and a weight inside, that returns after being rolled away. It was amazing to see the tube come back to the sender.

In conclusion, all of the speakers were riveting and one cannot wait until the next LIPTA meeting. Special thanks to LIPTA President Gillian Winters who hosted the event. Interestingly, Gillian mentioned that she first met Thom Weinacht at a highway traffic rest area. They ended up seated at the same table since there were no free tables for her to sit at. They quickly found out that they both have PhDs in physics, both were traveling to Long Island and Thom was to start teaching at Stony Brook. Ahh, the way fate works!

Opportunities in Physics at Brookhaven National Laboratory

by Susan Pepper

I want to take this opportunity to increase awareness of educational and career opportunities at Brookhaven National Laboratory (BNL) and promote our African American Advancement Group's (AAAG) scholarships for black high school students entering STEM disciplines in college next year.

Students may be familiar with Einstein's theory of relativity, but do they know that Brookhaven scientists recently created particles of matter and antimatter from light, an illustration of this famous $E=mc^2$ equation? Or that mRNA COVID-19 vaccines use genetic elements discovered by Brookhaven Biologists more than 40 years ago? With extensive core research capabilities and rich history of scientific breakthroughs, BNL advances the mission of the U.S Department of Energy's Office of Science through the study of nuclear and particle physics to gain a deeper understanding of matter, energy, space, and time. BNL employs more than 2,700 people including about 1,500 scientists and engineers who operate experimental facilities and perform research. They are joined by thousands more, scientists from around the world who use the Lab's unique facilities. BNL provides good paying, high tech jobs and is motivated to build a pipeline of African American physicists who train at BNL and eventually join the workforce.

Brookhaven's Office of Educational Programs (OEP) inspires the next generation of STEM professionals and recently was recognized for creating opportunities for underrepresented groups in STEM. OEP offers something for students at all stages of their education, K-12 teachers, and university professors. Examples include:

Exploration Labs: BOCES-aidable field trip programs for grades 5-12 with physics topics that include Accelerator Science, Spectroscopy, and Waves and Resonance

Contests: Bridge Building (April), Science Bowl (January)

Research Programs:

High School Research Program - a highly competitive six-week educational program for students interested in pursuing STEM studies

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Student Partnerships for Advanced Research and Knowledge - SPARK - provides an opportunity for all high school students and their science educators to become visiting researchers at Brookhaven National Laboratory's scientific facilities

STEM Prep Summer Institute – a four-week program to introduce high school students from traditionally underrepresented and underserved communities to the STEM fields

Summer Science Explorations: a variety of weeklong programs with several physics-themed options

Internships – 10-week internships (typically in the summer) where college students are paired with BNL mentors and contribute to ongoing research or develop their own project and present a summary of their work (managed through the DOE Office of Workforce Development for Teachers and Scientists - https://science.osti.gov/wdts/suli)

Information about these programs can be found at https://www.bnl.gov/education/.

Diversity is a core principle at BNL. Our AAAG is an employee resource group that provides a forum where employees and guests can promote awareness of the Black, African, African-American and Caribbean cultures, share professional insights, acquire information, and provide leadership on their careers and work environment within BNL. AAAG aspires to increase the presence and leadership ability of our community by building strong strategic alliances and facilitating the hiring, retention, education, mentorship, and career advancement of African-American talent at all levels, thereby assisting the Lab to achieve its diversity goals.

The AAAG offers multiple $1000 scholarships to black high school seniors who plan to study a STEM field in college. Information about the AAAG and its scholarship can be found at https://www.bnl.gov/aaag/ (to be updated in March with information about the 2022 scholarship). In addition to the cash award, since 2020 the AAAG has teamed with lab partners to offer internships and mentoring for each of the scholarship winners following their freshman year. We strongly encourage all STEM-interested students to apply for this scholarship, and because of BNL's physics mission, we are working to increase the number of physics majors who apply. Also, the AAAG can provide scholarships for the weeklong Summer Science Explorations and other BNL activities where a participation fee is required.

BNL's OEP, together with the AAAG scholarship, would like to make physics education and enrichment more accessible, starting with a conversation with your school's teachers, administrators, and students so that they can become more involved in our important work. Please contact Susan Pepper, Chair of the Nonproliferation & National Security Department, at pepper@bnl.gov.

Do you have any comments, information, or tips to share for future newsletters? Send it via email to: *keogh@lipta.org*

Brookhaven National Laboratory is hosting a virtual educator workshop, **Computational Sciences at Brookhaven Lab**, on February 23rd, 2022, from 1:00 to 4 pm. This workshop will introduce students and teachers to the Brookhaven Lab Computational Science Initiative's (CSI) high-performance computing, machine learning, quantum computing and applied math capabilities. Participants will also learn how they can collaborate in the CSI's diverse research projects.

High school science, computer science, math and research teachers are invited to apply. To register please visit: https://www.bnl.gov/oepteachertraining/. There is no cost to participate. The deadline to apply is February 15th, 2022.

For additional information please contact Aleida Perez at pereza@bnl.gov.

Computational Sciences at Brookhaven Lab

February 23, 2022

Brookhaven National Laboratory

(preliminary agenda: subject to change)

Wednesday February 23, 2022		
Time		
1:00 pm		***Welcome and goals***
1:15 pm	Discussion	***Around the room: informal introduction by all participants***
1:30 pm	*Lecture*	***Introduction to Brookhaven Lab; the Computational Science Initiative, computational science as interdisciplinary field***
2:00 pm	*Lecture*	***How can teachers and students collaborate with CSI? Various projects/topics presentations***
3:00 pm	*Break*	
3:10 pm		***SPARK Program: a multiyear approach to build computational science skills***
3:40 pm		***Next Steps***
4:00 pm		***Adjourn***

Do You Need Professional-hour credits?

⇒Attend the Fall and Spring Conferences (3 credit hours available for each conference)
⇒Attend the AP Physics Exam Analysis (2 credit hours available)

Professional Hour Certificates are available.
So become an active member of LIPTA and watch those professional hours pile up!

The Olympics are Back!

The Winter Olympics may be going on across the world, but the Physics Olympics is also returning after a two-year hiatus due to Covid-19.

Information packets were sent out with the event rules and registration information.

Go to www.lipta.org to register or for more information.

Contact Justin King at king@lipta.org if you have any questions concerning the events.

LIPTA Spring Conference
Syosset High School
Saturday, April 9, 2022

Details and registration information will be coming next month.

Physics Levity Brevity

I really hate the energy section of my physics class because it's nothing but work.

What do you call a rapper that raps about physics? mc^2