

Duke University SPIE Student Chapter Annual Report, 2014–2015

Officers 2014–2015

Role	Name	Email	SPIE ID No.
President	Theo DuBose	tbd8@duke.edu	3389609
Vice President	Will Eldridge	william.eldridge@duke.edu	3558253
Treasurer	Han Sang Park	hp36@duke.edu	
Secretary	Sanghoon Kim	sk72@duke.edu	3486986
Outreach Coordinator	Ruobing Qian	ruobing.qian@duke.edu	3650663

Current Members

- Shwetadwip Chowdhury
- Theodore DuBose
- Will Eldridge
- Sanghoon Kim
- Francesco LaRocca
- You Li
- Yang Liu
- Derek Nankivil
- Han Sang Park
- James Polans
- Ruobing Qian
- Matthew Rinehart
- Jainil Shah
- Liangbo Shen
- Justin Solomon
- Claire Vannelli
- Christian Viehland
- Michael Zarella
- Chris Lam
- Oscar Carrasco-Zevallos
- Ryan McNabb
- Andres Aragoneses Aguado
- Meg McNall
- Janna Register
- Lindsay McTague
- Bridget Crawford

Events During 2014–2015

Event Name	Date	Expenditure	Attendees
Election and General Meeting	2 September 2014	\$123.95	12
FIP Symposium Open House (Outreach)	1 March 2015	\$0	500
Recruitment Meeting	5 March 2015	\$198.75	15
Outreach at NCSSM*	12 March 2015	\$0	20
Outreach at Durham Academy	20 March 2015	\$0	30
Outreach at New Hope Elementary Science Night	17 April 2015	\$0	60

* North Carolina School of Science and Math

Currently, we are presenting up to six demos at a time; all demos are run in parallel by different students. Our current slate of demos is:

- Cellphone microscope: Using \$9 of hardware store parts and a laser pointer collimator lens, up to 175x magnification (20x objective equivalent) can be obtained when used in conjunction with a modern smartphone. People responded quite well to this demo; we gave out printed instructions on how people could build their own. For imaging, we have a slide set we bought, and we also frequently use plant clippings from outside of wherever the demos are occurring.
- Light pipe: This demo consists of an extremely bright halogen bulb with three large fiber optic ports. We have one light pipe that is just an acrylic tube, one that is a loose fiber bundle, and one that is a braided fiber bundle. We contextualize the light pipe by talking about fiber optic communications (if the audience is high school age or older) and generally talk about the principle of total internal reflection. This is fun as the light is quite eye-catching and the audience can easily handle the parts of the demo themselves.
- Reflection and Refraction: Using some parts from the OSA LightBLOX kits, we use a mirror, a biconvex cylindrical lens, a biconcave cylindrical, and a prism to demonstrate the basic ways light can be bent. The LED-based illumination provided in the kits is very nice and allows the demo to be hands-on.
- Diffraction: Using a diffraction grating in the LightBLOX kits as well as a pair of custom holographic glasses that generate the Duke University logo, the demonstrator talks about wave optics, the relationship of color and wavelength, and spectroscopy. If working with younger audiences, we tend to fold this into reflection and refraction as it requires more abstract thinking to understand the fundamental concepts.
- Solar car: We have a solar car kit that uses a solar panel to electrolyze water into hydrogen and oxygen, then uses a fuel cell to power a small electric motor. This resembles a toy, and can be fun. We contextualize the car with a discussion of solar energy and how photovoltaic materials will be an important part of the future.
- Webcam pulse monitor: using open source software running on a webcam-equipped laptop, it is possible to detect someone's pulse rate by looking at the frequencies of variation in red-green contrast of a patch of the person's forehead. Audiences are usually very enthusiastic, as it gives them a chance to participate. We often ask them to measure their heart rate once, then run back and forth a bit, and then remeasure to see if a difference can be detected.

Upcoming Events

- Summer 2015: Two rising seniors from NCSSM were accepted to come and work for six weeks in Duke University Optics labs. One student will be working to construct and validate a laser beam profiler (continuing the work done by an NCSSM student last summer), and the other will be designing phantoms that mimic the optical properties of cancerous and non-cancerous tissue. These activities will occur in the labs of Dr. Joseph Izatt and Dr. Adam Wax, respectively.
- Summer 2015: Although we are pleased with our current slate of demos, we would like to have a few more. First is demonstrating total internal reflection using a transparent container of water. By introducing some turbulence or scattering, we will be able to visualize the entire path of the light, which will hopefully make the light pipe demo more clear. Secondly, we are exploring the possibility of building a portable Schlieren photography setup, as it produces very striking images and could be fun and interactive for audiences.

Financial Details

- Initial Balance: \$875.73
- Cost of food at Annual Election: -\$123.95
- Cost of food at recruitment meeting: -\$198.75
- Final balance: \$553.03

No funding was received from SPIE. \$1550 awarded from OSA, but checks have not arrived as of writing.