

HUNTSVILLE ELECTRO-OPTICAL SOCIETY

[An Alabama Nonprofit Corporation - Code Section 501(c)(3)]

Our aim and purpose is to stimulate and to facilitate the knowledge and innovation of optics and photonics; to promote the mutual needs of its members; and to encourage free discussions of science and engineering among its members and the public. Any individual or entity active or interested in various categories of optics and photonics or related sciences, engineering arts, or technical areas shall be eligible for membership.

Leadership

Val Korman, Ph.D. - President (K Sciences)	Tommy Cantey, Ph.D. - CEO (Optical Sciences Corp)
Mike Zari - Vice President (A2Z Innovations)	Paul McManamon, Ph.D. - Director (Exciting Technology)
Kira Patty, Ph.D. - Secretary/Treasurer	Joel Burcham, Ph.D. - Director (Archarithms, Inc.)
Vacate - Program Chair	

CORPORATE MEMBERS



2015 ACHIEVEMENTS AND HIGHLIGHTS

- Submission of 2nd National Science Foundation (NSF) grant proposal
- Participant in Huntsville/Madison County College & Career Fair
- NASA Mirror Technology Days Conference (Annapolis, MD)
- Guest Speaker Series
- Regional and State Science Fair awards (\$2,225 awarded)
- Apprenticeship / Intern program
- Educational Outreach for Optics and Photonics
- Built large Camera Obscura

Submission of 2nd National Science Foundation (NSF) grant proposal



On November 13, 2015 HEOS submitted its second significant proposal to the NSF. The Huntsville Electro-Optical Society (HEOS) and strategic team partners propose an ITEST Strategies project developing a K-8 progression of fun, flexible, and highly engaging project and inquiry-based learning activities in the critical field of optics and photonics. The optics and photonics modules will be designed to integrate with the science already being taught while helping students enhance their science and engineering practices, experiences, and cognate development for the broader impact on education and workforce awareness. Specifically, the proposed effort will tailor and build optics and photonics educational activities and modules explicitly tied to Next Generation Science Standards (NGSS) while partnering with industry to provide the relevant context and framework for the abstract science, technology, engineering, and

mathematics (STEM) concepts. Implementation of teacher professional development and material resource distribution will be through established the state-funded Alabama Math, Science, and Technology Initiative (AMSTI) and regional public school systems that have established and effective research-based operations. All educational content and review material will be made available through the Alabama Learning Exchange (ALEX) designed to help educators build or refresh their skills and confidence in teaching the hands-on STEM educational activities. The completion of the project will result in evaluated, research-based, and career relevant optics and photonics education materials spanning the K-8 NGSS and a successful implementation model using an online community platform for teacher professional development, training, and relevant industry connections. This project will be implemented in 12 counties in north Alabama, across 93 schools, and using approximately 2000 teachers affecting more than 65,000 K-8 students. With the successful completion of the project, a plan for state-wide implementation in Alabama of the K-8 progression of optics and photonics activities and online resources will be developed. National dissemination of all online content and materials will be made available through SPIE - the International Society of Optics and Photonics. An external advisory board for project oversight will assure project objectives and implementation are effectively executed.

The prototyping and production of the educational modules will utilize a private fabrication lab and team partner, MindGear Labs. Other industry partners have signed onto the project (see below), SPIE “Women in Optics” working group, and industrial supporters of the National Photonics Initiative (NPI) [4] to provide a relevant contextual framework that links the learning experience to real world and industry activities and problems. The industry connection provides relevant context for the scientific and engineering technologies and possible career pathways that can shape students and teachers perceptions of STEM and cognate careers. The “Women in Optics” working group will provide that critical role model to further change perceptions and demonstrate possible career paths for women in science and engineering. In addition, the developed online resources will be integrated into an online community platform hosted by SPIE (the international society of optics and photonics) which will provide a nationally available educational resource for optics and photonics. Team partner Camisary, Inc. will provide research-based, professional video production for the interactive online teacher training and industry connections. Specific videos about relevant “Women in Optics” will be part of the industry connections and teacher training.

Industry Partners: Optical Sciences Corporation, K Sciences, Dynetics, Teledyne Brown Engineering, Jenoptik Optical Systems, GeneCapture, Inc.

For more information on how to get involved contact Tommy Cantey cantey@HEOS.org (256) 824-0067.

NASA Mirror Technology Days Conference 2015

HEOS helped to finance the Mirror Technology Days 2015 held November 9 to 13, 2015 in Annapolis, MD with local hosts the National Capital Section of the Optical Society of America. The workshop annually summarizes the U.S. Government's investment strategies and activities in developing technology for any application (such as telescopes, imaging systems, seeker/trackers, high-energy laser systems, solar energy, etc.) which requires optical components. Technology Days covers technology investment efforts in: optical materials; substrate design & manufacture; optical fabrication and metrology technology; optical coatings; wavefront sensing and control via adaptive optics; nano-technology imaging technologies; etc.

The purpose of Tech Days is to:

- Review the technical accomplishments of last year and plans for the future of mirror technology development being funded via the Government (e.g., SBIRs, DII, NASA ROSES, direct contracts, etc.)
- Celebrate success stories of funded mirror technology development efforts which have either been integrated into a Government program or reached the commercial marketplace.
- Offer Prime Contractors and/or Systems Integrators the opportunity to identify specific technologies which they would like to see developed.

OPEN sessions are intended for presentations of basic mirror technology development research. Presentations in the OPEN session contain no Export Controlled information. CLOSED sessions are intended for presentations which are Export or ITAR Controlled. Attendance for CLOSED sessions is restricted to U.S. citizens and Green Card Holders. Presentations will be distributed via DVD/CD.

This event helps to raise money for many of the educational outreach activities HEOS conducts throughout the year. Please consider other ways HEOS might expand its positive impact in our community.

Guest Speaker Series

Our Guest Speaker Series has continued normally on the third Thursday of each month. We have had several very good speakers this year and hope to have plenty more in 2015. Each speaker event is preceded by a light lunch and social gathering.

Regional and State Science Fair Awards

HEOS was able to award over **\$1000** in scholarships at the 61th North Alabama Regional Science and Engineering Fair (NARSEF) for Special Awards in optics and photonics related projects. The award funding was generously provided by SPIE, NASA, and HEOS. HEOS would like to thank all the volunteer judges for taking the time out of their schedules to participate in this event.

In addition, HEOS was able to award over **\$1200** in scholarships at the 2015 Alabama Science and Engineering Fair (ASEF) for Special Awards in optics and photonics related projects. The award funding was generously provided by SPIE, NASA, and HEOS. HEOS would like to thank all the volunteer judges for taking the time out of their schedules to participate in this event. The volunteer judges for this year were:

Phil Stahl - NASA MSFC

Tommy Cantey - Optical Sciences Corporation

These judges were responsible for evaluating the merit and application of optics in the science fair entries. All winners received SPIE or HEOS certificates and award scholarships. HEOS is greatly

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appreciative of the opportunity to help inspire the nation's future scientists and engineers. HEOS is about community and our optics community only works with continued dedication and participation of our membership. See our science fair reports for more information.



Figure 1: Volunteer Tommy Cantey with NARSEF elementary winners



Figure 2: Volunteer Phil Stahl with ASEF winners

Apprenticeship / Intern Program

HEOS has had the opportunity to sponsor two students over the summer to participate in an 8-9 week apprenticeship program in science and engineering. The purpose of this scholarship program was to invigorate and accelerate young students in pursuit and development of a career in science or engineering through an apprenticeship program concentrating in optics and photonics related fields. The two students were challenged to come up with their own research project that they could passionately pursue during the summer. After some serious brainstorming, they came up with several interesting topics but finally identified a single research project for household mold detection and identification. They researched many approaches to achieve detection and identification of mold spores and settled on diffractive technique which they tested in a prototype experimental set up. They learned a lot about conducting a research project as a team. Also consider getting involved next year in the Optics Apprenticeship Program as a mentor or sponsor of a student.

NAOAP Goals:

1. Provide opportunities for talented students to work in a real-world laboratory environment.
2. Develop professional experience and laboratory practices and methods.
3. Introduce optical science and engineering as a possible career path.
4. Establish early employment opportunities for inspiring young students.

2015 Summer Intern Students:

Joseph Lee - Olin College

Mentor - Dr. Tommy Cantey - Optical Sciences Corporation

Matthew Robertson - Sparkman High School

Mentor - Dr. Val Korman - K Sciences



Figure 3: Mentor Val Korman, Matthew Robertson, Joseph Lee, Mentor Tommy Cantey (L-R)

Educational Outreach Activities

HEOS participated in the awesome STE(A)M Fest 2015 Saturday April 18 at Lowe Mill. The event was free to all-ages celebrating the STEM education curriculum (science, technology, engineering, mathematics) with an emphasis on how those subjects are used in visual, creative, and performing arts. HEOS constructed a large 10' x 10' camera obscura to demonstrate how live scenes can be imaged onto a real surface like a real-time movie using only optics and a mirror. There was a refraction table demonstrating the wonder of lasers and the interaction with glass blocks, positive and negative lenses, acrylic rods, and fiber optics. On loan from NASA and UAH, large Fresnel lenses and parabolic mirrors were used to ignite wood, popped corn, and even melt holes in Coke cans. Visitors even got to explore for themselves the power of the Sun to burn wooden sticks and leaves. We also used UV beads to show portions of the electromagnetic spectrum that is beyond what our eyes can see.



Figure 4: The power of the Sun demonstrated by Hemang using a large Fresnel lens

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Figure 5: Camera obscura with some participants observing a real live image



Figure 6: Space optics from NASA



Figure 7: Inverted image of visitor

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Sponsored by the Huntsville City Schools, School Foundation, and the Chamber of Commerce over 7,000 high school students from Madison county had the opportunity to learn about a opportunities and a career in Optics and Photonics at the 2015 College and Career Fair. What a great bunch of young people we met. Thank you volunteers!

HEOS

