



OPEN Optics and Photonics Education News

Newsletter of the Optics and Photonics College Network

March 2019

All-at-Once, Volumetric 3-D Printing



www.osa-opn.org/home/newsroom/2019/february/all-at-once_volumetric_3-d_printing/

From the Executive Director



The lead graphic in this issue of Optics and Photonics Education Newsletter, shown above, displays a new, very rapid optical technique for 3D printing. The system works by spraying patterned light from a projector onto a rotating drum, which is filled with clear photosensitive resin designed to solidify when exposed to illumination above a threshold intensity-yielding a solid object after one revolution of the drum.

The following article, Emerging Application of Photonics, describes revolutionary wearable sensors that use infrared radiation enhancements for enabling clothing fabrics to heat and cool, in response to environmental changes. Applications of optics and photonics are expanding at an amazing rate!

Colleges teaching photonics technicians are now hosting employers who are interested in hiring their graduates. The article by Indian Hills CC, describes one important role that their faculty play to assist these deserving program completers in searching for a desired career opportunity. Effective strategies that faculty use to facilitate and enable student placement are completely described in the OP-TEC monograph, Successful Job Placement for Technician Students, which can be found in OP-TEC's online store at www.optecstore.org/products/successful-job-placement-for-technician-students/.

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Upcoming Events

03/13/19 - 3/15/19

OPCN Meeting
CREOL Industrial Affiliates Symposium
Orlando, FL

06/10/19 - 6/13/19

Laser Material Processing Workshop at Indian Hills
Ottumwa, IA

06/24/19 - 6/28/19

OP-TEC Online Course
Hands-on Capstone Labs
Indian Hills, Ottumwa, IA

07/22/19 - 07/25/19

High Impact Technology Exchange Conference
St. Louis, MO

08/5/19 - 08/6/19

Fundamentals of Photonics Workshop at Indian Hills
Ottumwa, IA

SAVE-THE-DATE

OPCN Meetings and Industry Site Visits
HI-TEC Conference

July 22-25, 2019
Hyatt Regency
at the Arch, St. Louis

New student recruitment continues to be an important goal for all photonics technician programs. Recruitment of high school students is enhanced when these students have experienced the phenomena associated with optics and lasers. The Light and Optics Experiment Book, created by LASER-TEC, includes 23 experiments for a "hands-on" course. LASER-TEC also provides guidelines, curricula and inexpensive equipment kits that high schools can obtain for these activities.

Dan Hull

Emerging Applications of Photonics

IR radiation accounts for about 40 percent of the body's heat loss and gain. Fabrics already exist that can warm the wearer by trapping IR radiation or cool by reflecting sunlight. However, a recently created *metatextile* is the first fabric that can either warm or cool the wearer in response to environmental changes.



Researchers from the University of Maryland have designed a fabric that uses infrared (IR)-radiation gating to bidirectionally regulate the wearer's body temperature, it can cool or warm, depending on the environment. The *metatextile*'s thermoregulation abilities come from a conductive carbon-nanotube coating that shifts the fabric's emissivity to IR radiation, and polymer fibers that shrink or expand the weave of the fabric in response to temperature or humidity. When the fabric becomes hot or damp, the fibers collapse, opening the weave of the fabric. This creates bigger pores that allow heat radiating from the body to escape. At the same time, the fiber collapse brings neighboring carbon microtubules closer together. Shortening the distance between the nanotubes creates resonant electromagnetic coupling, matching the IR emissivity of the wearer's skin. This "opening" of the IR-radiation gate results in *radiative cooling*.

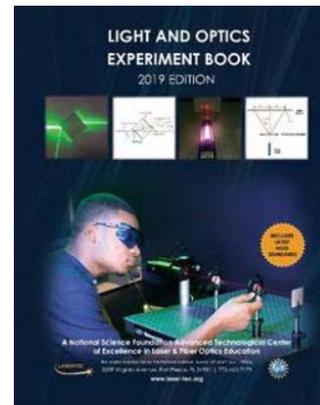
Conversely, when the fabric cools and dries, the fibers expand, closing the weave to trap heat. This increases the distance between the nanotubes, "closing" the IR-radiation gate and reducing IR heat exchange through the fabric.

www.osa-opn.org/home/newsroom/2019/february/fabric_heats_and_cools_using_ir-radiation_gating/

Indian Hills Employer Job Placement: Presentation and Interview (P&I) Week



Light & Optics Experiment Book - 2019 Edition



The Light and Optics Experiment Book, created by LASER-TEC, includes 23 experiments that guide students in the exploration of the fundamentals of geometrical and wave optics, lasers, laser safety, optical alignment, and experimental data analysis.

It is designed to be used by:

- High School Physics, AP, or Honor Physics courses
- CTE STEM Academies
- Colleges and Vocational Schools with introductory Photonics/Lasers courses
- Colleges or Universities teaching Physics to non-physics majors

Copies can be obtained from the LASER-TEC website www.laser-tec.org/experiment-book.html.

PACT Alumni Spotlight

Indian Hills CC recently hosted its annual P&I week. For six days, representatives from 14 employers gave company presentations and conducted interviews for the twenty-two graduating Laser & Optics Technology students at IHCC.

Graduates typically receive 4-6 job opportunities per person. Several students expect job offers in the near future. The average starting salary for IHCC completers in 2018 was \$57,500.



The companies that participated in P&I week include LSP Technologies, Spectralytics, Lumenis, Sightpath Medical, Mazak, MC Machinery, BAE Systems, Lawrence Livermore National Laboratory, Rudolph Technologies, Medtronic, Nuburu, TRUMPF, Laser Welding Solutions, and Adept Laser. They are based throughout the United States, in California, Colorado, Minnesota, Iowa, Illinois, Ohio, Texas, and New Hampshire. Some of the companies indicated that they had multiple job openings with a variety of technician opportunities. MPEC staff met also with these companies to learn more about their long and short-term projected demand, and where they anticipate future growth and opportunities.

MPEC Events: MPEC is currently taking registrations for the following events: Fundamentals of Photonics Workshop held on August 5-6, 2019, Laser Material Processing Workshop held on June 10-14, 2019, and a Hybrid Online Laser Material Processing course with lab activities on July 8-12, 2019. Registration for these events is now open and all activities are free to participants, with travel funding available. Register at www.midwestphotonics.org.



LASER-TEC Participates in Power America Annual Conference

On February 12 -14 Chrys Panayiotou and Gary Beasley attended the 2019 Power America annual conference held at North Carolina State University (NCSU) in Raleigh, NC. They participated in presentations and workshops on wide band-gap (WBG) semiconductor devices that are being developed for power electronics and especially, high-power inverters for solar and wind power conversion. The two major technologies are Silicon Carbide (SiC) and Gallium Nitride (GaN). Efficiencies of these new devices are 98% and can operate in MHz compared to today's Silicon MOSFET devices operating in KHz.

The Laser/Photonics program of Central Carolina Community College, under the direction of Gary Beasley, has been collaborating with Power America for years now, with summer programs at their semiconductor fabrication facility at NCSU. Power America and LASER-TEC collaborate on workforce development.

Power America is a member of Manufacturing USA, which brings



While in high school, **Carlos Salas** attended a presentation given by Gary Beasley, a professor in the Laser and Photonics Technology program at Central Carolina Community College (CCCC). His detailed explanations and compelling examples of photonics applications piqued Carlos's interest. By the end of the presentation, Carlos had decided to enroll at CCCC.

The most challenging part of his tenure at CCCC was working two jobs while going to school. One of those jobs was an internship at Wasatch Photonics, where Carlos applied the skills he was learning in school through hands-on exposure to spectroscopy. Carlos didn't let anything deter him, and by May 2015 he had earned his degree.

Carlos is now working as a Process Technician at Phononic, a start-up thermoelectric company. Working for a startup company means that he wears many different hats. He works in the production area assembling heat pumps for refrigerators and computer cooling devices, and he also supports the development team.

Carlos encourages interested students to research the different areas of photonics. "It's not just light," he points out. "You can go into electronics, go into thermoelectrics, or go into spectroscopy." He thinks that hands-on learners should "definitely consider" a degree in photonics. Through the Laser and Photonics Technology program at Central Carolina Community College, Carlos



99.1% Efficient SiC Solar Inverter made by PCIM

together the brightest minds in the wide bandgap (WBG) semiconductor world. Semiconductor manufacturers and the companies that use power semiconductors in their products are working together to accelerate the adoption of next generation silicon carbide (SiC) and gallium nitride (GaN) power electronics.

Power America's objective is to reduce the cost and the perceived risk inherent with this new technology. With the backing of the U.S. Department of Energy and engagement of top researchers, Power America exchanges

knowledge and processes and provide access to an educated workforce. This enables American industry to develop more innovative power electronics products and systems.

If you would like to learn more about Power America, contact Chrys Panayiotou at (772) 462 7621 or cpanayio@irsc.edu.

learned to troubleshoot and solve problems by researching and finding answers on his own.

Read more about Carlos and other successful technicians in [Success Stories in Photonics Careers](#).

For Previous Issues of the OPEN Newsletter please visit OP-TEC's [News Page](#).



2019 High Impact Technology Exchange Conference
JULY 22-25
ST LOUIS
HI-TEC Educating America's Technical Workforce
 Sponsored by the NSF ATE community
highimpact-tec.org

Join the Conversation

We hope you enjoyed this edition of the OPEN newsletter. We would really like to hear from you. If there is some subject that you would like us to discuss or look into, please let us know at prmanager@op-tec.org.

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