Faculty
Partha Banerjee
Joseph Haus
Andrew Sarangan
Mikhail Vorontsov
Qwen Zhan
Imad Agha
Vijay Asari
Bradley Duncan
Monish Chatterjee
Andy Chong
Cong Deng
Matt Dierking
Dean Evans
Shekhar Guha
Russ Hardie
Kiego Hirakawa
John Loomis
Jay Mathews
Paul McManamon
Michael O’Hare
Rita Peterson
David Rabb
Guru Subramanyaam
Ed Watson
Thomas Weyrauch
Timothy White
Perry Yaney
Chenglong Zhao

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Director’s corner

As the International Year of Light draws to a close, we have made some important strides in our program. I am happy to report that we have initiated the process to elevate the electro-optics (EO) program to a department. The proposal has been approved by the chairs of Electrical and Computer Engineering (ECE) and Physics, the Academic Leadership Committee in the School of Engineering (SoE), the respective deans of SoE and the College of Arts and Sciences, and by the graduate school. Now it awaits the decision of the academic senate. Additionally, EO also formed its first advisory board (see below) which met on campus in November.

This Fall, EO welcomed about 20 new students into our program, many of whom are being supported as teaching and research assistants. We are grateful to the Sensors and Materials directorates of Air Force Research Labs, as well as local companies such as Applied Optimization and Protobox for supporting many of our students. 10 students graduated in Summer and Fall. For 2015, EO graduated 3 PhDs and 13 MS students (see p.4). Some of our MS graduates are now pursuing their PhD in EO.

2015 has also been a banner year for the Intelligent Optics Lab and Optonicus (p.2). Mikhail Vorontsov received an Air Force Office of Scientific Research (AFOSR) Defense University Research Instrumentation Program (DURIP) grant for high-performance cluster computing. These computers, which will be housed in Fitz Hall, will satisfy the computational needs for atmospheric optics, and dramatically improve the computational facilities of EO and ECE. Also, Mikhail and Thomas Weyrauch received a prestigious National Science Foundation (NSF) Major Research Instrumentation (MRI) grant for the development of a high-power adaptive phased fiber-array laser system, with applications in additive manufacturing.

Cong Deng, an alum of HUST, and research scholar in EO, initiated negotiations between HUST and UD for future collaboration. Cong, Joe Haus, and I recently visited HUST, the largest optics institute in China, to discuss co-teaching of courses in Wuhan, and exchange of graduate students between the two institutions. Additionally, Qwen Zhan initiated a visit of scholars and administrators from Centro de Investigaciones en Optica (CIO) in Leon, Mexico for similar student exchanges. We hope these efforts bring in students from these prestigious institutions to EO in the near future.

I wish you all a very happy, illuminating, and productive 2016!

EO welcomes board members to campus

EO recently formed its advisory board and the members came for their first meeting this Fall. Pictured here (from right to left) are: Chris Brewer (AFRL materials and EO alum), Tim Bunning (chief scientist, AFRL materials), Mark Greiner (L3), Akhlesh Lakhtakia (Charles Binder Endowed Professor, Penn State), Bahaa Saleh (dean of CREOL), and John Taranto (ThorLabs and EO alum). Mike Roggeman (professor, Michigan Tech), could not attend. John Erdé, Chair, Physics, is also pictured. The initial report from the committee noted that “by becoming an independent department, we are on the right track to becoming an internationally recognized premier EO program”. Other suggestions included adding biophotonics as a growth area, and a name change to Optics and Photonics.
It was quite a successful year for the Intelligent Optics Laboratory and Optonicus LLC team. Following a review meeting in Washington D.C., the MURI team headed up by Mikhail Vorontsov was approved for a 2 year extension. This project studying “Deep Atmospheric Optical Turbulence Physics and Predictive Modeling” brought together researchers from UD, U. of Miami, AFIT, Michigan Tech, New Mexico State, and NC State.

The MURI teams research will be enhanced by the upcoming acquisition of a computing cluster that was recently funded through a AFOSR-DURIP grant “High Performance Computational Cluster for Extended-Range Atmospheric Optics Research”. This new resource will dramatically increase EO’s computational abilities through the purchase of a high performance computer housing 780 processing cores and 4 state of the art GPU units.

Recently Mikhail, along with co-Principal Investigator Thomas Weyrauch, were awarded an NSF MRI grant “Development of a High-Power Adaptive Phased Fiber-Array Laser System”. This grant focuses on constructing a ~10kW class continuous wave fiber-array laser system for use in a wide variety of industries such as automotive, aerospace, defense, and nuclear and fusion energy. With the emerging development of additive manufacturing techniques, high-power laser energy sources must adapt to fit stricter requirements for power and control. The proposed equipment combines precise beam pointing and stabilization, and adaptive compensation for mechanical jitter, among other key features. The availability of this new laser system to both industrial researchers and University programs will also help the local area economy in its transition to high-tech industry.

Optonicus also had a year of growth adding on two new Phase I SBIR contracts and two new Phase II SBIR contracts. Additionally, the existing Phase II STTR project developing an “Extended Range Atmospheric Sensing Suite” received a 14 month extension to perform additional work. Optonicus also had the opportunity to showcase its systems at several exhibitions this year. In June, the MOR-SAPR complex field sensor was on display at the Navy Opportunity Forum. In September, the SEAHAWK fiber-array cluster (above) was showcased at DARPA’s “Wait What?” Technology Forum.

“Scientific discovery inspires us to continue learning more about our universe and ourselves. It is also difficult work and this (NSF) award is validation of your efforts. UD, the state of Ohio and our nation will benefit from the research you are undertaking.”

Sherrod Brown, Ohio Senator

Optonicus, Intelligent Optics Lab have banner year

Capturing EO in 2015

From top left (clockwise): Haipeng Liu, Chuan Ni and Junxing Wong with Prathan Buranisiri, Partha Banerjee and Andrew Sarangan at SPIE Annual meeting, San Diego; Dean Evans receiving his fellowship from OSA President Philip Russell at FiO, San Jose; Sarah Krug at her MS defense; Partha Banerjee, Joe Haus, and Cong Deng with Ling Fu (left) and Haibin Yang (right) at Wuhan National Labs at HUST, Wuhan, China; Brian Dolasinski at SPIE Photonics West, San Francisco; Ed Watson and Yun Zhao at OSA’s International Year of Light reception in San Jose. Haipeng is with Newport, Junxing is a PhD student at U. California San Diego, and Prathan is faculty at King Mongkut U., Thailand. Chuan and Sarah received their MS in EO and are continuing on their PhD. Dean is with AFRL and is graduate faculty in EO. Brian is also employed at AFRL. Yun will complete his MS in EO in May of 2016.

from top left (clockwise): Haipeng Liu, Chuan Ni and Junxing Wong with Prathan Buranisiri, Partha Banerjee and Andrew Sarangan at SPIE Annual meeting, San Diego; Dean Evans receiving his fellowship from OSA President Philip Russell at FiO, San Jose; Sarah Krug at her MS defense; Partha Banerjee, Joe Haus, and Cong Deng with Ling Fu (left) and Haibin Yang (right) at Wuhan National Labs at HUST, Wuhan, China; Brian Dolasinski at SPIE Photonics West, San Francisco; Ed Watson and Yun Zhao at OSA’s International Year of Light reception in San Jose. Haipeng is with Newport, Junxing is a PhD student at U. California San Diego, and Prathan is faculty at King Mongkut U., Thailand. Chuan and Sarah received their MS in EO and are continuing on their PhD. Dean is with AFRL and is graduate faculty in EO. Brian is also employed at AFRL. Yun will complete his MS in EO in May of 2016.


Bending light beams to your whims sounds like a job for a wizard or an complex array of bulky mirrors, lenses and prisms, but a few tiny liquid bubbles may be all that is necessary to open the doors for next-generation, high-speed circuits and displays.

Faculty Spotlight: Chenglong Zhao

Dr. Chenglong Zhao joined Physics and Eo as an assistant professor in August, 2015. He received his Ph.D. from Peking University (Beijing, China) in 2011. Prior to UD, Chenglong was at Penn State and NIST.

Chenglong’s research interests include nanophotonics, graphene, plasmonics, metamaterials, and optical trapping and manipulation. He has authored and co-authored over 20 journal papers including Nature Communications, Nano Letters, ACS Nano, Nanoscale, and Lab Chip. His research findings have been widely reported by Science Daily, Physics News, National Science Foundation, Science Codex, Science News, etc.

Chenglong currently leads the Nano-photonic & Nano-Manipulation (NPNM) Lab in the Physics building. The NPNM lab aims to develop cutting-edge nanotechnologies by utilizing the light-matter interaction at nanoscales for applications in 3D nano-fabrication, single molecule detection, portable on-chip nano-trapping, ultra-sensitive bio-sensing, and point-of-care diagnostics.
Student Spotlight: Shiyi Wang

Shiyi Wang (PhD, EO, 2015) proposed and demonstrated a transmission-type metasurface composed of carefully designed rectangular slot antennas for the generation of vectorial optical fields. Acting as local linear polarizers, these slot antennas enable the spatial modulation of optical fields in amplitude, phase, and polarization for the cross-polarized component of the scattered field.

Shiyi joined Qiwen Zhan’s research group in the EO program at UD in 2010, having completed his BS and MS from Harbin Institute of Technology, China in 2008 and 2010, respectively. He was supported one year as a teaching assistant conducting Physics labs (as is typical for many EO students) before switching over to a research assistant under Dr. Zhan. Shiyi is currently employed as a Computational Pattern- ing Engineer with Global Foundries (formally incorporated with IBM) in New York.

It is probably common knowledge that coat hangers from your closet can play an important role in TV reception. Indeed, there are YouTube® videos showing how one can make a good HDTV antenna using just a few coat hangers to form a bowtie shape. Slot bowtie antennas have the advantage of wider bandwidth, good impedance match, and bidirectional radiation patterns, and are widely used in microwave communications. As optical counterparts of microwave antennas, optical nano-antennas are important devices for converting propagating radiation into confined/enhanced fields in the nanoscale. Recent advances in resonant subwavelength optical antennas have now offered researchers the entire electromagnetic spectrum—ranging from RF to X-rays—to design, analyze and predict new phenomena that were previously unknown.

Authors of Analog and Digital Holography: George Nehmetallah, Rola Aylo, Logan Williams. Author of Nanophotonics: Joe Haus. Congratulations!

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A joint initiative between electrons and photons

EO Graduates

May 2015
Ujitha Abeywickrema, PhD
Shiyi Wang, PhD
Zhicheng Xiao, MS
Katherine Duncan-Chamberlin, MS
David Lombardo, MS
Yang Xu, MS

August 2015
Rahmah Alzahrani, MS
Sarah Krug, MS

December 2015
Han Li, PhD
Awatif Alshammari, MS
Hongwei Chen, MS
Xin Huang, MS
Peiyun Li, MS
Zairui Li, MS
Ying Xu, MS
Mengyang Zou, MS

Congratulations!

Let’s get Digital...

Partha Banerjee was elected general chair of the OSA Digital Holography Topical Meeting at Heidelberg in July 2016. The meeting this year is part of the OSA Imaging Congress. He was general chair of DH in 2010 in Miami, and technical chair of DH in Shanghai in 2015.

EO @ UD
A joint initiative between electrons and photons

Recent books by EO alumni, faculty

Authors of Analog and Digital Holography with MATLAB: George Nehmetallah, Rola Aylo, Logan Williams. Author of Nanophotonics: Joe Haus. Congratulations!

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