

## BIOGRAPHICAL INFORMATION: ARJUN G. YODH

See Group Website for more information: <https://web.sas.upenn.edu/yodh-lab/>

### EDUCATION

1986 Ph.D., Harvard University, Division of Applied Sciences  
1982 M.S., Harvard University, Division of Applied Sciences  
1981 B.Sc., Cornell University, School of Applied and Engineering Physics

### POSITIONS HELD

1997- Professor of Physics and Astronomy, University of Pennsylvania  
1997-06 Professor of Radiation Oncology (Associated), University of Pennsylvania  
1993-97 Associate Professor of Physics, University of Pennsylvania  
1988-93 Assistant Professor of Physics, University of Pennsylvania  
1987-88 Postdoctoral Research Associate with *Harry W. K. Tom*, AT&T Bell Labs  
1986-87 Postdoctoral Research Associate with *Steven Chu*, AT&T Bell Labs  
1982-86 Research Assistant (RA) with *Thomas W. Mossberg*, Harvard University

### HONORS, LEADERSHIP POSITIONS, FELLOWSHIPS, MEMBERSHIPS

James M. Skinner Professor of Science, Endowed Chair, Univ. of Pennsylvania (2000- )  
Chair, Department of Physics and Astronomy, University of Pennsylvania (2022- )  
*Provost's Award for Distinguished PhD Teaching & Mentoring*, Univ. of Pennsylvania (2024)  
*Michael S. Feld Biophotonics Award* of the Optical Society of America (now Optica) (2021)  
Director, PENN Laboratory for Research on Structure of Matter (LRSM) (2009-20)  
Director, NSF Materials Research Science & Engineering Center (MRSEC) (2009-20)  
Co-Director, NSF Partnership for Res. & Edu. in Materials (PREM), U Puerto Rico (2009-20)  
Elected *Member-at-Large*, Medical Physics Group (GMED), APS (2020-23)  
Elected *Electorate Nominating Committee*, AAAS (2017-20)  
*Alexander von Humboldt Senior Research Award*, Heinrich-Heine-Un. of Düsseldorf (2015-18)  
*Raymond and Beverly Sackler Lecturer*, Tel-Aviv University (2015-16)  
*Visiting Professor*, École Supérieure of Industrial Physics & Chemistry (ESPCI), Paris, (2012)  
MRSEC Deputy Director, Laboratory for Research on the Structure of Matter (2004-2009)  
*Langmuir Lecturer* (ACS Division of Colloid and Surface Chemistry, 2006)  
*Sigma Xi National Distinguished Lecturer in Science* (2000-2002)  
Fellow, American Association for Advancement of Science (AAAS)  
Fellow, Optical Society of America (OSA, now Optica)  
Fellow, American Physical Society (APS)  
Fellow, American Institute for Medical and Biological Engineering (AIMBE)  
Member, *Bioengineering Graduate Group*, University of Pennsylvania  
Member, *Materials Science and Engineering Graduate Group*, University of Pennsylvania  
Member, *Laboratory for Research on the Structure of Matter*, University of Pennsylvania  
Member, *Center for Soft and Living Matter*, University of Pennsylvania  
Member, *Institute of Medicine and Engineering (IME)*, University of Pennsylvania  
Member, *Abramson Cancer Center*, Hospital at the University of Pennsylvania (HUP)  
Co-leader/Member, *Center for Advanced Metabolic Imaging & Precision Medicine*, (HUP)  
William Smith Term Chair, University of Pennsylvania 1997-2000

Office of Naval Research Navy Young Investigator 1991-94  
Alfred P. Sloan Research Fellow 1991-94  
National Science Foundation Presidential Young Investigator 1990-95  
AT&T Bell Laboratories Faculty Fellow 1990-93  
Lilly Foundation Faculty Teaching Fellow, University of Pennsylvania, 1988-89  
U.S. Army Pre-Doctoral Fellowship, Harvard University, 1983-86  
Cornell National Scholar, Cornell University, 1977-81  
Westinghouse Nationwide Science Talent Search Winner, Top 40, 1977

## SELECTED ACTIVITIES

**Editor/Editorial Board:** *Biomedical Optics Express* (2010-); *Biomedical Engineering Frontiers* (2020-); *Journal of Innovative Optical Health Sciences* (2008-); *Neurophotonics* (2014-17); *Physical Review E* (2002-05). Two Issues (1997) on “Diffusing Photons for Study of Turbid Media,” in *Journal of Optical Society of America A* (fundamental), *Applied Optics* (applied). Guest Editor Special Issues: “Celebrating Britton Chance” in *Journal of Biomedical Optics* (4/2000); Two Issues on “Metabolic Imaging & Spectroscopy” in *Journal of Biomedical Optics* (5/2019), *Molecular Imaging and Biology* (6/2019)

**Conference Chair/Co-Chair:** *Advances in Optics for Biotechnology, Medicine and Surgery*, (United Engineering Foundation, Kona, Hawaii, August 1999); *Advances in Optical Imaging and Photon Migration*, (Optical Society of America, Miami, Florida, April 2000); *Optical Society of America Biomedical Optics*, (OSA, Miami, Florida, April 2002); *Laser Science/OSA XXII Annual Meeting* (Rochester, NY, Fall 2006); *Optical Imaging & Spectroscopy OSA BIOMED Topicals* (Miami, Florida, 2010); *LRSM 50<sup>th</sup> Anniversary Celebration* (Philadelphia, PA, 5/2012); *Principal of Condensed Matter (Lubenskyfest)* (Philadelphia, PA, 11/2017); *Workshop on Imaging Biomarkers* (Philadelphia, PA, 2011,12,13,14, 2018); *International Symposium on Metabolic Imaging and Spectroscopy* (Philadelphia, PA, 2013); *88<sup>th</sup> ACS Conference on Colloid & Surface Science* (Philadelphia, PA, 2014); *2<sup>nd</sup> Britton Chance International Symposium on Metabolic Imaging and Spectroscopy* (Philadelphia, PA, 2018); *Principles of Quantum Matter (Kanefest)* (Philadelphia, PA, 8/2023); *Franklin Institute Award Symposium - Physics of Soft Matter: Self-Assembling, Responsive, Smart, and Squishy (Weitzfest)* (Philadelphia, PA, 4/2024); *The Duchess of Disorder (Liufest)* (Philadelphia, PA, 6/2024); *3<sup>rd</sup> Britton Chance International Symposium on Metabolic Imaging and Spectroscopy* (Philadelphia, PA, 2024).

**Scientific Consultant/Board:** Mallinckrodt Medical (1994-99); NIM Inc. (1994-96); Cytometrix Inc. (1994-98); Nanoselect Inc. (2004-08); Flox Medical (2012-15); Hemophotonics (2012-).

**Outside Service (selected):** *NRC Committee on Atomic, Molecular & Optical Sciences* (2000-03); Evaluation Committee, *FOM Programme 45 'Waves in complex media'*, Netherlands (2001); Advisory Board for *NIH Optical Resource (P41)* at MIT George Harrison Spectroscopy Lab (2002-2021); Review Panels - Numerous NIH Study Sections, NASA Grant Study Section, NSF Panel Review, Department of Energy Review Panel; External Review Committees (Naval Research Lab Biomaterials Section, Kent State University Chemical Physics Department, Boston University Physics Department); Working Groups (Oak Ridge Neutrons for Soft Matter, NSF-DMR Soft Matter); MRSEC External Advisory Boards (Harvard, Brandeis, Ohio State, NYU), MRL External Advisory Board

(Illinois); Advisory Board for *European Union* ITN project, *BitMap* (Brain Injury & Trauma Monitoring using Advanced Photonics). Advisory Board for *European Union* projects: *BitMap* (Brain Injury & Trauma Monitoring using Advanced Photonics) and Prometeus (Preterm Brain-Oxygenation and Metabolic EU-Sensing: Feed the Brain - Prometeus); Member of Physics Cluster for the Medal Awards of the *Franklin Institute* (2022-present).

**Public Lecturing:** *Exploring Einstein and Brownian Motion* (2005-6) lecture (with simple lab) to High School Physics Classes (Passaic Valley, Phoenixville, Harriton, Methacton, Susquehanna Township); *Sigma Xi National Lecturer in Science* (numerous lectures, 2000-2002); *Hands-On Research in Complex Systems Summer School*, 7/2009 Sao Paulo, Brazil; *LRSM Science Cafes* - regularly 2011-23 (*Imaging Body with Light, Random Walks, Coffee Rings, Order from Disorder*); *Exciting Science of Chocolate* (3/2014, Atlanta); *Why Light Matters* (10/2015, Franklin Institute, Philadelphia); *Materials & Optics @ the Research Frontier* (7/2016, Penn Wharton China Center, Beijing); *Physics of Chocolate* (9/2022, ICFO, Barcelona).

## GRADUATE STUDENT AND POST-DOCTORAL ASSOCIATE TRAINING

**For more information about my graduate students and post-doctoral associates, as well as about undergraduates, K-12 students, teachers who have worked in my group:**

See <https://web.sas.upenn.edu/yodh-lab/people/>.

## GRADUATE STUDENT SUPERVISION (PHD ADVISEES)

**Current:** Michio Tanaka, Alistair Lewis, Charlotte Slaughter, Jesse Elliott, Zaha Shahdad, Ben Pisanty

### 44 PhD Students (graduation year)

Mohsen Yeganeh (1992), Peter Kaplan (1993), Ming Hsu Kao (1995), Jining Qi (1995), David Boas (1996), Maureen O'Leary (1996), Joseph (Joe) Culver (1997), Anthony (Tony) Dinsmore (1997), William (Bill) Angerer (1998), Xingde Li (1998), Ritu Verma (1999), Vasilis Ntziachristos (2000), Ningping Yang (2001), Keng-hui Lin (2002), Jian Zhang (2003), Yu Chen (2003), Turgut Durduran (2004), Regine Choe (2005), Ahmed Alsayed (2006), Ulas Sunar (2006), Chao Zhou (2007), Jonathan Fisher (2007), Mateusz Bryning (2007), Alper Corlu (2007), Soren Konecky (2008), Daniel Tien-Nang Chen (2010), Erin Buckley (2011), David Busch (2011), Peter J. Yunker (2012), Anindita (Oni) Basu (2012), Meeri Kim (2013), Jennifer Lynch (2014), Matthew (Matt) Alan Lohr (2014), Wesley (Wes) Boehs Baker (2015), Han Yong Ban (2015), Matthew (Matt) Gratale (2016), Zoey Davidson (2017), Jeff Cochran (2018), Tiffany Ko (2018), Wei-shao Wei (2020), Sangoon (Bryan) Chong (2022), Analisa Hill (2022), Sophie Ettinger (2023), Emilie Benson (2023).

## POST-DOCTORAL ASSOCIATE SUPERVISION (POST-DOC ADVISEES)

**Current:** Rodrigo Forti, Tiffany Ko, Yihao Chen, Joe Majeski, Hongting Zhao

### 60 Post-docs (Final Year at Penn, other non-physics affiliations while at Penn)

Jeff Owrutsky (1993, w/R. Hochstrasser), Dinos Gonatas (1995, w/J. Leigh), Louis Jahn (1994, w/R. Hochstrasser), Zhijiang Sun (1995, w/R. Hochstrasser), David Cook (1996, w/R. Hochstrasser), Robert Danen (1998, w/NIM Inc.), Eric Weeks (1999), Teodor Vulcan (1999,

w/Radiation Oncology), John Crocker (2000), Cecil Cheung (2000), Michael Solonenko (2000, w/Radiation Oncology), Monica Holboke (2000), Subrata Sanyal (2001), Joe Culver (2001), Alison Slemp (2001, w/D. Fraker), Rex Cheung (2002, w/Radiation Oncology), Joe Giammarco (2002), Xavier Intes (2003, w/B. Chance), Peter Mach (2002, w/P. Wiltzius, Lucent), Zvonimir Dogic (2003), Jean-Christophe Loudet (2003), Hsing-wen Wang (2005, w/Radiation Oncology), Na Young Ha (2006), Mohammad Islam (2006), Kijoon Lee (2007), Guoqiang Yu (2007), Larry Hough (2006), Yilong Han (2007), Ahmed Alsayed (2008), Regine Choe (2010), Zexin Zhang (2010), Qi Wen (2011, w/P. Janmey), Ke Chen (2011), Rickson Mequita (2011), Yalin Ti (2011, w/T. Zhu, HUP), Erin Buckley (2012, w/D. Licht, CHOP), Saurav Pathak (2014), Malavika Chandra (2014), Joonwoo Jeong (2015), Ye Xu (2015), Sophie Chung (2015), Tim Still (2015), Han Ban (2016), Venki Kavuri (2016), Ashwin Parthasarathy (2016), Wesley Baker (2017), David Busch (2017, w/D. Licht, CHOP), Karla Bergonzi (2019 w/A. Kofke, HUP), Angel Martinez (2019), Jeff Cochran (2019), Lian He (2019), Alexis de la Cotte (2020), Xiaoguang Ma (2020), Chandan Kumar Mishra (2021), Brian White (2021, CHOP), Yihong Ong (2021, HUP), Alec Lafontant (2021, w/W. Baker CHOP), Lin Wang (2022), Analisa Hill (2023), Sanghoon (Bryan) Chong (2023).

### **UNDERGRADUATE STUDENT TRAINING (UGs IN YODH LAB)**

#### **PENN Undergraduates (79) (\* UGs who Co-authored Paper and/or wrote Thesis)**

Manoj Aggarwal (Penn, 1996), Ishtiaq Alam (Penn, 1997-98), Todd Allen (Penn, 2016-17), John Bartel (Penn, 2008), Daniel Bergey\* (Penn, 2002), Lee Burwasser (Penn, 2009), Chuck Chung (Penn, 1992-93), Brian J. Cope (Penn, 2000, 01), Rachel Courtland\* (Penn, 2000), Cem Dedeaga (Penn, 2007-08), Turgut Durduran\* (Penn, 1996-97), Sarah Fletcher (Penn, 2007), David Freifelder (Penn, 2015), Daniel Friedman\* (Penn, 2014), Nikhil Gangoli (Penn, 2021), Raman Ganti\* (Penn, 2012-13), Nikos Georgiades\* (Penn, 1990-91), Vanjessica Gladney (Penn, 2012-13), Bob Grimshaw (Penn, 1999), Adam Gross\* (Penn, 2014-16), Josh Gruber\* (Penn, 2000-01), Michael Haugh (Penn, 2004-05), Chan Hong (Penn, 2018-19), Zhensong Hu (Penn, 2016-17), Min Young Jeong (Penn, 2014), Robert Jones (Penn, 1993-94), Jahred Kallop (Penn, 2001), Helen Kim\* (Penn, 2012-14), Timur Kocaoglu (Penn, 2001), Michael Kopinsky (Penn, 2008), Nimay Kulkarni (Penn, 2016), Sean Lake (Penn, 2003-04), Hannes Leipold (Penn, 2013), Sam Lobel\* (Penn, 2013), Tara Lorimer (Penn, 2015), Bart Machielse\* (Penn, 2014-16), Clara Marty (Penn, 2019), Zigurt Mazumbdar\* (Penn, 1998-99), Ariel Michelman (Penn, 2000), David Minkoff\* (Penn, 2007-10), Vincent Morano\* (Penn, 2015-18), Kevin Muriuki (Penn, 2015-16), Amrita Nag (Penn, 2009-10), Edward Nieh (Penn, 2008), Matthew Osborn (Penn, 2016), Priyanka Parakh (Penn, 2009), Winston Peloso (Penn, 2020-23), Eric Pinter (Penn, 2010), Raghav Puranmalka (Penn, 2008-09), Avinash Rajput (Penn, 2008-09), Nithin Ramachandran\* (Penn, 2022-24), Lynne Raynor (Penn, 2019), Enrique Rojas\* (Penn, 2002), Jennifer Rouke\* (Penn, 1992-93), Dakara Rucker (Penn, 1997-99), Safiya Saha (Penn, 2019), Elaine Sayler (Penn, 2008-09), Steve Schenkel\* (Penn, 2009-14), Lee Schroeder\* (Penn, 1995-96), Peter Schwab\* (Penn, 2010-2014), Michael Shen (Penn, 2019), Andrea Simi (Penn, 2016), Seelig Sinton (Penn, 1998), Chang Su (Penn, 2015), Thad Szabo (Penn, 1992-93), Raman Thadani (Penn, 2019), David Thakker (Penn, 1998), Kimani Toussant (Penn, 1993), Harsh Vishwasrao (Penn, 1996-97), Doug Voet\* (Penn, 1995-96), Clara Wang (Penn, w/Wes Baker CHOP, 2023), Michael Warren (Penn, 2005-07), Elizabeth Wayne\* (Penn, 2007-09), Amy Wu (Penn, 2001), Hannah Yevick\* (Penn, 2007-08), Jeff Zaremba\* (Penn, 2004-05), Emily Zhang (Penn, 2022)

Bo Zhou (Penn, 2004).

**Non-PENN Undergraduates (93) (\*UGs who Co-authored Paper and/or wrote Thesis)**

Juan Aguirre (Unidad de Medicina y Cirugia Experimental, Spain, 2011), Sevde Arpaci (Bogazici University, Turkey, 2011), Carl Atkins (University of Sussex, UK, 2016), Soumendra Banerjee (Cornell, 2001), Blandine Barabé (Grenoble INP - Phelma, France, 2014), Samy Belbegra (Temple, 2019), Gabriel Benjamin-Fernandez (Swarthmore College, 1995), Joshua Boehm, (Case Western Reserve University, 2001), Zachery Brown\* (Saint Joseph's University, w/Piotr Haldas, 2015-16), Yaa Bruce (Harvard, 2002), Lauren Chaby (Clarkson University, 2008), Matt Colagreco (West Chester University, w/Kevin Aptowicz, 2010,11), Carrie Davis (University of Notre Dame, 2021), John Mike Devany (St. Joseph's University, w/Piotr Haldas, 2011), Mahima Devarajan (Case Western University, 2017), Connie Dong (University of Minnesota, 2015), Pouneh Fazeli (Harvard, 1995), Daniel Flynn (St. Joseph's University, w/Piotr Haldas, 2011), Sean Gossin (West Chester University, w/Kevin Aptowicz, 2008,09), Audrey Green (Rutgers University, 2013), Kaitlin Griffiths (Temple University, w/Dan Licht, 2015-16), Quoc Trung Nigel Van Ha (Swarthmore College, 2018), Kasey Hanson\* (Alfred University, 2013), Emily R. Hudson (Swarthmore College, 2015), Earl Hughes (Temple University, 2015), Daniel Imaizumi (New College, Florida, 1997), Martin Iwanicki\* (St. Joseph's University, w/Piotr Haldas, 2011,12,13), Jharna Jahnnavi (Haverford College, 2018), Richard Janowski (West Chester University, w/Kevin Aptowicz, 2015), Jane Jiang (Queen's College, NYC, 2016), Charles Jouaneh (Rhode Island University, 2023), Jessica M. Jowdy (Swarthmore College, 2013), Alpha Kamara (Community College of Philadelphia, 2010), Jonathan Kanatous (West Chester University, w/Kevin Aptowicz, 2007,08), Steve Kane (Haverford College, 1989-90), Clara Karastury (Northeastern University, 2018), Jaka Katransik\* (University of Ljubljani, Slovenia, 2011-2012), Camron Klotz (Rowan University, 2021), Aissia Koffi (Howard University, w/Wes Baker at CHOP, 2023), Laura Laderman (Swarthmore College, w/Peter Collings, 2012-13), Andrzej Latka\* (Saint Joseph's University, w/Piotr Haldas, 2007-08), Charles Laurans (Yale University, 1998), Andrew Levitt\* (University of Toronto, 2000), Michael Leyman (Drexel University, 2011-13), Scott Luedtke (University of Illinois, 2012), Mina Mandic (Swarthmore College, 2022), Rachael Mansbach (Swarthmore College, 2010), Ryan Margolis (West Chester University, w/Kevin Aptowicz, 2010), Lisa Mariani (St. Joseph's University, w/Piotr Haldas, 2011), William Marshall (University of South Carolina, 2019), Catherine Martlin (Swarthmore College, 2012), Giselle Matlis (Drexel, 2019, 2022), Joe Matteo\* (Lehigh University, 1997-98), Matthew Mawhinney (Saint Joseph's University, w/Piotr Haldas, 2010), Julia Mayer (West Chester University, w/Kevin Aptowicz, 2013), Miranda Mazzio (Saint Joseph's University, w/Piotr Haldas, 2017-18), Sarah Mburu (Cornell University, 2012), Matthew Menga (Temple, 2004), Julien Menko\* (Haverford College, 2012-2014), Tinashe (Harry) Mubvuma (Swarthmore College, 2012), Samer Nashed (Swarthmore College, w/Peter Collings, 2015), John Napp\* (Caltech, 2011), Kenneth Nieser (Swarthmore College, w/Peter Collings, 2012-13), Timothy Ogalla (Swarthmore College, w/Peter Collings, 2018), Per Olef\* (Swarthmore College, 1990-91), Patrick O'Neill (UC Santa Barbara, 2003), Nicholas Ordenez (Stephens Institute of Technology, 2017), Gabriel A. Calderon Ortiz\* (University of Puerto Rico, 2014), Luis R. Rodriguez Ortiz (University of Puerto Rico, 2011), Michelle Otte (Lockhaven University, 2015), Daniel M. Palmer (Swarthmore College, 2014), Sebastian Hurtado Parra (Saint Joseph's University, w/Piotr Haldas, 2014), Anthony Peng (Cornell, 2002), Angelo Porcu (University of Puerto Rico, Humacao, 2019, 2021), Margaret Regan (Swarthmore College, w/Peter Collings, 2012-13), Jennifer Rochlis (Mt. Holyoke College, 1993), Andrew Rouff

(Union College, 2013), Michael Ryan (West Chester University, w/Kevin Aptowicz, 2013-14), Christopher Rajiv Sue-Wah-Sing (Rowan University, 2018), Vishnu Srinivasan (Johns Hopkins University, 2023), Jesse Taylor (Calvin College, 2006), Nathaniel Thorne (University of the Sciences, 2011), Ran Tu (Juniata College, 2005), Rodrigo de Castro Vianna Barbosa (Toulouse (France), 2010), Janet Weaver (William & Mary, 1993), Kayla (Kathryn) Winters (Georgetown University, 2022), Maddie Winters\* (Guilford College, 2011-13), Derek Wong\* (Haverford College, 1996-97), Serena Woods (Norfolk State University, 2008), Laura Zemany\* (Harvard, 1995), Xingda Zhai (Swarthmore College, 2011), Xingyu (Alex) Zhang (Swarthmore College, 2011), Yikang Zhang\* (Peking University (PKU), China, 2017).

## **PATENTS**

*Fiber optic flow and oxygenation monitoring using diffuse correlation and reflectance*, Floyd, T.F., Yodh, A.G., Mesquita, R.C., United States Patent 11,478,151, October 25, 2022.

*Pressure Modulation, Motion Detection, Individualized Geometry, and Improved Optic-Skin Coupling to Improve Longterm Clinical Monitoring with Diffuse Optics*, Busch, D.R., Parthasarathy, A.B., Baker, W.B., Chandra, M., Mesquita, R.C., Licht, D.J., Yodh, A.G., United States Patent 10,827,976, November 10, 2020.

*Probes and pressure modulation algorithms for reducing extra tissue contamination in hemodynamic measurement*, Wesley B. Baker, Arjun G. Yodh, David R. Busch, Jr., Ashwin B. Parthasarathy, Rickson C. Mesquita, Malavika Chandra, United States Patent 10,342,488, July 9, 2019.

*Fiber Optic Flow and Oxygenation Monitoring using Diffuse Correlation and Reflectance*, Floyd, T.F., Yodh, A.G., Mesquita, R. C., United States Patent 10,064,554, Sept. 4, 2018.

*Coregistration and Analysis of Multi-modal Images Obtained in Different Geometries*, Azar, F.S., Yodh, A.G., Choe, R., Lee, K., United States Patent 9,251,585, February 2, 2016.

*Optical Measurement of Tissue Blood Flow, Hemodynamics and Oxygenation*, Yodh, A.G., Greenberg, J.G., Yu, G., Detre, J.A., Durdurán, T., Burnett, M.G., Mohler, III, E.R., Quon, H., Hahn, S., United States Patent 8,082,015, December 20, 2011.

*Extravasation Detection Apparatus and Method Based on Optical Sensing*, Culver, J.P., and Yodh, A.G., United States Patent 6,487,428, November 26, 2002.

*Systems and Methods for Imaging Fluorophores*, A.G. Yodh, B. Chance, M.A. O’Leary, D.A. Boas, X. Li, 6,304,771, October 16, 2001.

*Imaging Spatially Varying Dynamic Media with Diffusing Correlation Waves*, Boas, D.A., and Yodh, A.G., United States Patent 6,076,010, Jun. 13, 2000.

*Object Imaging Using Diffuse Light*, Yodh, A.G., Chance, B. Boas, D.A., O’Leary, M.A., United States Patent 5,917,190, June 29, 1999.

*Arrangement and Method to Apply Diffusing Wave Spectroscopy to Measure the Properties of Multi-Phase Systems, as Well as Changes Therein*, de Kruif, C.G., Grotenhuis, E. Ten, Weitz, D.A., Nishimura, G., Yodh, A.G., EP 0,947,822 A1, February 4, 1998.

## **PATENTS PENDING / PATENT DISCLOSURES**

*Non-invasive cerebral monitoring and cerebral metric-based guidance for medical procedures*, Kilbaugh, T., Ko, T., Mavroudis, C., Licht, D., Yodh, A., Berg, R., Morgan, R., Sutton, R., Baker, W., Publication #US 20230000362A1, January 5, 2023.

*Method and Systems for Photodynamic Therapy Calculations*, Zhu, Timothy, Yodh, A.G., Publication # 20220001193, November 6, 2019.

*System and Method for Coregistration and Analysis of Nonconcurrent Diffuse Optical and Magnetic Resonance Breast*, Azar, F.S., Yodh, A.G., Publication # 20080292164, November 27, 2018.

*Carbon Nanotubes: High Solids Dispersions and Nematic Gels Thereof*, Yodh, A.G., Islam, M., Ahmed, M., Alsayed, A., Claimed: P2952 (U.S. Provisional Application 60/409,821, filed Sept. 10, 2002) and P2984 (U.S. Provisional Application 60/419,882, filed Oct. 18, 2002)

*Single Wall Nanotube Composites*, Yodh, A.G., Islam, M.F., Bryning, M.B. (U.S. Patent Application No. 20060293434, December 28, 2006)

*Processes and Applications of Carbon Nanotube Dispersions*, Yodh, A.G., Islam, M.F., (U.S. Patent Application No. 20100247381, filed June 6, 2005)

## TEACHING ACTIVITIES (PRIMARY COURSES)

Since 1988 I have taught undergraduate and graduate courses at the University of Pennsylvania. This teaching activity includes the following.

1. **Physics 101 / Physics 102** (in current numbering system, **Physics 0101 / Physics 0102**). This *Introductory Physics* series is taken primarily by undergraduates interested in a career in medicine. **Physics 101** is largely *Mechanics*, and **Physics 102** is largely *Electricity and Magnetism*, with additional materials in *Optics, Thermodynamics, etc.*
2. **Physics 008** (in current numbering system, **Physics 0008**). This is an *Introductory Physics for Architects*. **Physics 008** covered *Mechanics* (including statics), and other topics such as *heat transfer, materials, optics*, which were advised by Architecture faculty.
3. **Physics 230** (in the current numbering system, **Physics 1230**). This Sophomore Level physics course is for aspiring majors. A central topic in the course is *Vibrations and Waves*. More recently, our faculty voted to include other topics including *Special Relativity* and *Classical Thermodynamics*, which I have also taught as part of the course.
4. **Physics Lab Lecture** (no longer offered). When I arrived at Penn, a lecture was dedicated to labs for *Introductory Physics* courses such as **Physics 101/102, 150/151**. The course involved a weekly lecture about the lab and about lab-related science in *mechanics, electricity and magnetism, optics*, and *statistical analysis*; the task also involved managing the labs and coordinating activity with the primary lecture course.
5. **Physics 421/529** (in current numbering system, **Physics 4421/5529**). I developed this course from scratch at Penn. It is a *Modern Optics* course intended for Senior Physics Majors, but it became apparent early-on that the course was very valuable for graduate (PhD and MD) students working in optics (*e.g.*, in the Physics and Astronomy department, and in other departments such as Chemistry, Materials Science and Engineering, Chemical Engineering, Electrical Engineering, and Medical Physics). Since many graduate students (PhD, MD) took the course, we augmented the course number to be **Physics 529**. Topics covered include: *introduction to wave phenomena (mainly math background), wave propagation, light interactions with linear media, geometric optics and spectroscopic instrumentation, Gaussian beams, diffraction/interference, holography, Fourier optics, coherence, polarization, quantum mechanical light-matter interactions, linear*

- spectroscopy, lasers (introductory), nonlinear spectroscopy (introductory), scattering from fluctuating media.* The course sometimes includes informal labs, time-permitting.
6. **Physics 530** (in current numbering system, **Physics 5530**). In essence, this course is **Modern Optics II**; it is advanced with respect to **Physics 421/529**. Topics covered include: *formal solutions of wave equation, Gaussian beams, resonators, guided waves (including coupled guided waves), photonic crystals and metamaterials, quantum mechanical linear and nonlinear spectroscopy, photon echoes, nonlinear optics, nonlinear microscopies, comprehensive theories of the laser, light forces (optical tweezers), light scattering, photon correlation spectroscopies, photon statistics, light diffusion, and more/different depending on time and progress in field.* **Physics 530** connects optics fundamentals to current research in optics and to applications of optics to other fields.

### PRIMARY PUBLICATIONS

**GOOGLE SCHOLAR: h-index - 120, Citations >51,000**

1. Carlson, N.W., Yodh, A.G., and Mossberg, T.W., Standing-wave-induced backward photon echoes in gases, *Physical Review Letters* **51**, 35-38 (1983).  
DOI: 10.1103/PhysRevLett.51.35
2. Carlson, N.W., Rothberg, L.J., Yodh, A.G., Babbitt, W.R., and Mossberg, T.W., Storage and time reversal of light pulses using photon echoes, *Optics Letters* **8**, 483-485 (1983).  
DOI:10.1364/OL.8.000483
3. Yodh, A.G., Bai, Y., Golub, J.E., and Mossberg, T.W., Grazing-incidence dye lasers with and without intracavity lenses: a comparative study, *Applied Optics* **23**, 2040-2042 (1984).  
DOI:10.1364/AO.23.002040, PMID:18212947
4. Yodh, A.G., Golub, J., Carlson, N.W., and Mossberg, T.W., Optically inhibited collisional dephasing, *Physical Review Letters* **53**, 659-662 (1984).  
DOI: 10.1103/PhysRevLett.53.659
5. Carlson, N.W., Yodh, A.G., and Mossberg, T.W., Standing-wave induced backward photon echoes in gases, in *Coherence and Quantum Optics V*, Mandel, L., and Wolf, E., eds., Plenum Press, 309-315 (1984).
6. Yodh, A.G., Golub, J., and Mossberg, T.W., Colliding without relaxing: The suppression of collisional dephasing with strong optical, in *Laser Spectroscopy VII*, Hänsch, T.W., and Shen, Y.R., eds., Springer-Verlag, 296-297 (1985).
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## INVITED TALKS

- University of Maryland, Department of Chemistry, Fall 1985 (Seminar).  
Aerospace Corporation, Los Angeles, CA, January 1986 (Seminar).  
Los Alamos National Lab, Los Alamos, New Mexico, January 1986 (Seminar).  
IBM Watson Research Center, Yorktown Heights, NY, Feb. 1986 (Seminar).  
AT&T Bell Laboratories, Murray Hill, NJ, Feb. 1986 (Seminar).  
AT&T Bell Laboratories, Holmdel, NJ, January 1988 (Seminar).  
University of Nebraska, Department of Physics, January 1988 (Colloquium).  
Columbia University, Department of Physics, February 1988 (Seminar).  
Yale University, Department of Physics, February, 1988 (Seminar).  
Georgia Tech University, Department of Physics, February, 1988 (Colloquium).  
University of Rhode Island, Department of Physics, February, 1988 (Seminar).  
University of Delaware, Department of Physics, February, 1988 (Seminar).  
University of Rochester, Department of Physics, February, 1988 (Seminar).  
Michigan State University, Department of Physics, March 1988 (Seminar).  
Purdue University, Department of Physics, March 1988 (Colloquium).  
Case Western Reserve University, Department of Physics, March 1988 (Colloquium).  
UCLA, Department of Physics, March, 1988 (Colloquium).  
University of Pennsylvania, Department of Physics, March 1988 (Seminar).  
UC Davis, Department of Physics, March 1988 (Seminar).  
Bryn Mawr College, PA, November 1989 (Colloquium).  
*The Fourth Binational US-USSR Symposium on "The Physics of Optical Phenomena and Their Use as Probes of Matter,"* Irvine, CA, Jan. 1990 (Invited Talk).  
Medical School, University of Pennsylvania, Philadelphia, PA, October 1990. (Seminar)  
Hercules Inc., Wilmington, Delaware, October 1990 (Seminar).  
Rowland Institute of Science/Harvard, Boston, MA, January 1991 (Seminar).  
University of Pennsylvania, Dept. of Chemistry, Philadelphia, PA, March 1991 (Seminar).  
*Structure Seminar*, Laboratory for Research on Structure of Matter, Univ. of PA, 1991 (Seminar).  
Johns Hopkins University, Dept. of Biophysics, Baltimore, Md., April 1991 (Seminar).  
Symposium on *Nonlinear Optics of Organic and Polymer Systems and Photonic Devices*, Philadelphia, PA, April 1991 (Invited Talk).  
1991 IEEE/MTT-S International Microwave Symposium, Session BB: *Time-Resolved Spectroscopy and Imaging of Tissue*, Boston, MA, June 1991 (Invited Talk).  
Naval Ocean Science Center, Dept. Solid State Electronics, San Diego CA, Aug. 1991 (Seminar).  
Naval Weapons Center, Department of Physics, China Lake CA, August 1991 (Seminar).

*180th Meeting of the Electrochemical Society, Nonlinear Optics and Materials Session* (Phoenix Arizona, (Oct. 13-17, 1991) (Invited Talk).

Yale University, Department of Physics, New Haven, Conn., Feb. 1992 (Colloquium).

Exxon Research Lab, East Annandale, NJ, March 1992, (Condensed Matter Seminar).

Optical Society of America, *8th Topical Meeting on Photon Correlation and Scattering*, Boulder, CO, Aug. 24-26, 1992 (Invited Talk).

Johnson Foundation, PENN, *Photon Migration in Physics, Biology, & Chemistry*, January 1992 (Seminar).

Indiana University of PA, Department of Physics, April 1992 (Colloquium).

Queen's College, Department of Physics, NY, May 1992 (Colloquium).

University of Delaware, Department of Physics, May 1992 (Seminar).

ICI Specialties, Wilmington Delaware, July 1992 (Seminar).

*Annual Meeting of the American Chemical Society*, Washington DC, August 24-28, 1992 (Invited Talk).

University of Pennsylvania, Department of Physics, September 1992 (Colloquium).

*Optical Society of America Annual Meeting*, Albuquerque, NM, September 20-25, 1992 (Invited Talk).

Princeton University, Department of Physics, 1992 (Condensed Matter Seminar)

SPIE Conference on *Photon Migration and Imaging in Random Media and Tissues*, January 1993, Anaheim, CA (Invited Talk).

SPIE Conference on *Ultrafast Spectroscopy of Advanced Electronic and Optoelectronic Materials*, January 1993, Anaheim, CA (Invited Talk).

Du Pont Co., Wilmington, Delaware, Feb. 1993 (Seminar).

University of Pennsylvania, Department of Chemical Engineering, Feb. 1993 (Colloquium).

IBM, Yorktown Heights, NY, March 1993 (Seminar).

*Engineering Foundation Conf. on Lasers in Medicine & Surgery III*, Palm Coast, Florida, March 1993.

*APS March Meeting*, March 22-26, 1993, Seattle, WA (Invited Talk).

University of Maryland, Department of Physics, April 1993 (Colloquium).

*Optical Society of America Conference on Quantum Electronics and Laser Science (QELS '93)*, Baltimore, MD, May 1993 (Invited Talk).

*International Spectroscopy on Luminescence and Optical Spectroscopy of Condensed Matter*, August 9-13, 1993, Storrs, Connecticut (Invited Talk).

Department of Radiology, University of Pennsylvania, Sept. 20, 1993 (Seminar).

*Interdisciplinary Laser Science Conference (ILS-IX)*, Toronto Canada, Oct. 3-8, 1993 (Invited Talk).

*Healthcare Innovations in Technology Systems*, (Henry Ford Health System), Atlanta, Georgia Oct. 10-13, 1993 (Invited Talk).

*Materials Research Society, Fall Meeting* Nov. 29 - Dec. 3, 1993, Boston, MA (Invited Talk).

SPIE Conference on *Laser Techniques for Surface Science*, Anaheim, CA, January 27-29, 1994 (Invited Talk).

University of Toronto, Department of Physics, January 31, 1994, Toronto, Canada (Seminar).

Gordon Research Conference, *Colloidal and Macromolecular Solutions*, Oxnard, CA, Feb. 1994 (Invited Talk).

*American Philosophical Society*, April 21-23 1994, Philadelphia, PA (Invited Talk).

*Conference of Lasers and Electro Optics (CLEO'94)*, May 1994, Anaheim, CA (Invited Talk).

*Adriatico Conference on Lasers in Surface Science*, Trieste, Italy, August 1994 (Invited Talk).

American Chemical Society, *Chemical Dynamics*, Washington DC, August 1994 (Invited Talk).

*Optical Society of America (ILS/OSA '94) Annual Meeting*, Oct. 1994, Dallas, TX (Invited Talk).

Temple University, Department of Physics, Nov. 14, 1994 (Colloquium).

*Medical Optical Imaging (MOI)*, Philadelphia, PA, Dec. 2, 1994 (Invited Talk).

*Workshop on Advanced Materials Characterization*, Univ. of PA, Nov. 1994 (Seminar).

Georgia Tech University, Department of Physics, Jan. 1995 (Colloquium).

*Future Directions of Lasers in Surgery and Medicine*, Salt Lake City, Utah, July 1995 (Invited Talk).

*Annual Meeting of Fine Particle Society, Colloidal Interactions*, Chicago, IL, August 1995 (Invited Talk).

Gordon Research Conference, *Surface Dynamics*, New Hampshire, August 1995 (Invited Talk).

*Optical Society of America (ILS/OSA '95) Annual Meeting*, Portland, Oregon Sept. 1995 (Invited Talk).

City College of New York (CCNY), *Conference on Interface Characterization*, New York, NY, October 1995 (Invited Talk).

General Electric Co., Schenectady, NY, December 13, 1995 (Seminar).

Rockefeller University, New York, NY, December 12, 1995 (Colloquium).

University of Pennsylvania, "*Retreat on Imaging*," Philadelphia, PA (Wharton-Sinkler Mansion) Dec. 19, 1995 (Invited Talk).

Mobil Corporation, New Jersey. January 9, 1996 (Seminar).

University of Virginia, Department of Physics, January 26, 1996, Charlottesville, VA (Seminar).

University of Delaware, Department of Physics, March 1996 (Seminar).

Rutgers University, Department of Physics, March, 1996, New Brunswick, NJ (Seminar).

University of Rochester, Department of Physics, Rochester, NY March 1996 (Seminar).

Case Western Reserve, Department of Physics, Cleveland, OH, April 18, 1996 (Colloquium).

Case Western Reserve, Dept. of Biophysics & Medical School, Cleveland OH, April 18, 1996 (Seminar).

Case Western Reserve, Department of Physics, Cleveland OH, April 19, 1996 (Seminar).

Radiology Grand Rounds, Univ. of PA, May 21, 1996 (Seminar/Panel Discussion).

*Gordon Conference on Lasers in Biology*, Meriden, New Hampshire, June 1996 (Invited Talk).

*“Vibrations at Surfaces,” VIII International Conf.*, Birmingham, UK, June 23-27, 1996 (Invited Talk).

*Workshop on Rough Surface Scattering and Related Phenomena*, Yountville, CA, June 24-27, 1996 (Invited Talk).

*International Workshop on Nonlinear Optics of Semiconductor Surfaces*, Max-Planck-Institute fuer Quantenoptic, Munich, Germany, Sept. 22-25, 1996 (Invited Talk).

*Annual Meeting of European Colloid Community (ECC)*, Nov. 28-30, 1996, Lyon, France (Invited Talk).

University of Pennsylvania Medical School, Department of Radiation Oncology, Jan. 23, 1997 (Seminar).

Brown University, Department of Physics, Providence, RI, January 30, 1997 (Seminar).

*Coherence Domain Optical Methods in Biomedical Science and Clinical Applications*, SPIE/BIOS'97, San Jose, CA, Feb., 13, 1997 (Invited Talk).

*Les Houches Winter School on Diffuse Waves in Complex Media*, Les Houches, France, March 17-27, 1998 (3 Lectures).

*APS March Meeting*, Kansas City, Missouri, March 21, 1997 (Invited Talk).

University of Rochester, Institute of Optics, Rochester, NY, March 24, 1997 (Seminar).

*Symposium on Soft Materials*, Laboratory for Research on the Structure of Matter (LRSM), University of Pennsylvania, Philadelphia, PA, May 29, 1997 (Invited Talk).

*International Conference on Breast Cancer Detection by Near Infrared Spectroscopy and Imaging*, Humboldt-Universitat zu Berlin, Berlin, Germany June 6-7, 1997 (Invited Talk).

*Max-Planck-Institut fuer Kolloid- and Grenzflaechenforschung (MPI-KG)*, Berlin, Germany, June 9, 1997 (Seminar).

*71st ACS Colloid & Surface Science Symposium*, University of Delaware, Newark, DE, June 29-July 2 (1997) (Keynote Lecture).

*Lasers in Medicine*, Engineering Foundation, Snowbird, Utah, July 13-18, 1997 (Invited talk about Group Research given by my PhD student Xingde Li).

Philadelphia College of Pharmacy and Science, Department of Mathematics, Physics & Computer Science, Philadelphia, PA, September 23, 1997 (Colloquium).

Duke University, Department of Physics, September 24, 1997, Durham, NC (Colloquium).

*Interdisciplinary Laser Science Meeting (ILS-XIII)*, “*Innovative Career Pathways in Optical Physics, PhD.....Now What?*” Long Beach, CA, Oct. 12-17, 1997 (Invited Talk).

Ecole Normal Superior (ENS) de Lyon, Dept. of Physics, Lyon, France, Dec. 2, 1997 (Seminar).

Boston University, Dept. of Physics, Boston, MA, Dec. 11, 1997 (Seminar).

*Winter Physics Conference*, Aspen Center for Physics, Aspen, CO, January 22, 1998 (Invited Talk).

Mallinckrodt Medical, St. Louis, MO, Feb. 19, 1998 (Seminar).

*APS March Meeting*, Los Angeles, CA, March 1998 (Invited talk about Group Research presented by my Post-doc, John Crocker).

Harvard University, Department of Physics, Cambridge, MA, April 10, 1998 (Seminar).

Johns Hopkins University, Applied Physics Lab, April 3, 1998, Columbia, MD, (Colloquium).

Drexel University, Dept. of Biosciences & Engineering, Philadelphia, PA, April 17, 1998, (Seminar).

UC Irvine, Department of Physics, Irvine, CA, May 1, 1998 (Colloquium).

Univ. of Connecticut, Dept. of Electrical Engineering, Storrs, Conn., Dec. 11, 1998 (Colloquium).

*Materials Science Summer Institute (MASSI) on Complex Fluid Materials*, Joint Summer School given by Princeton/Rutgers/PENN, Georgian Court College, Lakewood, NJ, July 27-August 7, 1998 (4 Lectures).

*Conference on Photon Migration in Tissues*, BIOS section of the International Conference on Electro-Optics, and Optoelectronics in Europe, Stockholm, Sweden, Sept. 10, 1998 (Invited Talk).

NEC Research Institute, Princeton, NJ, Sept. 25, 1998 (Condensed Matter Physics Seminar)

*Structure in Solution*, Symposium sponsored by Princeton University and Rhodia Inc., Princeton, NJ, Oct. 1998 (Invited Talk).

*DuPont-PENN Symposium on 'Colloidal Science'*, Philadelphia, PA Oct. 28, 1998 (Invited Talk).

*UCSB-JNCASR-IISC Joint Workshop on Frontiers of Materials Science & Engineering*, Bangalore, India, Nov. 15-20, 1998 (Invited Talk).

New York University, Physics Department, New York City, Dec. 10, 1998 (Colloquium).

Princeton University, Physics Department, Princeton, NJ, April 12, 1999 (Seminar).

University of Maryland, Chemistry Department, College Park, MD, April 14, 1999 (Seminar).

New York University, Physics Department, New York City, April 23, 1999 (Seminar).

*Gordon Conference on Condensed Matter Physics*, New London, CT, June 13-18, 1999 (Invited Talk).

*4th Liquid Matter Conference*, Granada, Spain, July 3-7, 1999 (Invited Talk).

*Advances in Optics for Biotechnology, Medicine and Surgery*, United Engineering Foundation Conference, Kona, Hawaii, August 1-6, 1999 (Invited Talk / Session Leader).

*Symposium on Complex Fluids (Symposium for Phil Pincus)*, University of California at Santa Barbara (UCSB), Santa Barbara, Aug. 22-25, 1999 (Invited Talk).

*International Conference on Laser Science (ILS'99)*, Santa Clara, CA, September 1999 (Invited Talk).

*National Institutes of Health Workshop on In-Vivo Optical Imaging*, Bethesda, MD, Sept. 1999 (Invited Talk).

*International Symposia on Industrial Lasers and Biomedical Optics, BMO'99*, Huazhong University of Science and Technology, Wuhan, China, Oct. 26, 1999 (Invited Talk).

Rice University, Dept. of Physics, Houston, Texas April 19, 2000 (Colloquium).

Rice University, Dept. of Bioengineering, Houston, Texas April 20, 2000 (Seminar).

Princeton University, Dept. of Chemical Engineering, Princeton, NJ, April 24, 2000 (Seminar).

*33<sup>rd</sup> Middle Atlantic Regional Meeting of the American Chemical Society*, University of Delaware, Newark, Delaware, May 15-17, 2000 (Invited Talk).

*Gordon Conference on Lasers in Medicine and Biology*, New London, CT, June 11-16, 2000 (Invited talk about Group Research given by my post-doc Joe Culver).

*Division of Atomic, Molecular & Optical Physics, DAMOP Annual Meeting*, Storrs, CT, June 14-17, 2000 (Invited Talk).

*Gordon Conference on Chemistry at Interfaces*, Meriden, NH, July 2-6, 2000 (Invited Talk).

*5<sup>th</sup> Microgravity Fluid Physics Conference*, Cleveland OH, Aug, 8-10, 2000 (Invited Talk).

*Photon Correlation and Spectroscopy Topical Meeting of the Optical Society of America*, Whistler, Canada, August 21-23, 2000 (Invited Talk).

*Interactions, Structure, and Phase Behavior of Colloidal Dispersions*, Discussion Meeting of the Royal Society, London, England, October 25-27, 2000 (Invited Talk).

*The Interface between Biology and Materials Science*, University of Pennsylvania, Philadelphia, PA, November 2-4, 2000 (Invited Talk).

Presentation at DARPA meeting *Optical Technologies in Biomedicine*, Washington, DC, Jan. 12, 2001 (Invited Seminar).

University of Pittsburgh, Department of Physics, Pittsburgh, PA, January 29, 2001 (Colloquium).

University of Chicago, Department of Chemistry, Chicago, IL, February 5, 2001 (Seminar).

University of Delaware, Department of Physics, Newark, DE, February 7, 2001 (Colloquium).

Johns Hopkins University, Department of Physics, Baltimore, MD, Feb. 8, 2001 (Colloquium).

Kent State University, Department of Physics, Kent, OH, Feb. 15, 2001 (Colloquium).

Federal Data Corporation, (for NASA flight), Cleveland, OH, Feb. 22, 2001 (Seminar).

*Particles 2001*, Orlando, Florida (Feb. 24-27, 2001) (*Plenary Lecture*).

University of Pennsylvania, Department of Bioengineering, Philadelphia, PA, March 8, 2001 (Seminar).

Ramapo College, gave *Sigma Xi Lecture*, Mahwah, NJ, March 9, 2001 (Public Lecture).

*APS March Meeting*, Seattle, Washington, March 12-16, 2001 (Invited talk about Group Research given by my PhD student Keng-hui Lin)

Harvard University, Department of Chemistry, Cambridge, MA, March 29, 2001 (Seminar).

Georgetown University, Department of Physics, Georgetown, DC April 5, 2001 (Colloquium)

Presentation for National Research Council Review Committee, *Colloid Science in Microgravity*, Washington, DC, April 18, 2001 (Invited Talk).

*The Physics of Soft Matter*, the 21<sup>st</sup> Annual Conference of the Center for Nonlinear Studies at Los Alamos Nat. Lab., Santa Fe, New Mexico, May 21-25, 2001 (Invited Talk).

*Colloidal Stability and Aggregation Dynamics*, American Chemical Society Colloids and Surface Symposium, Carnegie Mellon Univ., Pittsburgh, PA, June 10-13, 2001 (Keynote Lecture).

*ICOLS, 15<sup>th</sup> International Conf. on Laser Spectroscopy*, Snowbird, Utah, June 13-15, 2001 (Invited Talk).



University of Florence, Laser Science Institute, Florence, Italy, June 27, 2001 (Seminar).  
*Advancing Frontiers of Condensed Matter Physics, "Non-conventional systems and new directions,"* Abdus Salam International Center for Theoretical Physics, Trieste, Italy, July 2-6, 2001 (Invited Talk).

Exxon-Mobil, East Annandale, NJ, July 16, 2001 (Seminar).  
*Advances in Optics for Biotechnology, Medicine & Surgery, United Engineering Foundation Conf.,* Banff, Alberta, Canada July 22-27, 2001. (Invited talk about Group Research, given by my post-doc Joe Culver).

Colorado School of Mines, Golden, CO, Jan. 10-11, 2002 (*Heiland Lecture*).

Ohio State University, Department of Physics, Columbus, OH, Jan. 29-30, 2002 (Colloquium).

Princeton Chapter of Sigma Xi, *Sigma Xi Lecture*, Princeton, NJ, Feb, 7, 2002 (Public Lecture).

University of Pennsylvania, Department of Physics, Philadelphia, PA, Feb. 2002 (Colloquium).

*APS March Meeting*, Indianapolis, Indiana, March 18-22, 2002, (Invited talk about Group Research given by my PhD student Turgut Durduran).

*Society of Cosmetic Chemists*, Ringwood, NJ, April 1, 2002, (Seminar).

Massachusetts Institute of Technology, *Modern Optics & Spectroscopy Seminar Series*, Cambridge, MA, May 7, 2002 (Seminar).

*12th International Conference on Photoacoustic and Photothermal Phenomena*, Toronto, Canada, June 24 – 25, 2002 (Invited Talk).

Gordon Conference: *Granular & Granular-Fluid Flow*, Holderness School, Plymouth, NH, June 30 – July 3, 2002 (Invited Talk).

*Sixth Microgravity Fluid Physics and Transport Phenomena Conference*, Cleveland, Ohio, August 13 – 16, 2002 (Invited Talk).

Gordon Conference: *Lasers in Medicine & Biology*, Kimball Union Academy, (near Manchester), NH, July 14 – 17, 2002 (Invited Talk).

*Soft Matters I* (Joint Symposium of the LRSM and the Max Planck Institute for Colloid and Interface Science), University of Pennsylvania, Philadelphia, PA, Sept. 27, 2002 (Invited Talk).

*Annual Meeting of the Optical Society of America (ILS/OSA)*, Orlando, FL, Oct. 2, 2002 (Invited Talk).

*BioPhotonics 2002 European Workshop*, Heraklion, Crete, Greece, October 16 – 21, 2002 (Invited Talk).

University of New Mexico, Dept. of Physics, Albuquerque, NM, Nov. 7, 2002 (*Sigma Xi Public Lecture*).

University of New Mexico, Dept. of Physics, Albuquerque, NM, Nov. 8, 2002 (Colloquium).

*Photonics 2002, Sixth International Conference on Optoelectronics, Fiber Optics and Photonics*. Mumbai, India, December 15, 2002 (Invited Talk).

Tata Institute of Fundamental Research, Mumbai, India, December 18, 2002 (Colloquium).

Indian Institute of Technology (IIT), Mumbai, India, December 19, 2002 (Seminar).

Harvard Medical School Department of Radiology and MGH/NMR Center, Cambridge, MA, January 9, 2003 (Seminar).

Haverford College, Department of Physics, Haverford, PA, March 21, 2003 (2 Lectures: Colloquium and an in-class lecture on *Biomedical Imaging*).

*Soft Matters II* (Joint Symposium of the LRSM and the Max Planck *Institute for Colloid and Interface Science*), Berlin, Germany, May 13, 2003 (Invited Talk).

Centre Européen de Calcul Atomique et Moléculaire (CECAM), Lyon, France, July 5-9, 2003 (Invited Talk).

Utrecht University, Departments of Chemistry and Physics, Utrecht, Netherlands, July 11, 2003 (Seminar).

*Advances in Optics for Biotechnology, Medicine and Surgery*, United Engineering Foundation Conference, Banff, Canada, August 2-6, 2003 (Invited overview of sub-field).

*American Chemical Society (ACS) National Meeting, Colloids Section*, New York, NY, Sept. 7-8, 2003 (Invited Talk).

*Soft Matter Days*, Kerkrade, Netherlands, November 17-21, 2003 (Invited Talk).

AstraZeneca, Wilmington, DE, January 9, 2004 (Seminar)

*SPIE Meeting on Biomedical Optics*, San Jose, CA, January 23-25, 2004 (Invited Talk).

Penn State, Department of Physics, State College, PA, Feb. 12, 2004 (Colloquium)

*Particles 2004*, Orlando, FL, March 7-8, 2004 (Invited Lecture).

Lehigh University, Department of Physics, Bethlehem, PA, April 8, 2004 (Colloquium)

Network for Optical Imaging of Breast (NTROI), UC Irvine, Irvine, CA, June 4-6, 2004 (Invited Talk).

*Summer School on Colloids and Soft Materials*, Eastern Michigan University, Ypsilanti, Michigan, June 16-17, 2004 (2 Lectures).

*From Hard to Ultrasoft Colloids*, Koutouloufari, Crete, Greece, June 22-29, 2004 (Invited Talk).

FORTH Institute at University of Crete, Iraklio, Crete, Greece, June 25, 2004 (Colloquium).

Advanced Research Technologies (ART, Inc.), Montreal, Canada, Aug. 18-19, 2004 (Seminar).

Levich Institute, City University of New York (CUNY), New York, NY, Sept. 7, 2004 (Seminar).

University of Illinois, Beckman Center, Urbana-Champaign, IL, Oct. 18, 2004 (Seminar).

University of Illinois, Department of Materials Science & Engineering, Urbana-Champaign, IL, Oct. 19, 2004 (Colloquium).

IBM, Yorktown Heights, NY, October 29, 2004 (Seminar).

Institute of Medicine and Engineering (IME), University of Pennsylvania, Philadelphia, PA, December 2, 2004 (Seminar)

Bucknell University, Department of Physics, Lewisburg, PA, Dec. 7-8, 2004 (Colloquium).

*SPIE Biomedical Optics Symposium: Hot Topics Session*, San Jose, CA, Jan. 22, 2005 (Invited Talk).

NIST Conference on *Nanotube Dispersions & Processing*, National Institute for Standards & Technology, Gaithersburg, MD, January 27, 2005 (Invited talk about Group Research given by my post-doc Mohammad Islam).

Avon, Suffern, NY, Feb. 8, 2005 (Seminar)

Princeton University, Department of Physics, Princeton, NJ, March 28, 2005 (Seminar).

*Frontiers of Soft Condensed Matter Symposium (Symposium for Tom Lubensky & Paul Chaikin)*, Exxon-Mobil Research Labs, East Annandale, NJ, May 18-20, 2005 (Invited Talk).

Network for Optical Imaging of Breast (NTROI), UC Irvine, Irvine, CA, June 2-3, 2005 (Invited Talk).

*79<sup>th</sup> Annual ACS Colloids and Surface Science Symposium*, Clarkson University, Potsdam, NY, June 13-14, 2005 (Invited Talk).

*Optical Imaging Retreat for PENN Center for Technology Transfer (CTT)*, Philadelphia, PA, June 29, 2005 (Invited Talk).

*Applications of Optics to Biology and Medicine*, Engineering Foundation Conference, Copper Mountain, CO, July 25-28, 2005 (Invited Talk).

Temple University, Department of Physics, Philadelphia, PA, Sept. 12, 2005 (Colloquium).

Rhodia, Inc., Cranbury, NJ, September 27, 2005 (Seminar).

*Optics for Studies of Brain (Symposium)*, Bad Honnef, Germany, Oct. 31-Nov.4, 2005 (Invited Talk).

University of Delaware, Department of Chemical Engineering, Newark, Delaware, Nov. 22, 2005 (Seminar).

*Symposium on Statistical Physics (Annual meeting)*, Rutgers University, New Brunswick, NJ, December 19-20, 2005 (Invited Talk).

*International Winter School on Applications of Modern Optics to Condensed Matter Sciences*, Chinese Academy of Sciences, Beijing, China January 5-9, 2006 (2 Lectures).

*OSA Biomedical Optics Topical Meeting*, Fort Lauderdale, Florida, March 19-22 2006 (Invited Talk).

OSA Topical Meeting *Photonic Metamaterials: From Random to Periodic*, Freeport, Bahamas, June 5-7 2006 (Invited Talk).

Network for Optical Imaging of Breast (NTROI), UC Irvine, Irvine, CA, June 22-23, 2006 (Invited talks about Group Research (3) from my PhD/Post-doc group members, R. Choe, S. Konecky, K. Lee).

*21<sup>st</sup> International Liquid Crystal Conference*, Keystone, Colorado, July 2-7, 2006 (Invited Talk).

*Gordon Research Conference on Physical Metallurgy*, Holderness School, Plymouth, NH, July 23-28, 2006 (Invited Talk).

*World Congress on Medical Physics & Bioengineering*, Seoul, Korea, August 27-Sept. 1, 2005 (2 Talks: Invited talk and Tutorial Lecture about Diffuse Optics).

*American Chemical Society (ACS) National Annual Meeting*, San Francisco, CA. Sept. 10-14, 2006 (*Langmuir Lecture*).

*Symposium on Formulation of Soft Matter*, Rhodia Inc., Bristol, PA, Nov. 13, 2006 (Invited Talk).

University of Pennsylvania Medical School (HUP), Department of Physical Medicine and Rehabilitation, Philadelphia, PA, December 19, 2006 (Seminar).

*Joint Symposium on Frontier Materials Research*, Academia Sinica/LRSM-MRSEC, Taipei, Taiwan, January 4-10, 2007 (Invited Talk).

Wayne State University, Department of Physics, Detroit, MI, January 24-25, 2007 (Colloquium).

Rutgers University, Department of Mechanical Engineering & Applied Mechanics (MEAM), New Brunswick, NJ, February 7, 2007 (Seminar).

Duke University, Department of Physics, Durham, NC, April 8-10, 2007 (Colloquium).

University of Massachusetts at Amherst, Department of Polymer Science, Amherst, MA, April 12-14, 2007 (Colloquium).

*MGH/MIT Lester Wolfe Workshop on Biomedical Optics*, Massachusetts General Hospital (MGH), Boston, MA, April 17-18, 2007 (Invited Talk).

*Annual Meeting of the American Colleges of Sports Medicine*, New Orleans, LA, May 30 to June 1, 2007 (Invited Talk).

*Gordon Research Conference on Liquid Crystals*, New London, New Hampshire, June 10-12, 2007 (Invited Talk).

*ACS 81<sup>st</sup> Annual Conference on Surfaces and Colloid Science*, University of Delaware, Newark, Delaware, June 25-27, 2007 (Invited talks about Group Research (2) given by my Post-docs, Y. Han, A. Alsayed).

Network for Optical Imaging of Breast (NTROI), UC Irvine, Irvine, CA, June 28-30, 2007 (Invited talk about Group Research given by my Post-doc, R. Choe).

*Conference on Correlated Systems in Applied Physics*, University of Tokyo, Tokyo, Japan, September 25-30, 2007 (Invited Talk).

Vanderbilt University, Department of Physics, Nashville, Tennessee, Nov. 8, 2007 (Colloquium).

Harvard University, Department of Physics, Cambridge, MA, Nov. 30, 2007 (Seminar).

University of Chicago, Department of Physics, Chicago, Illinois, January 31, 2008 (Colloquium).

Johns Hopkins University, Department of Chemical & Biomolecular Engineering, Baltimore, Maryland, February 20, 2008 (Seminar)

*ACC Radiation Biology Program Research Meeting*, 196 John Morgan Building, School of Medicine, University of Pennsylvania, Philadelphia, PA, April 3, 2008 (Seminar).

*SPIE Conference on Optical Trapping and Optical Micromanipulation*, San Diego, CA, August 8-10, 2008 (Invited Talk).

*Engineering in Medicine & Biology-LEOS Symposium on Biomedical Optics*, Vancouver, Canada, August 20-21, 2008 (Invited Talk).

University of Washington, Department of Chemistry, Seattle, WA, October 7-9, 2008 (Colloquium).

Oregon Health Sciences University, Portland, Oregon, October 9-11, 2008 (Seminar).

Department of Physics, Emory University, Atlanta, GA, October 24, 2008 (Colloquium).

*Bi-annual Southeastern US Complex Fluids Meeting*, Atlanta, GA, October 25, 2008 (Invited Talk).

*International Conference on Lasers in Life Sciences*, Taipei, Taiwan, December 3-6, 2008 (Invited Talk).

Yangming University, Dept. of Neuroscience, Taipei, Taiwan, December 5, 2008 (Seminar).

Academia Sinica, Physics Division, Taipei, Taiwan, December 8, 2008 (Seminar)

Hong Kong University of Science & Technology (HKUST), Physics Department, Hong Kong, December 11, 2008 (Seminar).

Beckman Laser Center, Bioengineering/Medical School, UC Irvine, Irvine, CA, Jan. 23, 2009 (Seminar).

*Biophotonics/SPIE BiOS: "Hot Topics,"* San Jose, CA, January 25 – 26, 2009 (Invited Talk).

*Ringberg Castle Soft Matter Conference*, Krueth, Germany, March 7-10, 2009 (Invited Talk).

University of Stuttgart, Department of Physics, Stuttgart, Germany, March 11, 2009 (Seminar).

*APS March Meeting*, Pittsburgh, PA, March 18 – 19, 2009 (Invited Talk).

University of Minnesota, Department of Chemical Engineering, Minneapolis, MN, March 30-31, 2009 (Seminar).

Cornell University, Department of Physics, Ithaca, NY, April 19-21, 2009 (Colloquium).

Presented *Lectures on Diffuse Optics: Fundamentals & Tissue Applications*, CLXXIII International School of Physics "Enrico Fermi", Varenna, Italy, June 26 - July 3, 2009. (2 Lectures)

Presented *Lectures and Experiments at Hands-On Research in Complex Systems School*, Universidade Federal do ABC, Santo André, Sao Paulo, Brasil, July 28 to August 7, 2009 (Invited Talk / Lab Course).

*EMBC-IEEE Conference on Biomedical Engineering*, Minneapolis, MN, Sept. 3-4, 2009 (Invited Talk).

Rochester Institute of Technology and University of Rochester (Joint), Departments of Physics, Rochester, NY, December 10-11, 2009 (Seminar).

ICFO (Institute of Photonics Sciences), Barcelona, Spain, January 9, 2010 (Colloquium)

ICFO (Institute of Photonics Sciences), Barcelona, Spain, January 10, 2010 (Seminar)

University of Barcelona, Department of Physics, Barcelona, Spain, January 11, 2010 (Seminar)

University of Texas, Biomedical Engineering Department, Austin, Texas, Feb. 11, 2010 (Colloquium)

*APS March Meeting*, Portland, Oregon, March 15-18, 2009 (Invited talk about Group Research given by my Post-doc Zexin Zhang).

*1st COMPASS Symposium of the LRSM-Rhodia-CNRS Soft Matter Collaboration*, University of Pennsylvania, Philadelphia, PA, April 29, 2010 (Invited Talk).

*Fourth annual PREM Symposium: Soft Matters*, University of Puerto Rico at Humacao, Puerto Rico, May 5-9, 2010 (Invited Talk / Session Chair).

*Conference on Lasers and Electro-Optics (CLEO) 2010*, San Jose, CA, May 17-18, 2010 (Invited Talk).

*Mid-Atlantic Soft Matter Workshop (MASM)*, Georgetown University, Washington DC, June 17-18, 2010 (Invited Talk).

*2nd Annual Bragg-Stoner Symposium "Understanding Frustrated Interactions Using Nanotechnology,"* University of Leeds, Leeds, UK, July 10-15, 2010 (Invited Talk).

*Center of Integrated Nanotechnologies (CINT) User Conference,* Joint Los Alamos National Lab & Sandia National Lab Sponsorship, Albuquerque, NM, August 10-11, 2010 (Invited Talk).

*North American Thermal Analysis Society (NATAS),* University of Pennsylvania, Philadelphia, PA, August 17-18, 2010 (*Plenary Lecture*).

*1<sup>st</sup> fNIRS (Functional Near-Infrared Spectroscopy) of Brain Workshop,* Harvard University, Cambridge, MA, October 15-17, 2010 (Invited Talk).

*Advances in Breast Cancer Research Workshop,* University of Arkansas, Fayetteville, Arkansas, October 26-28, 2010 (Invited Talk).

*Royal Society Theo Murphy meeting on Biomedical Optics,* The Kavli Royal Society International Center, London UK, November 6-10, 2010 (Invited Talk).

University of Pennsylvania, Department of Radiology, Philadelphia, PA, January 18, 2011 (Seminar).

*Photonics West, SPIE Hot Topics Session, "Britton Chance Retrospective",* San Francisco, CA, January 22-27, 2011 (Invited Talk).

University of Illinois, Department of Electrical and Computer Engineering (ECE), Urbana-Champaign, IL, February 17, 2011 (Colloquium).

University of Pennsylvania, Department of Radiology Grand Rounds, Philadelphia, PA, February 22, 2011 (Seminar).

National Science Foundation (NSF) Partnership for Research and Education in Materials (PREM) and MRSEC Joint Directors Meeting, Puerto Rico, March 9-11, 2011 (Invited talk).

*APS March Meeting,* Dallas, TX, March 21-25, 2011 (Invited talk presented by my Post-doc Ke Chen).

*American Chemical Society, Symposium on "Dynamics of Colloid Dispersions,"* Anaheim, CA, March 28, 2011 (Invited talk about Group Research presented by my PhD student Peter Yunker).

*LRSM Science Café Program 2010/2011,* Stoney's, Wilmington, DE, April 25, 2011 (Public Lecture).

*Symposium: Britton Chance: His Life, Times, & Legacy,* Fisher Translational Research Center, University of Pennsylvania, Philadelphia, PA, June 3, 2011 (Invited Talk).

*NIH Bench to Bed-Side meeting,* National Institutes of Health, Bethesda, MD, September 14-15, 2011 (Invited Talk).

*Soft Matter & Innovation (Symposium for Dave Weitz),* Harvard University, Cambridge, MA, October 8-10, 2011 (Invited Talk).

State University of New York at Stony Brook, Department of Biomedical Engineering, NY, October 19, 2011 (Seminar).

*Diffuse Optical Imaging Workshop,* Rensselaer Polytechnic Institute, Troy, NY, October 27-28, 2011.

Chang Gung University (CGU) and Chang Gung Memorial Hospital (CGMH) Joint-sponsorship, Taoyuan, Taiwan, November 2, 2011 (Colloquium).

Yang Ming University, Taipei, Taiwan, November 3, 2011 (Seminar).

Stanford University, Department of Bioengineering, Palo Alto, CA, December 6, 2011 (Seminar).

National Institute of Materials Science (NIMS), Tsukuba, Japan, Dec. 21, 2011 (Seminar).

University of North Carolina, Department of Physics, Chapel Hill, NC, January 9, 2012 (Colloquium).

*ACC Breast Cancer Program Scientific Retreat*, Hospital at the University of Pennsylvania, Philadelphia, PA, January 27, 2012 (Seminar).

*LRSM Science Café 2011-12*, Dark Horse Pub, Philadelphia, PA, February 6, 2012 (Public Lecture).

University of Massachusetts at Amherst, Dept. of Physics, Amherst, MA, Feb. 8, 2012 (Colloquium).

*Bi-Annual Conference of Peace through Mind-Brain Research*, Hammamatsu, Japan, February 15, 2012 (Invited Talk).

*APS March Meeting*, Boston, MA, February 28, 2012 (Invited Talk).

*APS March Meeting*, Boston, MA, March 2, 2012 (Invited talk presented by my PhD student Peter Yunker).

University of Southern California (USC), Department of Physics, Los Angeles, CA, April 6, 2012 (*Distinguished Lecture*).

*ACC Program in Radiology and Imaging Lecture Series*, Hospital at the University of Pennsylvania (HUP), Philadelphia, PA, April 26, 2012 (Seminar).

*Frontiers of Soft Matter 2012 Symposium (Symposium for Noel Clark)*, University of Colorado, Boulder CO, May 16-18, 2012 (Invited Talk).

*COMPLOIDs Annual Meeting 2012*, University of Edinburgh, Edinburgh, UK, May 29-June 2, 2012 (Invited Talk).

*Biomedical Imaging Retreat 2012*, Hospital at the University of Pennsylvania (HUP), University of Pennsylvania, Philadelphia, PA, June 7, 2012 (Invited Talk).

*86<sup>th</sup> Annual ACS Colloid & Surface Chemistry Symposium*, Johns Hopkins, Baltimore, MD, June 11-12, 2012 (*Plenary Lecture*).

École Supérieure de Physique et de Chimie Industrielles (ESPCI), CNRS Gulliver Seminar, Paris, France, June 25, 2012 (Seminar).

Lecturer at the *International "Enrico Fermi" International School of Physics, Physics of Complex Colloids 2012*, Varenna, Italy, July 7, 2012 (Invited Lectures).

American Chemical Society National Meeting, Philadelphia, Marriott, Franklin Hall, Philadelphia, PA, August 21, 2012 (Invited Talk).

Rensselaer Polytechnic Institute (RPI), Department of Chemical Engineering, Albany, NY, September 11-12, 2012 (Colloquium).

University of Akron, Polymer Science Institute, Akron, OH, Sept. 20-21, 2012 (Colloquium).

Tufts University, Department of Physics, Medford, MA, October 4-5, 2012 (Colloquium).

University of Ljubljana, Department of Electrical Engineering, Ljubljana, Slovenia, October 10, 2012 (Seminar).

*Workshop on Assembling of Superstructures in Soft Matter*, Ljubljana, Slovenia, October 11-14, 2012 (Invited Talk).

*Workshop on Fluidity, Rigidity, Adaptability Frontiers*, University of Chicago, Chicago, IL, October 26-28, 2012 (Invited Talk).

Brain Behavior Lab, Hospital at the University of Pennsylvania (HUP), Dept. of Neuropsychology, Philadelphia, PA, December 6, 2012 (Seminar).

Rowan University, Department of Physics, Glassboro, NJ, February 22, 2013 (Colloquium)

Lester-Wolfe Workshop *Light in the Brain: Neurodegeneration & Neuroprotection*, sponsored by MIT and the Wellman Laser Labs, Wellman Conference Center, Cambridge, MA, April 30-May 1, 2013 (Invited Talk).

*Chance 100<sup>th</sup> Symposium on Metabolic Imaging and Spectroscopy*, University of Pennsylvania, Philadelphia, PA, June 18-19, 2013 (Invited Talk).

ETH University, Zurich, Switzerland, June 26, 2013 (Seminar).

*CECAM Meeting on Glasses*, CECAM-ETHZ, Honggerberg Campus, Zurich, Switzerland, June 26-27, 2013 (Invited Talk).

*Evolution of Colloidal Matter (Symposium for David Pine)*, Center for Genomics and Systems Biology, New York University, New York City, NY, June 27-29, 2013.

University of Bordeaux, Centre de Recherche Paul-Pascal, Bordeaux, France, July 2-7, 2013 (Colloquium).

Institute of Physics of UNICAMP (Campus Universitario Zeferino Vaz SN - Cidade Universitaria), Campinas, Sao Paulo, Brazil, July 15, 2013 (Colloquium).

*IFGW Winter School*, Institute of Physics of UNICAMP (Campus Universitario Zeferino Vaz SN - Cidade Universitaria), Campinas, Sao Paulo, Brazil, July 14-19, 2013 (2 Winter School Lectures).

*7<sup>th</sup> International Discussion Meeting in Complex Systems (IDMCS)*, Universitat Politècnica de Catalunya, Barcelona, Spain, July 21-26, 2013.

*SPIE, OTOMX: Optical Trapping & Optical Micromanipulation*, SPIE Optics + Photonics 2013, San Diego, CA, August 25-29, 2013.

*ACS 246<sup>th</sup> National Meeting*, Convention Center, Indianapolis, IN, September 8-12, 2013.

133<sup>rd</sup> ICB Seminar on *Optoelectronics in Medical Diagnosis (Optics for Brain Symposium) at International Centre of Bio-cybernetics (ICB)*, Warsaw, Poland. September 25-29, 2013.

*Photonics Workshop, ABEC – Australian Biomedical Engineering Conference*, Sydney, Australia, October 14, 2013.

University of Sydney, School of Chemistry, Sydney, Australia, October 15, 2013 (Seminar).

University of Sydney, School of Electrical & Information Engineering, Sydney, Australia, October 16, 2013 (Seminar).

*Complex Fluids 4, American Society for Gravitational and Space Research (ASGSR)/ International Symposium for Physical Sciences in Space (ISPS)*, Orlando, FL, Nov. 7-8, 2013.

Los Alamos National Laboratory, Los Alamos, NM, January 5-8, 2014 (Seminar).



Georgia Tech, *Squishy Physics Saturday*, Atlanta, GA, March 21-23, 2014 (*Public Lecture on the Physics of Chocolate*).

*8<sup>th</sup> Annual Symposium on NSF-PREM-related Research*, University of Puerto Rico, Humacao, Puerto Rico, May 15 – 16, 2014 (Invited speaker/chair).

*International Workshop on Tissue Phantoms and Standardization in Biophotonics*, University of Maryland, College Park, MD, May 20-21, 2014 (Invited Talk).

Penn Outreach Nano-Media Event, Univ. of Penn Club, New York, NY, June 6, 2014 (Invited Talk).

*International Society on Oxygen Transport to Tissue (ISOTT) Annual Meeting*, University College London, London, UK, June 27 to July 3, 2014 (Invited Talk).

*9<sup>th</sup> Liquid Matter Conference*, Univ. of Lisbon, Lisbon, Portugal, July 19-26, 2014 (Keynote Lecture).

Chinese Academy of Sciences, Beijing, China, Sept. 1, 2014 (Seminar).

Beijing University (PKU), Department of Physics, Beijing, China, Sept. 2, 2014 (Seminar).

Chinese Academy of Applied Physics, Mianyang, China, Sept. 4, 2014 (2 Seminars).

Huazhong University of Science & Technology, Wuhan, China, Sept. 9, 2014 (Colloquium).

Soochow University, Department of Physics, Suzhou, China, Sept. 12, 2014 (Seminar).

Kent State University, Department of Physics, Kent, OH, October 15-16, 2014 (Colloquium).

*CECAM Workshop “Friction & Interface Dynamics at Nano- and Meso-scales,”* Tel Aviv University, Tel Aviv, Israel, October 25-30, 2014 (Invited Talk).

Bar-Ilan University, Department of Physics, greater Tel Aviv area, Israel, Oct. 29, 2014 (Seminar).

University of Colorado, Department of Physics, Boulder, CO, December 10, 2014 (Colloquium).

University of Colorado, Department of Physics, Boulder, CO, December 11, 2014 (Seminar).

*45<sup>th</sup> Winter Colloquium on Physics of Quantum Electronics*, Snowbird, Utah, January 4-8, 2015 (Invited Talk).

*11<sup>th</sup> IGAUKEN International Symposium on Advances in Biomedical Imaging*, Tokyo Metropolitan Institute of Medical Science, Tokyo, Japan, Feb. 17-21, 2015 (Invited Talk).

*Physics of Structural and Dynamical Hierarchy in Soft Matter (Symposium for Hajime Tanaka)*, University of Tokyo, Tokyo, Japan, March 14-18, 2015 (Invited Talk).

*International Society of Oxygen Transport in Tissue (ISOTT) Annual Meeting 2015*, Wuhan, China (July 9-16, 2015 (Invited Talk/Session Chair).

Hong Kong University of Science and Technology (HKUST), Dept. of Physics, Hong Kong, China, July 20-21, 2015 (Colloquium).

University of Hong Kong, Department of Mechanical Engineering, Hong Kong, China, July 22, 2015 (Seminar).

Chinese University of Hong Kong, Dept. of Physics, Hong Kong, China, July 23-24, 2015 (Colloquium).

Massachusetts Institute of Technology, Department of Materials Science, Cambridge, MA, Sept. 11, 2015 (Seminar).

Yale University, Department of Applied Physics, New Haven, Connecticut, Sept. 23-24, 2015 (Seminar).

The Franklin Institute, *Public Lecture* on “*Why Light Matters*,” Philadelphia, PA, October 17, 2015 (Public Lecture).

*Mid-Atlantic Chapter of the American Physical Society (APS) Fall Meeting*, Morgantown, West Virginia, October 23-24, 2015 (Invited Talk).

University of California at Irvine, Department of Physics, Irvine, CA, October 28-31, 2015 (Colloquium).

*Jülich Soft Matter Days 2015*, Bad Honnef, Germany, November 9-13, 2015.

University of Copenhagen, Department of Neurology, Copenhagen, Denmark Nov. 17, 2015 (Seminar).

Korean Advanced Institute of Science and Technology (KAIST), Department of Biomedical Optics, Daejeon, South Korea, December 8-9, 2015 (Seminar).

Korean Advanced Institute of Science and Technology (KAIST), Department of Physics, Daejeon, South Korea, December 8-9, 2015 (Seminar).

Korean Institute for Science & Technology (KIST), Seoul, South Korea, Dec. 10-11, 2015 (Seminar).

*19<sup>th</sup> Innovative Workshop on Soft/Bio Materials 2015*, Ulsan National Institute of Science and Technology (UNIST), Ulsan, South Korea, December 11-12, 2015.

Daegu Gyeongbuk Institute of Science and Technology (DGIST), Department of Biomedical Engineering, Daegu, South Korea, December 14, 2015 (Seminar).

Solvay Inc., Research Headquarters in Seoul (at Ewha Univ.), South Korea, Dec. 15, 2015 (Seminar).

Samsung, Electronics Mobile Communication, Seoul/Suwon, South Korea, Dec. 16, 2015 (Seminar).

*COMPFLU 2016*, Indian Institute of Science Education and Research, Pune (IISER-Pune), Pune, India, January 2-4, 2016 (Invited Talk).

*Discussion Meeting on Emergent Phenomena in Soft and Active Matter*, International Centre for Materials Science, Jawaharlal Nehru Centre for Advanced Scientific Research (JNCASR), Bangalore, India, January 6, 2015 (Keynote Lecture).

Saint Joseph’s University, *McGroddy Lecture for Departments of Physics, Chemistry and Biology*, Philadelphia, PA, February 3, 2016 (McGroddy Lecture).

Tel Aviv University, *Sackler Lecture 1* (Host: Department Biomedical Engineering), Tel Aviv, Israel, March 6, 2016 (Sackler Lecture).

Tel Aviv University, *Sackler Lecture 2* (Host: Department of Physics), Tel Aviv, Israel, March 10, 2016, (Sackler Lecture).

Beijing University (PKU), *PKU-Penn Joint Symposium on Molecular Science Frontiers*, Beijing, China, July 11-13, 2016 (Overview and Invited Talk).

Penn Wharton China Center, *Public Lecture* entitled “*Penn Science for Building a New World: Materials & Optics @ the Research Frontier*,” Beijing, China, July 14, 2016 (Public Lecture).

Heinrich-Heine-University of Dusseldorf, Dusseldorf, Department of Physics, Germany, July 28, 2016 (Seminar-*Soft Solids*).

Heinrich-Heine-University of Dusseldorf, Department of Physics, Dusseldorf, Germany, July 29, 2016 (Seminar-*Coffee Stains*).

University of Massachusetts, Amherst, *Workshop on Surface Activity Driven by Material Geometry and Elasticity*, September 8-10, 2016 (Invited Talk).

Universitätsklinikum of Dusseldorf, Department of Neuroradiology, Dusseldorf, Germany, September 12, 2016 (Seminar-*Functional Imaging and Monitoring with Light*).

*International Conference on Innovative Optical Health Science*, Shanghai, China, October 10-12, 2016 (Plenary Lecture).

University of California at Riverside, Department of Bioengineering, *2016-17 Distinguished Speaker Series*, Riverside, CA, January 25, 2017 (Colloquium).

Stockton University, Department of Physics, Galloway, NJ, February 6, 2017 (Colloquium).

*37<sup>th</sup> CNLS Annual Conference - Applied Statistical Mechanics*, Santa Fe, NM, May 1-4, 2017 (Invited Talk)

Institut Fresnel, Aix-Marseille Universite, Marseille, France, June 2, 2017 (Seminar).

*Biomedical Optics and its Challenges 2017*, CERIMED, Campus of La Timone Hospital, Marseille, France, June 6-8, 2017 (Invited Talk).

*The Broad Reach of Materials Physics*, Symposium Marking the Retirement of Peter Collings, Swarthmore College, Swarthmore, PA, June 10, 2017 (Invited Talk).

*ECI Advances in Optics for Biotechnology, Medicine and Surgery XV*, Snowmass Village, CO, July 23-26, 2017 (Invited Talk covering Group Research, given by my post-doc Ashwin Parthasarathy).

*PBIM 2017 – 14<sup>th</sup> International Conference on Photonics and Imaging in Medicine and Biology*, Suzhou, China, September 26-28, 2017 (Plenary Lecture).

*Mexican Symposium on NIRS Neuroimaging (MEXNIRS)*, Instituto Nacional de Astrofísica Óptica y Electrónica – INAOE, San Andrés Cholula, Puebla, Mexico, October 20-21, 2017 (Keynote Lecture).

Lehigh University, Department of Bioengineering, Bethlehem, PA, November 8, 2017 (Seminar).

Lehigh University, Department of Physics, Bethlehem, PA, November 9, 2017 (Colloquium).

Massachusetts Institute of Technology (MIT), Department of Mechanical Engineering, Cambridge, MA, December 12, 2017 (Seminar).

*NSF Shared Facilities Operations Workshop 2018*, University of California at Santa Barbara (UCSB), Santa Barbara, CA, March 9-10, 2018 (Invited Talk).

*OSA Biophotonics Congress: Biomedical Optics*, Hollywood, FL, April 3-6, 2018 (Plenary Lecture).

*Soft Matter Frontiers Symposium*, Georgia Tech University, Atlanta, GA, April 18-20, 2018 (Invited).

*Optics in Neuromonitoring*, Symposium sponsored by *EU BitMap* (Brain Injury and Trauma Monitoring using Advanced Photonics) Consortium, Nalecz Institute of Biocybernetics and

Biomedical Engineering, Polish Academy of Sciences, Warsaw, Poland, May 28-30, 2018  
(Invited).

*Designer Soft Matter 2018*, Singapore, June 6-8, 2018 (Invited).

Technical University of Munich, *Center for Translational Cancer Research (TranslaTUM)*,  
Munich, Germany, July 16, 2018 (Seminar).

*Pearl River Workshop of Biophotonics 2018*, Jinan University, Guangzhou, China, July 27, 2018  
(Plenary Lecture).

*Pacific Rim Conference on Lasers and ElectroOptics (CLEO Pacific Rim) 2018*, Hong Kong,  
China, July 29 – August 3, 2018, (Tutorial Speaker).

University College London (UCL), Department of Medical Physics & Biomedical Engineering  
and Centre for Medical Image Computing, London, UK, August 10, 2018 (Seminar).

University of Toronto, Department of Medical Biophysics, Toronto, Canada, September 10,  
2018 (Seminar).

University of Tokyo, Institute of Industrial Science, Tokyo, Japan, October 5, 2018 (Seminar).

*fNIRS 2018*, Biannual meeting of the Society of Functional Near-Infrared Spectroscopy, Tokyo,  
Japan, October 5-8, 2018 (Invited).

*Nonequilibrium Collective Dynamics: Bridging the Gap between Hard and Soft Materials*,  
International Conference NECD18, Potsdam, Germany, October 8-11, 2018 (Invited).

*Science Café*, Stoney's British Pub, Wilmington, DE, October 15, 2018 (LRSM-MRSEC Public  
Lecture).

Nanyang Technological University (NTU), Biomedical Engineering Faculty, Singapore,  
November 16, 2018 (Seminar).

Nanyang Technological University (NTU), College of Engineering (CoE) *Distinguished Lecture*,  
Singapore, November 19, 2018.

University of Chicago, James Frank Institute (Departments of Physics, Chemistry), Chicago,  
Illinois, February 26, 2019 (Seminar)

*Sao Paulo School of Advanced Science on Modern Topics in Biophotonics*, Sao Carlos, Brazil,  
March 20-29, 2019 (School Lecturer, 3 lectures during 3/20-3/25).

Facebook Inc., *Brain-Computer Interface Webinar Series*, hosted at Menlo Park, CA, May 6,  
2019 (Seminar).

*Quantitative Diffuse Optical Methods for Neuromonitoring*, Symposium sponsored by Nalecz  
Institute of Biocybernetics and Biomedical Engineering, Polish Academy of Sciences (IBIB  
PAN), Warsaw, Poland, June 17-19, 2019 (Invited Talk).

ICFO – The Institute for Photonic Sciences, Av. Carl Friedrich Gauss 3, Castelldefels,  
Barcelona, Spain, June 21, 2019 (Seminar).

*Nano Korea 2019*, KINTEX, Korea, July 3-5, 2019 (Plenary Lecture).

Yonsei University, Seoul, Korea, July 5, 2019 (Seminar).

*Gordon Research Conference (Liquid Crystals)*, Colby-Sawyer College, New London, NH, July  
7-12, 2019 (Invited Talk).

*Topical Problems of Biophotonics (VII International Symposium)*, Nizhny Novgorod, Russia,  
July 27-31, 2019 (Plenary Lecture).

University of Pittsburgh, Swanson School of Engineering (Industrial Engineering), Pittsburgh, PA, September 5, 2019 (Seminar).

*Functional Near-Infrared Spectroscopy UK 2019 (fNIRS UK)*, University of Birmingham, Birmingham, UK, September 24-25, 2019 (Plenary Lecture).

Miami University of Ohio, Department of Physics, Oxford, Ohio, October 9, 2019 (Colloquium).

City College of New York (CCNY-CUNY), Department of Physics, New York, NY, October 23, 2019 (Colloquium).

Virginia Tech, Department of Physics, Blacksburg, VA, November 15, 2019 (Colloquium).

*Biophotonics and Imaging Graduate Summer School (BIGSS) 2020*, National University of Ireland, Galway, Ireland, August 25-29, 2020 (4 Lectures at the Virtual Summer School).

Indian Institute of Technology (IIT), Delhi, Department of Physics, Delhi, India, April 19, 2021 (Colloquium).

47<sup>th</sup> Annual NATAS Conference (Virtual), North American Thermal Analysis Society (NATAS), Philadelphia, PA, August 6, 2021 (Plenary Speaker).

*Center for Advance Metabolic Imaging and Precision Medicine*, Perleman School of Medicine, University of Pennsylvania, February 17, 2022 (Seminar).

*Raman Research Institute*, Bangalore, India, March 31, 2022 (Colloquium).

Louisiana State University (LSU), Cain Department of Chemical Engineering, Baton Rouge, LA, April 29, 2022 (Colloquium).

*Drops, Particles and Bugs, Science, Startups and Success: Workshop to celebrate Jerome Bibette*, Benasque, Spain, May 31 – June 4, 2022 (Invited Talk).

The Institute for Photonic Sciences (ICFO), Av. Carl Friedrich Gauss 3, Castelldefels, Barcelona, Spain, October 18, 2022 (Seminar).

The Institute for Photonic Sciences (ICFO), Av. Carl Friedrich Gauss 3, Castelldefels, Barcelona, Spain, October 18, 2022 (Public Lecture, Physics of Chocolate).

*Physics in Medicine and Biology 2022*, XXXVII Trobades Científiques de la Mediterrània – Josep Miquel Vidal, Mao, Menorca, Spain October 19-21, 2022 (Invited Talk).

*Gordon Research Conference (Colloidal, Macromolecular and Polyelectrolyte Solutions)*, Ventura, CA, November 6-11, 2022 (Invited Talk).

Webinar Series (sponsored by the *SPIE* and *Journal of Biomedical Optics*) entitled “50 Years After Pulse Oximetry Was Invented,” December 12, 2022 (Invited Talk & Panel Discussion).

*Bi-Annual (19<sup>th</sup>) Conference on Peace through Mind-Brain Research*, Hamamatsu, Japan, February 20-23, 2023 (Invited Talk).

*Multimodal Imaging of Ketone Body Metabolism in Health and Disease*, Center for Advanced Metabolic Imaging and Precision Medicine (CAMIPM) 2023 Workshop, Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, March 16, 2023 (Invited Talk).

*Science Café*, Stoney’s British Pub, Wilmington, DE, March 28, 2023 (LRSM-MRSEC Public Lecture).

*MPAF@60(1 + ε)*, *Symposium to honor of Mathew Fisher*, May 19-20, 2023, University of California at Santa Barbara (UCSB), Santa Barbara, CA (short Invited Talk).

*Lasers, Optics, Photonics, Sensors, Biophotonics, & Ultrafast Nonlinear Optics (LOPS 2023)*, June 2-5, 2023, Fort Lauderdale, FL (Invited Talk).

*NCIBT - Interventional Biophotonics Week Symposium and Summer School*, July 17-21, 2023, University of California at Davis, Davis, CA (Invited Talk).

*Center for Precision Surgery Seminar Series* of the Abramson Cancer Center, Perelman School of Medicine, PCAM Room 14-101, University of Pennsylvania, Philadelphia, PA, March 7, 2024 (Seminar).

New York University (NYU), Department of Physics, New York, NY, March 28, 2024 (Colloquium).

*LOPS 2024: Lasers, Optics, Photonics, Sensors, Biophotonics, & Ultrafast Nonlinear Optics*, June 6-9, 2024, Hollywood, FL (Invited Talk).

*Photonics Media (Biophotonics publisher) Webinar*, presented June 25, 2024, recording available online (Invited Talk).

*The Third Britton Chance International Symposium on Metabolic Imaging and Spectroscopy*, University of Pennsylvania, Perelman School of Medicine, Philadelphia, PA, July 17-20, 2024 (Invited Talk).

*NCIBT – Second Interventional Biophotonics Week Symposium and Summer School*, July 21-25, 2024, University of California at Davis, Davis, CA (Invited Talk on Panel).

*American Chemical Society (ACS Fall Meeting)*, Denver, Colorado, August 18-22, 2024 (Invited Talk).

*Provost Leadership Academy*, University of Pennsylvania, Philadelphia, PA, September 27, 2024 (Joint Invited Talk and Session Co-leader for *Mentoring Strategies and Equity-minded Workload Management*)

Washington University in Saint Louis, Department of Biomedical Engineering, Saint Louis, MO, October 17-18, 2024 (Colloquium and Keynote Lecture of *Spectra's Annual Student-led Conference*).

*Center for Excellence in Teaching, Learning, and Innovation (CETLI)*, University of Pennsylvania, Philadelphia, PA, November 20, 2024 (Invited Talk/Panel for “Conversation on Mentoring Graduate Students in the Lab”).

## **MAJOR RESEARCH GRANTS**

**[>\$80M generated from primary efforts (PI/Co-I)]**

Petroleum Research Fund, American Chemical Society (1990-1992, Yodh (PI))

**PRF 22328-GS**

“Nonlinear Optical Studies of Ultra-thin Silicide Films on Silicon”  
(\$18K Total)

National Science Foundation (1990-1996, Yodh (PI))

**NSF DMR-9058498**

“Presidential Young Investigator”

(\$500K Total; \$100K/year with matching funds, for 5 years)

National Science Foundation (“Materials Research Center Grants: MRL & MRSEC”, 1988-present)

**NSF DMR-8519059; NSF DMR-8819885; NSF DMR-9120668; NSF DMR-9632598; NSF DMR-0079909; NSF DMR-0520020; NSF DMR11-2090; NSF DMR-1720530**

Continuous funding for many different interdisciplinary collaborative research projects; I was a group leader for some of these collaborative projects.

(\$35K/year 1988-91, \$60K/year 1992-96, \$75-80K/year 1996-2017, \$150K/year 2017-2023; Yodh was MRSEC Co-PI for 2004-09 and MRSEC PI for 2009-17, 2017-23)

National Science Foundation (1990-1993, Yodh (PI))

**NSF DMR-9003687**

“Diffusing-Wave Spectroscopy & its Applications to Dynamical Studies of Dense Colloidal Suspensions”

(\$120K Total; \$40K/year)

Office of Naval Research (1991-1997, Yodh (PI))

**ONR N00014-91-J-1867**

“Second-Order Nonlinear Optical Spectroscopy of Solid-Solid Interfaces”

(\$600K Total; \$100K/year)

Alfred P. Sloan Foundation (1991-1995)

“Sloan Fellowship”

(\$30K)

National Science Foundation (1993-1997, Yodh (PI))

**NSF DMR-9306814**

“Applications of Diffusing Light Spectroscopies for Study of Dense Random Media”

(\$180K Total; \$60K/year)

Mallinckrodt, Inc. (1994-1998, Yodh (PI))

“Contrast Agents for Detection of Tumors Using Diffusing Near-Infrared Light Probes”

(~\$350K Total; \$75K-\$100K/year)

NIM Incorporated, (1995-1997, NIH SBIR Phase II subcontract; Yodh (Co-I))

**NIH (NINDS) N44-NS-5-2317**

“Regional Brain Imager”

(~\$120K Total; ~\$40K/year)

National Science Foundation (1996-1999, Yodh (PI))

**NSF DMR-9623441**

“Diffusion of Particles and Photons in Complex Fluids”

(\$240K Total; \$80K/year)

National Science Foundation (1997-2000, Yodh (PI))

**NSF DMR-9701657**

“Three-Wave Mixing Spectroscopy of Buried Solid Interfaces and Thin Film Structures”

(\$210K Total; 70K/year)

National Institutes of Health (1997-2000, Yodh (PI))

**NIH 1R01-CA075124-01**

“FFT-Based Images with Diffusing Light Waves”

(~\$1.2M Total; ~\$400K/year)

National Science Foundation (1997, Klein, PI; Yodh, Co-PI & Shared Experimental Facility Director)

**NSF DMR-9724486**

“Acquisition of Instrumentation of Imaging and Micromanipulation of Soft Materials”

(~\$200K Total)

National Aeronautics and Space Administration, NASA (1998-2003, Yodh (PI))

**NASA NAG3-2172**

“Colloidal Assembly in Entropically Driven, Low-Volume-Fraction Binary Particle Suspensions”

(~\$700K Total; ~\$140K/year)

Mallinckrodt, Inc. (1998-2000, Yodh (PI))

“Extravasation Monitoring with Diffusing Near Infrared Light”

(~\$200K Total; \$100K/year)

Dupont Pharmaceuticals Company (1998-2000, Yodh (PI))

“Fine Particle Technology”

(~\$25K)

Army Research Office (1999-2002, Breast Cancer Idea Awards, Yodh (PI))

**ARO DAMD17-97-1-7272**

“Parallel, Rapid Diffuse Optical Tomography of the Breast”

(~\$450K Total; \$150K/year)

National Science Foundation (1999-2002, Yodh (PI))

**NSF DMR-9971226**

“Entropy, Assembly, and Novel Microscopy in Complex Fluids”

(~\$300K Total; ~\$100K/year)

National Institutes of Health (1997-2000, Yodh (PI))

**NIH 1R01-CA075124-01**

“Flow in Thick Tissues Probed by Diffusing Light”

(~\$1.05M Total ~\$350K/year)

David and Lucille Packard Foundation (2000-2005, Finkel, PI; Yodh, Co-PI)

**Packard Foundation #2000-01737**

“Mesoscale Optical Brain Imaging of Perceptual Learning”

(~\$500K Total; ~\$100K/year for Yodh, excluding equipment)



National Institutes of Health (2000-2003, Yodh (PI))

**NIH 8R01-EB000283-06 (renewal)**

“Flow in Thick Tissues Probed by Diffusing Light”

(~\$1.05M Total; ~\$350K/year)

National Institutes of Health (2000-2004, Yodh (PI))

**NIH 2R01-CA075124-04**

“Parallel Detection and Computation for Diffuse Optical Tomography of Breast”

(~\$1.6M Total; ~\$400K/year)

National Institutes of Health (2001-2006, PPG, Glatstein, PI; Yodh, Co-PI)

**NIH P01-CA87971**

“Photodynamic Therapy of Intraperitoneal Neoplastic Diseases”

(~\$1M Total; ~\$250K/year for Yodh Project)

National Science Foundation (2002-05, Yodh (PI))

**NSF DMR-0203378**

“Interactions and Assembly in Suspension”

(~\$330K Total; \$110K/year)

National Aeronautics and Space Administration, NASA (2003-2008, Flight Exp., Yodh (PI))

**NASA NAG8-2172 (renewed)**

“Entropically Driven Colloidal Assembly”

(~\$1.25M Total; ~\$225K/year)

National Science Foundation (2004, Klein, PI; Yodh, Co-PI & Shared Exp. Facility Co-Director)

**NSF DMR-0320699**

“Acquisition of Instrumentation for Viscoelastic Characterization Facility”

(~\$320K Total)

National Institutes of Health (Awarded to University of California, Irvine, 2003-2008, with NIH NTROI subcontract to Yodh (Grant Co-PI; PI at Penn))

**NIH NCI U54 CA105480**

“Network for Translational Research in Optical Imaging: Breast Cancer Multi-Dimensional Diffuse Optical Imaging”

(~\$750K Total; ~\$150K/year for Yodh)

Department of Defense: Army Medical Research and Materiel Command (2004-2006, G. Yu (PI); Yodh (Co-I) – Yu was working in Yodh’s lab.)

**DOD W81XWH-04-1-0006**

“Real-time Diffuse Optical Measurement for In-vivo PDT Dosimetry of Human Prostate”

(~\$240K Total; ~\$120K/year)

National Institutes of Health (2004-2008, Yodh (PI))

**NIH 1R01-HL077699-01**

“Diffuse Light Imaging of Flow, Oxygen & Brain Metabolism”

(~\$1.4M Total; ~\$350K/year)

National Institutes of Health (2004-2008, Yodh (PI))

**NIH 2R01-EB002109-08**

“Multispectral II-Plate Diffuse Optical Breast Tomography”

(~\$2M Total; ~\$500K/year)

AstraZeneca (2004-2007, Yodh (PI))

“Diffuse Photon Spectroscopy and Imaging Pharmaceutical Formulations”

(~\$60K Total; ~\$20K/year)

National Science Foundation (2005-2011, Klein (PI), Yodh (Co-PI); Yodh replaced Klein, 2009)

**NSF DMR-0520020**

“Materials Research Science and Engineering Center (MRSEC), Klein/Yodh (Directors)”

Funding for center grant was generated by Klein (PI) in 2005; Yodh was PI starting 2009.

(~\$21.7M Total, ~\$3.6M/year)

National Science Foundation (2005-2008, Yodh (PI))

**NSF DMR-0505048**

“Structure and Dynamics in Temperature-Sensitive and Anisotropic Complex Fluids”

(~\$360K Total; \$120K/year)

Radiation Monitoring Devices, Inc. (2006-2007, Yodh (PI))

“Photon Counting Cameral for Diffuse Optical Tomography”

(~\$20K)

National Aeronautics and Space Administration, NASA (2008-2013, Flight Exp., Yodh (PI))

**NASA NNX08A00G**

“Entropically Driven Colloidal Assembly (Phase 2)”

(~\$300K Total; \$50K-\$60K/year)

National Institutes of Health (2008-2014, NIH BRP, Yodh (PI))

**NIH/NINDS 2R01NS060653-01**

“Diffuse Optics for Stroke Management”

(~2.5M Total; ~\$500K/year)

National Institutes of Health (2008-2014, PPG PI, Glatstein; Yodh, Co-PI.)

**NIH 2P01-CA087971-06A1 (renewed)**

“Photodynamic Therapy of Intraperitoneal Neoplastic Diseases”

(~\$1M Total; ~\$200K/year for Yodh Project)

National Science Foundation (2008-2012, Yodh (PI))

**NSF DMR-0804881**

“Temperature-Sensitive Complex Fluids”

(~\$480K Total; \$120K/year)

National Institutes of Health (2009-2014, Yodh (PI))

**NIH 2 R01 EB 002109-12**

“Multispectral II-Plate Diffuse Optical Breast Tomography”  
(~\$2M Total; ~\$400K/year)

National Institutes of Health (2010-2015, RR Reddy, PI; Yodh, Co-PI)

**NIH 5P41-RR002305-27**

“A Resource for Magnetic Resonance and Optical Imaging”  
(~\$500K Total; ~\$100K/year for Yodh, excluding equipment)

National Science Foundation (2009-2014, Ramos (PI); Klein/Yodh (Co-PI), Yodh replaced Klein as LRSM/MRSEC Director, 2009)

**NSF DMR-0934195**

“Partnership for Research & Education in Materials (PREM)”  
Grant was written by Klein/Ramos (at Penn), but Yodh was PI starting 2009.  
(~\$3M Total; ~\$500K/year, UPR-Penn partnership with Ramos, PI and Klein/Yodh, Co-PI)

National Science Foundation (2011-2014, Yodh (PI))

**NSF DMR-1062638**

“Research Experience for Undergraduates (REU) Site Grant”  
(~\$276K Total)

National Science Foundation (2012-2016, Yodh (PI))

**NSF DMR12-05463**

“Novel Dynamics in Complex Fluids: From Phonons to the Drying Process”  
(~\$480K Total; ~\$120K/year)

National Aeronautics and Space Administration, NASA (2013-2018, Yodh (PI))

**NASA NNX0800G (renewed)**

“Low Volume Fraction Entropically Driven Colloidal Assembly (Phase 3)”  
(~\$750K Total; ~\$150K/year)

National Science Foundation (2011-2017, Yodh (PI))

**NSF DMR-1120901**

“Materials Research Science and Engineering Center (MRSEC), Yodh (Director)”  
(~\$22M Total, ~\$3.7M/year)

National Science Foundation (2014-2017, Yodh (PI))

**NSF DMR-1359351**

“Research Experience for Undergraduates (REU) Site Grant,” Yodh (PI)  
(~\$180K Total; ~\$60K/year)

National Institutes of Health (Kofke, PI; Yodh, Co-PI, 2014-2018 (2019-NCE))

**NIH R01- NS082309**

“Detection of Cerebral Ischemia with a Noninvasive Neurometabolic Optical Monitor”  
(~\$750K Total; ~\$100K-\$200K/year to Yodh, including equipment)

National Institutes of Health (NIH BRP Renewal, Yodh (PI), (2014-2019))

**NIH 1R01-NS060653-06 (renewed)**  
“Diffuse Optics for Acute Stroke Management”  
(~\$2.5M Total; ~\$500K/year)

National Institutes of Health (PPG, PI, Glatstein; Yodh, Co-I/collaborator, 2014-2019)  
**NIH 5P01-CA087971-09 (renewed)**  
“Photodynamic Therapy of Intraperitoneal Neoplastic Diseases”  
(~\$375K Total; ~\$75K/year for Yodh)

National Institutes of Health (RR 2015-2020, Reddy (PI); Yodh (Co-PI))  
**NIH P41-EB015893 (renewed)**  
“A Resource for Magnetic Resonance and Optical Imaging”  
(~\$500K Total; ~\$100K/year for Yodh, excluding instrumentation)

National Science Foundation (2015-2020, Ramos (PI); Yodh (Co-PI))  
**NSF DMR-1523463**  
“Partnership for Research & Education in Materials (PREM)”  
(~\$3M Total; ~\$500K/year, UPR-Penn partnership with Ramos, PI and Yodh, Co-PI)

National Institutes of Health (RR, Schwartz, PI; Yodh, Co-PI, 2015-2019)  
**NIH U01-HD087180-01**  
“Developing a multi-modality, paradigm-shifting approach for in vivo assessment of the human placenta and the impact of maternal nutrition on its development and function”  
(~\$600K Total; ~\$150K/year for Yodh)

National Institutes of Health (2016-2021, Floyd (PI); Yodh (Co-PI))  
**NIH U01-NS095761-01**  
“Spinal Fiber Optics Monitoring”  
(~\$350K Total; ~\$50-150K/year for Yodh)

National Science Foundation (2016-2020, Yodh (PI))  
**NSF DMR-160738**  
“Elasticity, Deformation, Rearrangement & Assembly in Complex Fluids”  
(~\$420K Total; ~\$140K/year)

National Science Foundation (2017-2020, Yodh (PI))  
**NSF DMR-1659512**  
“Research Experience for Undergraduates (REU) Site Grant”  
(~\$295K Total)

National Science Foundation (2017-2018, Yodh (PI); Co-PIs: Detsi, Fakhraai, Winey, Heiney)  
**NSF DMR-1725969**  
“Acquisition of an Ultra-Small-Angle to Wide-Angle Dual Source X-ray Scattering Instrument for Materials Characterization”  
(~\$539K Total)

National Science Foundation (2017-2023, Yodh (PI))

**NSF DMR-1720530**

“Materials Research Science and Engineering Center (MRSEC), Yodh (Director)”

(~\$22.6M Total, ~\$3.75M/year)

National Aeronautics and Space Administration, NASA (2018-2020, Yodh (PI))

**NASA NNX0800G (evolved to flight experiment)**

“Crystal to Glass Transitions in Colloids (Flight Experiment)”

(~\$225K Total; ~\$150K/year-1. ~\$75K/year-2)

National Science Foundation (2020-2025 (including NCEs), Yodh (PI))

**NSF DMR-2003659**

*Routes of Relaxation and Reconfiguration in Soft Matter*

(~\$530K Total; ~\$176K/year)

National Institutes of Health (2021-2026, Reddy (PI); Yodh (Co-PI))

**NIH P41-EB029460**

“Center for Advanced Metabolic Imaging in Precision Medicine (CAMIPM)”

(~\$500K Total for TRD 4 (Yodh); ~\$100K/year for Yodh, excluding instrumentation)