ROBERT W. BOYD – CURRICULUM VITAE

Contact Information

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Biography

Robert W. Boyd was born in Buffalo, NY, USA. He received the B.S. degree in physics from MIT and the Ph.D. degree in physics from the University of California at Berkeley. His Ph.D. thesis was supervised by Charles Townes and involves the use of nonlinear optical techniques in infrared detection for astronomy. Professor Boyd joined the faculty of the University of Rochester in 1977, and in 2001 became the M Parker Givens Professor of Optics and Professor of Physics. In 2010, he became Professor of Physics and Canada Excellence Research Chair in Quantum Nonlinear Optics at the University of Ottawa. His research interests include studies of "slow" and "fast" light propagation, quantum imaging techniques, nonlinear optical interactions, studies of the nonlinear optical properties of materials, and the development of photonic devices including photonic biosensors. Professor Boyd has written two books, co-edited four anthologies, published over 550 research papers (≈70,000 citations, Google h-index 121), and been awarded ten patents. He is the 2016 recipient of the Arthur L. Schawlow Prize in Laser Science of the APS, the 2016 recipient of the Charles Hard Townes Award of OSA, the 2014 recipient of the Quantum Electronics Award of IEEE Photonics Society, the 2010 recipient of a Humboldt Research Award, and the 2009 recipient of the Willis E. Lamb Award for Laser Science and Quantum Optics. Prof. Boyd is a fellow of AAAS, APS, OSA, IEEE, and SPIE. He is a fellow of the Royal Society of Canada. He is a past chair of the Division of Laser Science of APS and has been a member of the Board of Directors of OSA. Prof. Boyd has served as a member of the Board of Editors of Physical Review Letters and of the Board of Reviewing Editors of Science Magazine.

Education

Graduate: Ph.D. in Physics at the University of California at Berkeley, September 1977. Thesis "An Infrared Upconverter for Astronomical Imaging" was supervised by Prof. C. H. Townes.

Undergraduate: B.S. degree in Physics at M.I.T., June 1969. Thesis "Acoustical Analysis by Holography" was supervised by Prof. K. U. Ingard.

Awards

Frederic Ives Medal / Jarus W. Quinn Prize, awarded by Optica, formerly the Optical Society of America 2023. This prize recognizes overall distinction in optics; it is the highest award of the Society.

Frank Isakson Prize for Optical Effects in Solids, American Physical Society 2020. This prize recognizes outstanding optical research that leads to breakthroughs in the condensed matter sciences.

Excellence in Research Award of the University of Ottawa, 2020. The objective of the award is to focus attention on research at the University of Ottawa by recognizing annually two members (one in science and one in humanities) of its 2900-member teaching staff who have earned distinction for themselves and for the University as a result of the importance and exceptional characteristics of their research work.

Elected to Fellow Status in the Royal Society of Canada, August 2019. As Canada's senior National Academy, the Royal Society of Canada exists to promote Canadian research and scholarly accomplishment in both of Canada's official languages, to mentor young scholars and artists, to recognize academic and artistic excellence, and to advise governments, non-governmental organizations, and Canadians generally on matters of public interest.

Elected as a Corresponding Member of the Mathematics and Natural Sciences Section of the Heidelberg Academy of Sciences and Humanities, July 21, 2018. The Heidelberg Academy is over 100 years old and has had many Nobel laureates among its members. Membership is limited to 100 people, 50 in the Natural Sciences and 50 in the Humanities.

IEEE Fellow, 2017: The IEEE Fellow is one of the most prestigious honors of the IEEE and is bestowed upon a very limited number of Senior Members who have contributed importantly to the advancement or application of engineering, science and technology bringing significant value to our society. The citation reads: *for contributions to the fields of nonlinear optics and photonics.*

Charles Hard Townes Award, Optical Society of America, 2016: The Charles Hard Townes Award is given for contributions to quantum electronics. Robert W. Boyd is receiving the award for his fundamental contributions to the field of nonlinear optics, including the development of methods for controlling the velocity of light, of quantum imaging methods, and of composite nonlinear optical materials.

Arthur L. Schawlow Prize in Laser Science, American Physical Society, 2016: This award is given by the Division of Laser Science of the APS to recognize outstanding contributions to basic research that uses lasers to advance knowledge of the fundamental physical properties of materials and their interaction with light.

IEEE Photonics Society Distinguished Lecturer, 2015-2016 and 2016-2017: This program is designed to honor excellent speakers who have made technical, industrial or entrepreneurial contributions of high quality to the field of lasers and electro-optics.

Quantum Electronics Award, IEEE Photonics Society, 2014: The IEEE Photonics Society Quantum Electronics Award is given to honor an individual (or group of individuals) for outstanding technical contributions to quantum electronics, either in fundamentals or applications, or both.

Honorary Doctorate, University of Glasgow 2014

Humboldt Research Prize, 2010: This award is granted in recognition of the researcher's entire academic achievements and whose fundamental discoveries, new theories, or insights have had a significant impact on their own discipline and who are expected to continue producing cutting-edge achievements in the future.

Canada Excellence Research Chair, 2010: This 7-year, 10-million-dollar award is highly competitive and is made only after a thorough and stringent multi-level review process. It is awarded only to an outstanding and innovative researcher whose accomplishments have made groundbreaking impacts in his/her field, including the application of research findings for social and economic benefit. The awardee must be internationally recognized as a world leader in his/her field. Lastly the awardee must have a superior record of attracting and supervising graduate students and postdoctoral fellows.

Willis E. Lamb Award for Laser Science and Quantum Optics, 2009: The Willis E. Lamb Award for Laser Science and Quantum Optics is presented annually for outstanding contributions to this field.

Honors

University of Ottawa Award for Excellence in Research in the Sciences, 2018-2019

Elevated to Fellow Status of the AAAS: *For distinguished scientific contributions, exposition and teaching in the fields of quantum electronics and nonlinear optic*s, November 2018.

Elevated to Fellow Status, SPIE, 2014

Best Platform Talk "A Chip-Scale High-Resolution Slow-Light Spectrometer for Sensing and Recognition," Chemical and Biological Defense Science and Technology (CBD S&T) Conference, November 14-18, 2011, Las Vegas, Nevada, USA.

Distinguished Visiting Scientist and Lecturer at the Institute for Optical Sciences, University of Toronto, March 2010

Research highlighted in the New York Times, May 16, 2006.

Research designated by Discover magazine as one of the top research stories of 2006.

Honorable Mention, OSA Joseph W. Goodman Book Writing Award, 2006, for his book, *Nonlinear Optics*.

Principal Lecturer in the Frontiers in Spectroscopy Symposium, Ohio State University, January 2006.

Presented the Herta Leng Memorial Lecture, RPI April 13, 2005.

Fellow of the OSA (1988), APS (2000), and SPIE (2014).

Professional Appointments

Visiting Professor, School of Physics and Astronomy, University of Glasgow**,** 1 September 2013 through present.

Visiting Scientist, Max Planck Institute for the Science of Light, Erlangen, Germany, October 2019 through present.

Canada Excellence Research Chair in Quantum Nonlinear Optics, University of Ottawa**,** and Professor of Physics and Professor in the School of Electrical Engineering and Computer Science, 2010 through present.

Faculty Member, University of Rochester. Assistant Professor of Optics, July 1977 through June 1982; Associate Professor of Optics, June 1982 through November 1987: Professor of Optics, November 1987 through June 2001; M. Parker Givens Professor of Optics, July 2001 through 2010; Professor of Optics and Professor of Physics, July 2010 through present.

Research Assistant to Prof. C. H. Townes, U.C. Berkeley, September 1971 through 1977. Research topics included Lasers, Nonlinear Optics, Theoretical Astronomy, and Observational Infrared Astronomy.

Earlier Visiting Appointments: Visiting Senior Scientist, Jet Propulsion Laboratory, California Institute Technology, Pasadena, California, Summer 1981, 1982, and 1983. Visitor, University of Toronto, 1985. Visiting Scientist, University of Paris, 1992.

Leadership

Canadian Co-Director of the Max Planck Centre for Extreme and Quantum Photonics, May 2015 through present

Leader of major funded research consortia such as: US DARPA/DSO program on Giant Nonlinear Response of ENZ Metastructures (2018 through present), US DARPA/DSO program on Slow Light (2005-2010), and US MURI program on Quantum Imaging (2006-2011).

Chair, International Council on Quantum Electronics, 2008-2010.

Member, Board of Directors, Optical Society of America, 2006 through 2007.

Chair, Joint Council on Quantum Electronics 2002 through 2004.

Chair, Division of Laser Science, American Physical Society (1999-2000).

Chair, Charles Hard Townes Medal Selection Committee, an award given by Optica (formerly OSA) (2023-2024)

Conference Organization (Representative Examples)

Program Co-Chair (2019) and General Co-Chair (2021), OSA Conference on Nonlinear Optics.

Co-Organizer (with David Andrews, Alex Lvovsky, and Duncan O'Dell), Workshop on Quantum Field Framework for Structured Light Interactions, held at the Banff International Research Station, April 24-28, 2017.

Co-Organizer, International School on Parametric Nonlinear Optics, Les Houches, France, April 20 through May 1, 2015.

Co-Chair, Latin America Optics & Photonics Workshop, Cancún, Mexico, October 26 through November 8, 2012.

General Co-Chair and Local Coordinator, International Conference on Quantum Information, Ottawa, Canada, June 8-11, 2011.

General Co-Chair, APS Annual Meeting on Laser Science (2011).

Program Co-Chair, International Conference on Quantum Electronics (2007).

Co-Chair, OSA Annual Meeting (2004).

General Co-Chair (1998), Program Co-Chair, OSA/IEEE Conference on Nonlinear Optics (1996).

Editorships (Representative Examples)

Member of the Editorial Board of the journal Applied Sciences from November 15, 2018.

Guest Editor (with D. Faccio and H. Bachor), Special Issue on Enhanced Quantum Imaging, Journal of Optics 2017.

Editorial Advisory Board of Laser & Photonic Reviews from May 1, 2016.

Lead Guest Editor, Optical Materials Express Special Issue on Material Platforms and Experimental Approaches for Quantum Nanophotonics, 2016.

Member, Board of Editors, Quantum Information Processing, 2013 through present.

Lead Guest Editor, Lasers: The First Fifty Years, a Feature Issue of Applied Optics, Published August 2010 by the Optical Society of America.

Guest Editor, Feature Issue on Slow Light and Its Application of the Journal of the Optical Society of America, Vol. 25 (2008).

Guest Editor, Serial Issue on Frontiers in Nonlinear Optics, 2007, Optics Express, Published by the Optical Society of America.

Member, Editorial Board, Journal of the Optical Society of America, B (1982-1985).

Member of the Board of Reviewing Editors, Science Magazine (July 2006 through 2011).

Guest Editor, Special Issue of the Journal of Optics on Slow Light, Published October 2010 by the Institute of Physics, Publishing.

Member of the Board of Editors, Physical Review Letters (2003-2006).

North American Editor, Journal of Modern Optics (1996-2006).

Member of Editorial Board, Journal of Nonlinear Optical Physics and Materials (1992 through present).

Member of the Editorial Board, Laser & Photonics Reviews, www.lpr-journal.org (2015 through present).

Recent Media Coverage

University of Rochester. "'Flipping' optical wavefront eliminates distortions in multimode fibers." Science Daily, 10 May 2021. <www.sciencedaily.com/releases/2021/05/210510161500.htm>.

IEEE Spectrum, New Encryption Strategy Passes Early Test, July 2020, page 11.

IEEE Spectrum: Indium tin oxide might be the material photonics has been waiting for, 28 April, 2016.

Science News: Physicists create Möbius strips out of light, January 2015.

New Scientist: Möbius strips of light made for first time, January 2015.

Fox News: Physicists see 27th dimension of photons, January 29, 2014.

Physics World: First weak measurements made on optical polarization states, March 11, 2013.

Science Recorder: Scientists discover a way around Heisenberg's Uncertainty Principle, March 4, 2013.

National Post: Canadian researchers take a sneak peek at Schrödinger's Cat and a step toward a quantum computer, March 4, 2013.

New Scientist: Warning, speedsters: you can't fool quantum radar, December 14, 2012.

Forbes: Slowing the Speed of Light to a Crawl, July 7, 2011.

Physics World: Rotating cylinder puts a new spin on slow light, July 5, 2011.

PhD Theses Supervised

51. Saumya Choudhary, Light-Matter Interaction in Plasmonic Systems and Atomic Vapor, December 11, 2023.
50. Mohammad Karimi, Time-varying all-optical systems using highly nonlinear epsilon-near-zero materials, November 23, 2023.
49. Samuel Lemieux, Applications of high-gain parametric down-conversion to metrology, March 31, 2023.
48. Md Saad-Bin-Alam, Tailoring Metasurface Lattice-Controlled Resonances for Flat-Optic Applications, January 13, 2023.
47. A. Nicholas Black, Characterizing and Mitigating Phase Distortions in Quantum and Nonlinear Optical Systems, December 7, 2022.

46. Jiapeng Zhao, Structured photons enabled secure quantum communication and spatio-temporal characterization of terahertz pulses, July 14, 2021.
45. Yiyu Zhou, Optical communication with structured photons propagating through aberrating media, March 18, 2021.
44. M. Zahirul Alam, Experiments in Nonlinear Optics with Epsilon-Near-Zero Materials, 2020.
43. Akbar Safari, Resonant Light-Matter Interaction for Enhanced Control of Exotic Propagation of Light, March 14, 2019.
42. Kashif M. Awan, Fabrication of III-V Integrated Photonic Devices, May 18, 2018.
41. Boshen Gao, Applications of Silicon-on-Insulator Photonic Crystal Structures in Miniature Spectrometer Designs, October 6, 2017.
40. Omar Magaña-Loaiza, Novel Effects in Optical Coherence: Fundamentals and Applications, July 27, 2016.
39. Mohammad Mirhosseini, Quantum Information with Structured Light, December 14, 2015.
38. Brandon Rodenburg, Communicating with Transverse Modes of Light, October 17, 2014.
37. Andreas Liapis, Optical Time Delays in Structured Media, September 8, 2014.
36. Joseph E. Vornehm, Photonic Technologies to Enable Slow Light Applications, Feb. 10, 2014
35. Petros Zerom, Image Reconstruction and Discrimination at Low Light Level, 2013
34. Mehul Malik, Secure Quantum Technologies, 2013.
33. Aaron Schweinsberg, Studies of Slow Light with Applications in Optical Beam Steering, 2012.
32. George M. Gehring, "Superluminal" Pulse Propagation Dynamics, 2011.
31. Heedeuk Shin, Nonlinear and Quantum Superresolution and Fast-Light Pulse Distortion Management, 2011.
30. Zhimin Shi, Fundamentals and Applications of Slow Light, 2010.
29. Anand Kumar Jha, Coherence Properties of the Entangled Two-Photon Field Produced by Parametric Down-Conversion, 2009.
28. Giovanni Piredda, Materials for Nonlinear Optics: Semicontinuous Gold Films and Fast Saturable Absorbers, 2008.
27. Ksenia Dolgaleva, Local-Field Effects and Nanostructuring for Controlling Optical Properties and Enabling Novel Optical Phenomena, 2008.
26. Sean J. Bentley, Transverse Effects in Nonlinear and Quantum Optics, 2004.
25. Ryan Bennink, Frequency Conversion of Optical Signals Using Coherently Prepared Media, 2004.
24. Matthew Bigelow, Ultra-Slow and Superluminal Light Propagation in Solids at Room Temperature, 2004.
23. Vincent Wong, Coherent Population Trapping in Real and Artificial Atoms, 2004.
22. John Heebner, Nonlinear Optical Whispering Gallery Microresonators for Photonics, 2003.
21. Elna M. Nagasako, High-Gain Parametric Amplification for the Generation of Quantum States of Light, 2001.
20. Robert L. Nelson, Composite Nonlinear Optical Materials, 1998.
19. Mark W. Bowers, Phase Locking and Self-Phase Matching in Nonlinear Optics, 1997.
18. Eric L. Buckland, Origin of the Third-Order Nonlinear Optical Response of Silica Fibers, 1997.
17. Russell J. Gehr, Investigations of the Third-Order Nonlinear Optical Respoonse of Composite Materials, 1997.

16. George L. Fischer, Third-Order Nonlinear Optical Properties of Composite Materials, 1996.
15. Robert E. Bridges, Multi-Dimensional Effects of Intensity-Dependent Optical Nonlinearities on the Propagation of Light, 1995.
14. Andrew J. Stentz, Aspects of the Generation and Propagation of Solitons in Optical Fibers, 1995.
13. William V. Davis, Nonlinear Optical Modification to the Polarization and Noise Properties of a Laser Beam after Propagating through Atomic Potassium Vapor, 1993.
12. Thomas R. Moore, Limitations to the Quality of Optical Phase Conjugation by Stimulated Brillouin Scattering, 1993.
11. Martti Kauranen, Limitations to the Performance of Nonlinear Optical Processes Utilizing Atomic Vapors, 1992.
10. Jeffery J. Maki, Linear and Nonlinear Optical Measurements of the Lorentz Local Field, 1991.
9. Edward J. Miller, Ultrafast Stimulated Scattering, 1991.
8. Alexander L. Gaeta, Stochastic and Deterministic Fluctuations in Stimulated Brillouin Scattering, l990.
7. Wayne R. Tompkin, Phase Conjugation by Four-wave Mixing in Dye-Doped Glasses, l990.
6. Daniel J. Gauthier, Instabilities and Chaos of Laser Beams Propagating through Nonlinear Optical Media, 1989.
5. Mark T. Gruneisen, Two-Beam Coupling and Phase Conjugation by Resonant Nonlinear Optical Interactions, 1988.
4. Mark D. Skeldon, Optical Phase Conjugation Enhanced by the Brillouin Interaction, 1988.
3. Michelle S. Malcuit, Competition Effects in Nonlinear Optics, 1987.
2. Mark A. Kramer, Nonlinear Optical Properties of Impurity-doped Solids, 1986.
1. Donald J. Harter, Nondegenerate Four-Wave Mixing Enhanced by the a.c. Stark Effect, 1982.

Master's Theses Supervised

17. Md Saad-bin-Alam, Tailoring Metasurface Lattice-Controlled Resonances for Flat-Optic Applications, January 12, 2023.
16. Katherine K. M. Bearne, Novel Techniques in Quantum Optics, April 29, 2022.
15. Saad F. Jaddua, Propagation of a Single Photon in a 1-D Waveguide Coupled to a V-Type Atom, July 23, 2020.
14. Sisira Suresh, Nonlinear optical properties of metal-dielectric stacks in their epsilon-near-zero regime, December 11, 2019.
13. Marie-Claude Dicaire, Generation of vortex beam superpositions using angular gratings, March 2017.
12. Frédéric Bouchard, Classical and quantum dynamics of twisted light, August 2016
11. Saumya Chaudhary, On plasmonic superradiance and the scaling laws of spontaneous parametric downconversion, July 2016.
10. Asad Tahir, Plasmonic Metasurfaces, June 2016.
9. Samuel Lemieux, Tailoring the modal structure of bright squeezed vacuum states of light via selective amplification, May 2016.
8. Kevin Piché, Limiting behaviours in physics: from duality to super-resolution, 2015.
7. Eliot Bolduc, Studies in Applied and Fundamental Quantum Mechanics, Cryptography, Tomography, Holography, and Duality, 2014.
6. Edward D. Baraban, Optical Bistability by Two-Wave Mixing in Photorefractive Crystals, 1991.

5. Arturo A. Jacobs, Scalar and Vector Properties of Phase Conjugation by Degenerate-Four-Wave Mixing, l986.

4. Stephen R. Wilk, A KCl:O Laser, l983.

3. W. Michael Dimmler, The Fast Fourier Transform Applied to the Spectral Analysis of Noise in Charge-coupled Device Imaging Systems, l983.

2. Thomas J. Brukilacchio, Generation-recombination Noise in Extrinsic Photoconductive Detectors, 1983.

1. Katherine Creath, Noise and Response Characterization of a HgCdTe Photoconductive Detection System, l98l.

Recent Postdoctoral Advisees

23. Saumya Choudhary, January 2024 through present

22. Varun Sharma, February 1, 2023, through January 31, 2024.

21. Aku Antikainen, September 2022 through June 1, 2024.

20. Giulia Marcucci, September 1, 2020, through December 31, 2021.

19. M. Zahirul Alam, February 2020 through present.

18. Girish Kulkarni, September 2019 through August 2022.

17. Murat Yildirim, 2018 through December 2020.

16. Rasoul Alaee, 2018 September 2021

15. Boris Braverman, 2018 through May 2022

14. Orad Reshef, 2016- April 2022

13. Enno Giese, 2016-2018.

12. Mohammad Hashimi, 2016-2017.

11. Omar Magaña, 2016-2016.

10. Robert Fickler, 2015-2018.

9. Mikko Huttunen, 2015-2017.

8. Kosmas Tsakmakidis, 2015-2016.

7. Mohammad Mirhosseini, 2015-2016.

6. Filippo Miatto, 2012-2015.

5. Ebrahim Karimi, 2012-2014.

4. Sebastian Schulz, 2012-2016.

3. Jeremy Upham, 2012-2013.

2. Jonathan Leach, 2011-2013.

1. Israel De Leon, 2011-2015.

Patents Awarded

11. Measurement Apparatus of Wavefront and Polarization Profile of Vectorial Optical Fields, Z. Shi, Z. Zhu, D. Hay, Y. Zhou, and R. W. Boyd, US Patent 11067450B2, Issued Date: Jul. 20, 2021

10. Wavefront Sensing Apparatus, Method and Applications, Zhimin Shi, Robert W. Boyd, Mohammad Mirhosseini, and Mehul Malik, US Patent 9,500,531 B2, Nov 22, 2016.

9. Apparatus and Methods Using Highly Optically Dispersive Materials, Robert W. Boyd, Zhimin Shi, and Daniel J. Gauthier, U.S. Patent No. 7,990,540, August 2, 2011.

8. Efficient Room Temperature Source of Polarized Single-Photons, S. G. Lukishova, R. W. Boyd, and C. R. Stroud, 7,253,871, August 7, 2007.

7. Apparatus with a Series of Resonator Structures Situated Near an Optical Waveguide for Manipulating an Optical Pulse, R. W. Boyd and J. E. Heebner, 7,245,801 B2, July 17, 2007.

6. Detecting Infrared Radiation, Robert W. Boyd, Clovis R. Haden, Marlan O. Scully, Vitaly Kocharovsky, and Alexey Belyanin; United States Patent 6,730,910, May 4, 2004.

5. Light-Induced Refractive Index Changes in Low-Temperature Glasses, N. F. Borrelli, R. W. Boyd, S. Radic, and P. A. Tick, #6,284,685, September 4, 2001.

4. Nonlinear Optics utilizing Composite Optical Material Architectures for Providing Enhanced Nonlinear Susceptibility, R.W. Boyd and J. E. Sipe, #5,253,103, October 12, 1993.

3. System for Combining Laser Beams by Transferring Energy there between in Atomic Vapor, R. W. Boyd, A. L. Gaeta, M. T. Gruneisen, and K. R. MacDonald, #4,918,699, April 17, 1990.

2. Phase Conjugate, Common Path Interferometer, R. W. Boyd, D. J. Gauthier, R. Junquist, and L. L. Voci, #4,938,596; July 3, 1990.

1. Method and Apparatus for Non-Frequency-Shifted Phase Conjugation of Optical Waves by Brillouin-Enhanced Four-Wave Mixing, M. D. Skeldon, P. Narum, and R. W. Boyd, #4,778,261; patent awarded October 18, 1988. 8. Efficient Room Temperature Source of Polarized Single-Photons, S. G. Lukishova et al. 7,253,871, August 7, 2007.

Books Published

Quantum Photonics: Pioneering Advances and Emerging Applications, edited by R.W. Boyd, S.G. Lukishova, and V. N. Zadkov, Springer, Berlin, 2019.

Self-Focusing, Past and Present, edited by R.W. Boyd, S.G. Lukishova, and Y.R. Shen, Springer, Berlin, 2009 (88,164 chapters downloaded as of June 2020).

Contemporary Nonlinear Optics, edited by G. P. Agrawal and R. W. Boyd, Academic Press, Boston, 1992.

Nonlinear Optics, R. W. Boyd, Academic Press, Boston, 1992; Second Edition, 2003; Third Edition 2008; Fourth Edition 2020 (total sales 15,515 as of April 2018).

Optical Instabilities, edited by R.W. Boyd, M.G. Raymer, and L.M. Narducci, Cambridge University Press, Cambridge, 1986.

Radiometry and the Detection of Optical Radiation, John Wiley and Sons, New York, 1983.

YouTube Videos

1. Animation: Light with a Negative Group Velocity, 2008 (link)

2. Robert Boyd Interview: Highlights of the 2011 FiO/LS Annual Meeting (link)

3. Robert Boyd Interview Upon His Arrival in Ottawa
Innovation at the Speed of Light, October, 2011 (link)

4. Newscast: Ottawa Sun, University of Ottawa Hires Photonics Pioneer 2011 (link)

5. Robert Boyd: Honorary Degree Ceremony, University of Glasgow, 2014 (link)

6. Robert Boyd's Presentation: Foundation of Nonlinear Optics at the
International School on Parametric Nonlinear Optics, Les Houches, France, April 2015 (link)

7. Robert Boyd's plenary presentation at Photonics West, 2016
Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World (link)
8. Robert Boyd's presentation at Chapman University, 2016
Weak Values and Direct Measurement of the Quantum Wavefunction (link)
9. Robert Boyd's Colloquium at the U Maryland Campus of JQI, 2016 (link)
10. Three Lectures on Nonlinear Optics hosted by the IEEE Photonics Society Ottawa Chapter, 2016 (link)
11. Robert Boyd's Nonlinear Optics Graduate Course 2016 (link)
12. Robert Boyd's Tutorial at CLEO, May 13, 2020,
How Light Behaves When the Refractive Index Vanishes (link)
13. Robert Boyd's Keynote Talk at Photonics North, Advances in Quantum Imaging,
May 27, 2020. (link)

In addition, my YouTube channel is at
https://www.youtube.com/channel/UCMCmY17GWbUigFvtX67-6nw

Published Research Articles

564. Polarization-controlled unidirectional lattice plasmon modes via a multipolar plasmonic metasurface, S. Mousavi, M. A. Butt, Z. Jafari, O. Reshef, R. W. Boyd, P. Banzer, I. De Leon, Appl. Phys. Lett. 124, 181703 (2024).

563. Photon number resolving detection with a single-photon detector and adaptive storage loop, N. M Sullivan, B. Braverman, J. Upham, R. W. Boyd, New J. Phys. 26 043026 (2024)

562. Measurement of the Dispersion of χ (3) of SiO2 and SiN Across the THz and Far-Infrared Frequency Bands, B. Zhou, M. Rasmussen, S. Zibod, S. Yan, N. K. Noori, O. Nagy, Y. Ding, S. J. Lange, K. Dolgaleva, R. W. Boyd, P. U. Jepsen, Laser & Photonics Reviews (2024).

561. Phase-matched third-harmonic generation in silicon nitride waveguides, S. Vijayakumar, K. Vyas, D. H. G. Espinosa, O. Reshef, M. Song, K. M. Awan, S. Choudhary, J. Cardenas, R. W. Boyd and K. Dolgaleva, Nanophotonics (2024).

560. Roadmap on photonic metasurfaces, S. A. Schulz and 65 other authors, Appl. Phys. Lett. 124, 260701 (2024)

559. Hybrid architectures for terahertz molecular polaritonics**,** A. Jaber, M. Reitz, A. Singh, A. Maleki, Y. Xin, B. T. Sullivan, K. Dolgaleva, R. W. Boyd, C. Genes & J.-M. Ménard, Nature Communications, 4427 (2024).

558. Controlling nonlinear rogue-wave formation using the coherence length of phase noise, S. Choudhary, A. N. Black, A. Antikainen and R. W. Boyd, Phys. Rev. Research 6, 013174 (2023)

557. Interactions of Fundamental Mie Modes with Thin Epsilon-near-Zero Substrates, M. Karimi, K. M. Awan, Y. Vaddi, R. Alaee, J. Upham, M. Z. Alam, R. W. Boyd, Nano Letters (2023).

556. Orthogonal spatial coding with stimulated parametric down-conversion, Y. Xu, S. Tang, A. N. Black, and R. W. Boyd, Opt. Express 31, 42723-42729 (2023).

555. Metamaterial-based octave-wide terahertz bandpass filters, A. Maleki, A. Singh, A. Jaber, W. Cui, Y. Xin, B. T. Sullivan, R. W. Boyd, and J.-M. Ménard, Photonics Research 11, 526 (2023).

554. Experimental generation of polarization entanglement from spontaneous parametric down-conversion pumped by spatiotemporally highly incoherent light, C. Li, B. Braverman, G. Kulkarni, and R. W. Boyd, Phys. Rev. A 107, L04170 (2023)

553. Quantum-enhanced phase imaging without coincidence counting, A. N. Black, L. D. Nguyen, B. Braverman, K. T. Crampton, J. E. Evans, and R. W. Boyd, Optica 10, 952-958 (2023).

552. Strong Nonlinear Response in Crystalline Quartz at THz Frequencies, S. Zibod, P. Rasekh, M. Yildrim, W. Cui, R. Bhardwaj, J.-M. Ménard, R. W. Boyd, and K. Dolgaleva, Strong Nonlinear Response in Crystalline Quartz at THz Frequencies. Adv. Optical Mater., 2202343 (2023).

551. Beam deflection and negative drag in a moving nonlinear medium, R. Hogan, A. Safari, G. Marcucci, B. Braverman, and R. W. Boyd, Optica 10, 544-551 (2023).

550. Automatic turbulence mitigation for coherent free-space optical links using crystal-based phase conjugation and fiber-coupled data modulation**,** H. Zhou, Y. Duan, H. Song, X. Su, Z. Zhao, K. Zou, H. Song, R. Zhang, R. W. Boyd, M. Tur, and A. E. Willner, Opt. Lett. 48, 2194-2197 (2023).

549. Time-varying gradient metasurface with applications in all-optical beam steering, M. Karimi, M. Z. Alam, J. Upham, O. Reshef and R. W. Boyd, Nanophotonics (2023).

548. Dark and bright modes, and their coherent control in dipolar metasurface bilayers, S. Choudhary, R. W. Boyd, J. E. Sipe, Physical Review A, 107, 023521 (2023).

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C24. Planar Chiral Metamaterials for Biosensing Applications, S. Murugkar, I. D. Leon, M. Horton, H. Qassim, J. Leach, and R. W. Boyd, in Plasmonics in Biology and Medicine X (International Society for Optics and Photonics, 2013), pp. 85970Y.

C23. Development of a Slow-Light Spectrometer on a Chip, S. Murugkar, I. D. Leon, Z. Shi, G. Lopez-Galmiche, J. Salvail, E. Ma, B. Gao, A. C. Liapis, J. E. Vornehm, and R. W. Boyd, in Integrated Optics: Devices, Materials, and Technologies XVI (International Society for Optics and Photonics, 2012), pp. 82640T.

C22. Slow-Light Enhanced Spectrometers on Chip, Z. Shi, and R. W. Boyd, in Photonics North 2011 (International Society for Optics and Photonics, 2011), pp. 80071D.

C21. Quantum key Distribution in a High-Dimensional State Space: Exploiting the Transverse Degree of Freedom of the Photon, R. W. Boyd, A. Jha, M. Malik, C. O'Sullivan, B. Rodenburg, and D. J. Gauthier, in Advances in Photonics of Quantum Computing, Memory, and Communication IV (International Society for Optics and Photonics, 2011), pp. 79480L.

C20. What are the Limits to the Time Delay Achievable Using Slow-Light Methods?, R. W. Boyd, N. Lepeshkin, A. Schweinsberg, P. Zerom, G. Gehring, G. Piredda, Z. Shi, H. Shin, and Q. Park, in Complex Mediums VI: Light and Complexity (International Society for Optics and Photonics, 2005), pp. 592402.

C19. Progress in Quantum Lithography, R. W. Boyd, H. J. Chang, H. Shin, and C. O'Sullivan-Hale, in Quantum Communications and Quantum Imaging III (International Society for Optics and Photonics, 2005), pp. 58930G.

C18. Novel Photonic Materials for Advanced Imaging Applications, R. W. Boyd, in International Symposium on Photonic Science in the 21st Century, (2003), pp. 603.

C17. Strong Dispersive and Nonlinear Optical Properties of Microresonator-Modified Optical Waveguides, J. E. Heebner, and R. W. Boyd, in Laser Resonators and Beam Control VI (International Society for Optics and Photonics, 2003), pp. 185-195.

C16. Theory of Relativistic Harmonic Generation, Q. Park, R. W. Boyd, J. E. Sipe, and A. L. Gaeta, in Technical Digest. Summaries of Papers Presented at the Quantum Electronics and Laser Science Conference. Postconference Technical Digest (IEEE Cat. No.01CH37172) (2001), pp. 274-275.

C15. Influence of Local Field Effects on the Nonlinear Optical Properties of Composite Materials, R. W. Boyd, in National Science Foundation (NSF) Forum on Optical Science and Engineering (International Society for Optics and Photonics, 1995), pp. 136-142.

C14. Experimental Study of Soliton Propagation Through 40 km of Dispersion-Decreasing Fiber, A. J. Stentz, R. W. Boyd, and A. F. Evans, in Coherence and Quantum Optics VII (Springer, Boston, MA, 1996), pp. 461-461.

C13. Quantum Fluctuations as the Origin of Laser Beam Filamentation, E. M. Nagasako, R. W. Boyd, and G. S. Agarwal, in Coherence and Quantum Optics VII (Springer, Boston, MA, 1996), pp. 637-638.

C12. Quantum Statistical Properties of Optical Phase Conjugation, A. L. Gaeta, and R. W. Boyd, in Coherence and Quantum Optics VI (Springer, Boston, MA, 1990), pp. 343-347.

C11. Bistability and Chaos in Counterpropagating Laser Beams, D. J. Gauthier, M. S. Malcuit, and R. W. Boyd, in Coherence and Quantum Optics VI (Springer, Boston, MA, 1990), pp. 395-399.

C10. Polarization Properties of Phase Conjugation by Degenerate Four-Wave Mixing In Saturable Absorbers, R. W. Boyd, D. J. Gauthier, M. Kauranen, M. S. Malcuit, and W. R. Tompkin, in

Nonlinear Optical Beam Manipulation and High Energy Beam Propagation Through the Atmosphere (International Society for Optics and Photonics, 1989), pp. 58-66.

C9. Vector Phase Conjugation and Beam Combining By Multiwave Optical Mixing, R. W. Boyd, K. R. MacDonald, and M. S. Malcuit, in Laser Wavefront Control (International Society for Optics and Photonics, 1989), pp. 69-81.

C8. Instabilities, Dynamics and Chaos in Nonlinear Optical Systems, N. B. Abraham, E. Arimondo, and R. W. Boyd, in Instabilities and Chaos in Quantum Optics II (Springer, Boston, MA, 1988), pp. 375-391.

C7. Laser Beam Combining Through the Nonlinear Response Of A Strongly Driven Atomic Transition, K. R. MacDonald, M. T. Gruneisen, and R. W. Boyd, in Nonlinear Optical Beam Manipulation, Beam Combining, and Atmospheric Propagation (International Society for Optics and Photonics, 1988), pp. 169-175.

C6. Nonlinear Optical Interactions in Low-Melting-Temperature Glasses Containing Organic Dyes, W. R. Tompkin, and R. W. Boyd, in Advances in Nonlinear Polymers and Inorganic Crystals, Liquid Crystals and Laser Media (International Society for Optics and Photonics, 1988), pp. 2-7.

C5. Instabilities in the Propagation of Arbitrarily Polarized Counterpropagating Waves in a Nonlinear Kerr Medium, A. L. Gaeta, R. W. Boyd, P. W. Milonni, and J. R. Ackerhalt, in Optical Bistability III (Springer, Berlin, Heidelberg, 1986), pp. 302-305.

C4. Instabilities in a Self-Pumped Barium Titanate Phase Conjugate Mirror, P. Narum, D. J. Gauthier, and R. W. Boyd, in Optical Bistability III (Springer, Berlin, Heidelberg, 1986), pp. 298-301.

C3. Instabilities in Four-Wave Mixing, R. W. Boyd, A. L. Gaeta, D. J. Gauthier, M. S. Malcuit, and P. Narum, in Optical Chaos (International Society for Optics and Photonics, 1986), pp. 156-163.

C2. Stimulated Brillouin Scattering With A Multimode Laser, M. D. Skeldon, P. Narum, and R. W. Boyd, in Nonlinear Optics and Applications (International Society for Optics and Photonics, 1986), pp. 93-100.

C1. Continuously Tunable Sum-Frequency Generation Involving Sodium Rydberg States, R. W. Boyd, D. J. Gauthier, J. Krasinski, and M. S. Malcuit, in International Quantum Electronics Conference (Optical Society of America, 1984), pp. WII3.

Recent Invited Conference and Colloquium Presentations

Presentations in 2024

Nonlinear Optics of THz (and IR and FIR) Radiation, Presented at the 30th Iranian Conference on Optics and Photonics (ICOP 2024) January 29, 2024.

Quantum Imaging, presented at a Workshop on New Directions in Superresolution, Chapman University, Orange, California, April 9, 2024.

Sharper Images Through Quantum Imaging, Presented at Photonics North, Vancouver, BC, May 28, 2024.

An Embarrassment of Riches: What to Do with a Material One Million Times More Nonlinear Than Silica, Presented at the Optica Society's Conference on Advanced Photonics, Québec City, July 31, 2024.

Presentations in 2023

Nonlinear Optics of THz (and IR and FIR) Radiation, Presented at the 48th Conference on Infrared, Millimeter, and Terahertz Waves, Montréal QC, Canada, September 18, 2023.

The Max Planck Centre for Extreme and Quantum Photonics, presented at the 27th Meeting of the Canada-Germany Joint Science & Technology Cooperation Committee (JSTCC), 30-31 May 2023, Ottawa.

How Light Behaves When the Refractive Index Vanishes: Physics and Applications of Epsilon-Near-Zero Materials, Presented as the Physics Colloquium at the University of Montreal, Feb. 3, 2023.

Control of Laser-Beam Self-Focusing, Filamentation, and Rogue-Wave Formation Using Structured Light Beams, Presented at Photonics North, Montréal, QC, Canada, June 13, 2023.

Presentations in 2022

How light behaves when the refractive index vanishes, Physics Colloquium at the University of Darmstadt, January 21, 2022.

Quantum Imaging, presented at Brookhaven National Laboratory, March 10, 2022.

Quantum Imaging, presented at Photonics North, Niagara Falls ON, Canada, May 24, 2022.

Quantum Imaging, presented at the RIT-SPIE conference Photonics for Quantum, Rochester NY, June 8, 2022.

Control of Laser-Beam Self-Focusing, Filamentation, and Rogue-Wave Formation Using Structured Light Beams, Presented at the International Conference on Laser Filamentation, COFIL 2022, Chania, Crete, Greece, July 12, 2022.

The promise of quantum nonlinear optics, presented at the IEEE Photonics Conference, Vancouver BC, Canada, November 13, 2022.

Presentations in 2021

How light behaves when the refractive index vanishes, presented at the Tampere University "International Day of Light" Conference, May 21, 2021.

Tailoring light propagation through controllable phase and group velocities, presented at the Indian Institute of Science Education and Research (IISER) Kolkata, India, November 3, 2021.

Tailoring light propagation through controllable phase and group velocities, presented at the virtual Frontiers in Optics + Laser Science Meeting, November 2, 2021.

Tailoring light propagation through controllable phase and group velocities, presented at Applied Physics 483 Optics & Electronics Seminar, October 25, 2021.

Tailoring light propagation through controllable phase and group velocities, presented at Topical Problems of Nonlinear Wave Physics, Nizhny Novgorod, Russia,19–22 September 2021.

Tailoring light propagation through controllable phase and group velocities, Silver Jubilee Webinar Series, International School of Photonics, Cochin University of Science and Technology, India, March 4, 2021.

How light behaves when the refractive index vanishes, presented at the Joint Karl-Franzens-University—University of Technology, Graz, Austria, Online Colloquium, March 2, 2021.

How light behaves when the refractive index vanishes, presented as a plenary talk at CLEO / Europe, June 21, 2021.

Designer Materials for Photonics, presented to the Optics and Photonics Society of Iran, February 2, 2021.

Nonlinear Optics of Time-Varying Media (Especially epsilon-near-zero media), Presented at the virtual Workshop on Time-Varying Media, Imperial College, London, May 26, 2021.

Physics and Applications of Epsilon-Near-Zero materials, presented as a keynote talk at Photonics West, SPIE OPTO, March 7-11, 2021.

Presentations in 2020

Physics and Applications of Epsilon-Near-Zero Materials, Physics of Quantum Electronics, Snowbird, Utah, January 6, 2020

How Light Behaves When the Refractive Index Vanishes, Presented at CLEO, San Jose, CA, USA, May 13, 2020.

Progress in Quantum Imaging, Presented at Photonics North, an online virtual conference, May 27, 2020.

Physics and Applications of Epsilon-Near-Zero Materials, presented at the Nonlinear Photonics virtual meeting, a part of the OSA Advanced Photonics Congress, 13-16 July 2020.

How Light Behaves when the Refractive Index Vanishes, presented at the Imperial College Optical Society (ICOS) and the IC student chapters of OSA and SPIE, July 28, 2020.

Nonlinear Photonics with Low-Index Materials, presented at the OSA Laser Congress 2020, October 13, 2020.

Presentations in 2019

Quantum Radiometry, presented at the 49th Winter Colloquium on the Physics of Quantum Electronics, Snowbird Utah, January 10, 2019.

Putting Quantum Optics to Work: Quantum Radiometry and Quantum Aberration Correction, presented at the Conference on Coherence and Quantum Optics, CQO-11, Rochester, NY, August 6, 2019.

Quantum Nonlinear Optics: New Materials and Interactions, presented at the Photonics for Quantum Workshop, Rochester Institute of Technology, January 23, 2019.

Physics and Applications of Epsilon-Near-Zero Materials, presented at Photonics West, San Francisco, February 2, 2019.

Physics and Applications of Epsilon-Near-Zero Materials, presented at an IMPRS Seminar at the Max Planck Institute for Quantum Optics, Garching, Germany, April 4, 2019.

Quantum Nonlinear Optics: New Materials and Interactions, presented at the Colloquium of the Department of Electrical and Computer Engineering, University of Minnesota, Minneapolis, MN USA, April 18, 2019.

Physics and Applications of Epsilon-Near-Zero Materials, presented at Photonics North, Québec, May 21, 2019.

How to Sort OAM States of Light, presented at the International Conference on Optical Angular Momentum, Ottawa, 2019, June 19, 2019.

Quantum Imaging, presented at the workshop on Advances in Computational and Quantum Imaging (ACQI), Purdue University, West Lafayette, Indiana, USA, September 11, 2019.

How light behaves when the refractive index vanishes, presented at Frontiers in Optics, Washington DC, September 17, 2019.

How Light Behaves when the Refractive Index Vanishes, presented to the Heidelberg Academy of Sciences, October 25, 2019.

Presentations in 2018

Physics and Applications of Epsilon-Near-Zero Materials, presented at the Symposium for the Science of Light, Max Planck Institute for the Science of Light, Erlangen, July 23, 2018, July 23, 2018.

Quantum Key Distribution with Full Laguerre-Gauss Encoding, OSA Imaging and Applied Optics Congress, Orlando, FL, USA, June 26, 2018.

Tutorial on Nonlinear Optics, Max-Planck University of Ottawa Centre for Extreme and Quantum Photonics Summer School, June 18, 2018.

Nonlinear Optical Metastructures, Photonics North, Montreal QC, June 6, 2018.

Some new results in nonlinear optics: epsilon-near-zero materials, preventing beam filamentation, and the nature of rogue waves, Presented at the International Conference on Metaphotonics, Hunan University, Changsha, P.R. China, May 29, 2018.

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, Presented at Hunan University, Changsha, P.R. China, May 28, 2018.

Paul Corkum and the Photonics Program at the University of Ottawa, Symposium on Recollision Physics, Montebello QC, May 8, 2018.

Laser Beam Filamentation: Overview and Recent Results, SPIE Defense + Security Symposium, Orlando FL, USA, April 19, 2018.

What's New in Nonlinear Optics, CERC Seminar, March 25, 2018.

What's New in Nonlinear Optics, Department of Physics, University of Maryland, March 13, 2018.

Some New Advances in Slow and Fast Light, Presented at Photonics West, San Francisco, USA, January 29, 2018.

Generation of Caustics and Rogue Waves from Nonlinearity, PQE-18, Snowbird, Utah, USA, January 8, 2018.

Presentations in 2017

Quantum Nonlinear Optics, presented at the Physics Department Colloquium, University of Toronto, January 19, 2017.

Quantum Imaging, Presented at the Space and Airborne Systems Division, Raytheon Company, El Segundo, CA Feb 2, 2017

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, presented at the Technion Symposium Series, Haifa, Israel, March 2, 2017.

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, Presented at three Australian Universities as part of the IEEE Distinguished Lecturer Series, March 2017.

Quantum Nonlinear Optics, Presented as the Physics Colloquium, University of Oklahoma, April 13, 2017.

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, Colloquium presented at Northwestern University, May 5, 2017.

Weak Values and Measurement of the Photon's Wavefunction, Presented at the Princeton-TAMU Symposium on Quantum Physics and Engineering, Princeton University, June 15-17, 2017.

Presentations in 2016

Quantum Imaging, Presented at the Royal Society of London, May 9, 2016

Nonlinear Optics and Laser Science, presented as the Schawlow Prize Acceptance Speech, Joint OSA Frontiers in Optics and APS/DLS Laser Science Meeting, October 20, 2016.

Quantum Nonlinear Optics, presented at the OSA Meeting on Lasers in Sensing and Communication, Boston, Mass, November 1, 2016.

Quantum Imaging, presented at the Joint Quantum Institute, University of Maryland Campus,

December 12, 2016.

Presentations in 2015

Observation of Optical Polarization Möbius Strips, presented at the 45th Winter Colloquium on the Physics of Quantum Electronics, January 4-8, 2015 – Snowbird, Utah, USA.

Optical Forces and Fresnel Drag in Atomic-Vapor "Slow-Light" Media, presented at Trends in Optical Micromanipulation III, Obergurgl, Tyrol, Austria, January 27, 2015.

Optical Forces and Fresnel Drag in Atomic Vapor "Slow-Light" Media, presented at Institut für Quantenoptik und Quanteninformation, Wien, Österreich, January 30, 2015.

Weak Values and the Direct Measurement of the Quantum Wavefunction, presented at Photonics West, San Francisco, CA, USA, February 11, 2015.

Optical Forces and Fresnel Drag in Atomic Vapor "Slow-Light" Media, presented at Photonics West, San Francisco, CA, USA, February 10, 2015.

Laboratory studies of weak measurement and direct measurement of the wavefunction, presented at the International Workshop on Weak Value and Weak Measurement, Tokyo Institute of Technology, March 19-20, 2015.

High Capacity Quantum Cryptography Carrying more than One Bit Per Photon, presented at the Astronomy Section of the Rochester Academy of Sciences, April 3, 2015.

Research in Quantum Photonics, presented at the 5th Annual Meeting of the Canada Excellence Research Chairs, April 13-14 2015, University of Waterloo.

Introduction to Nonlinear Optics and Nonlinear Optics: The Enabling Technology for Quantum Information Science, presented at the International School on Parametric Nonlinear Optics, Les Houches, France, April 20-May 1, 2015.

How Do Basic Nonlinear Optical Processes Lead to Atmospheric Lasing? Presented at CLEO, San Jose CA, May 11, 2015.

Optical Forces Modified by Slow Light and Quantum Properties of Orbital Angular Momentum of Light, presented at the Annual Meeting of the Russell Division of the Max Planck Institute for the Science of Light, Ringberg Castle, Tegernsee, May 37-30, 2015.

Quantum Walks and Wavepacket Dynamics on a Lattice with Twisted Photons, presented at Photonics North, June 9-11, Ottawa ON Canada.

Unity-Order Intensity-Dependent Change in Refractive Index in Indium-Tin Oxide at its Epsilon-Near-ZeroWavelength, presented at the OSA Topical Meeting on Nonlinear Optics, 26-31 July 2015, Kauai, Hawaii, USA

Structured Materials and Structured Light for Photonics, presented at META'15 New York, USA, August 4, 2015.

Quantum Properties of the Orbital Angular Momentum of Light, presented at ICOAM, New York USA August 4, 2015.

Fundamentals and Applications of the Orbital Angular Momentum of Light, presented to the Baltimore IEEE Photonics Society, September 21, 2015

Quantum Properties of the Orbital Angular Momentum of Light, presented at the 600th WE-Heraeus-Seminar, Frontiers of Quantum Optics, Physikzentrum Bad Honnef, Germany, October 26-30, 2015.

New Results in Nanophotonics, presented at the Nano Ontario Conference, November 5, 2015.

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, presented at The Ohio State University ECE Distinguished Seminar Series, November 18, 2015.

Structured Materials and Structured Light for Quantum Photonics, presented at the Boston section of the IEEE Photonics Society and the New England Section of OSA, December 8, 2015.

Slow-Light-Enhanced Spectral Interferometers, presented at the Innovation and Technology Information Exchange, NASA Marshall Space Flight Center, Huntsville, AL Dec. 10, 2015.

(All of these presentations were invited presentations.)

Presentations in 2014

Weak Values and Direct Measurement of the Quantum Wavefunction, Presented at the 44th Winter Colloquium on the Physics of Quantum Electronics, Snowbird, Utah, January 5, 2014.

Development of Artificial Materials and Material Structures for Nonlinear Optics, Photonics, and Quantum Information Science, Brockhouse Institute for Materials Research, McMaster University, January 20, 2014

Some Open Questions in Slow and Fast Light Research, SPIE Photonics West, San Francisco, Feb 2, 2014.

Weak Values and Direct Measurement of the Quantum Wavefunction, SPIE Photonics West, San Francisco Feb 5, 2014.

Introduction to Quantum Nonlinear Optics, Presented at MIT Lincoln Labs, April 9, 2014.

Direct Measurement of the Quantum Wavefunction, presented at MIT Lincoln Labs, April 10, 2014.

Quantum Nonlinear Optics: Nonlinear Optics, Meets the Quantum World, presented at the Boston University Distinguished Lecture Series in Photonics, April 12, 2014.

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, presented at the Berliner Physikalisches Kolloqium, June 5, 2014.

Quantum Nonlinear Optics: Nonlinear Optics Meets the Quantum World, presented at the Max Born Institute, June 6, 2014.

Introduction to Nonlinear Optics, presented at the International School of Physics “Enrico Fermi,”Course 190 - Frontiers in Modern Optics, 30 June - 5 July, 2014.

Menzel's Experiment: Violation of Complementarity?, presented at CQIQC, University of Toronto, 29 August 2014.

Presentations in 2013

Nonlinear Optics: The Enabling Technology for Quantum Information Science, Presented at Yale University, November 13, 2013

Introduction to Quantum Nonlinear Optics Presented to the SPIE Student Chapter, University of Ottawa, Nov 10, 2013.

Quantum Aspects of the Transverse Degrees of Freedom of Photons, Presented at the OSA Structured Light in Structured Media Incubator, Washington DC, 29 September – 1 October 2013

Ghost Imaging and Quantum Imaging, Presented at the OSA Annual Meeting, Orlando, Florida, October 9, 2013

Weak Values and Direct Measurement of the Quantum Wavefunction, Presented at the APS/DLS Laser Science Annual Meeting, Orlando, Florida, October 9, 2013

Nonlinear Optics: The Enabling Technology for Quantum Information Science, ETH, December 15,2014
Research in Quantum Nonlinear Optics, Carleton University, Sept 17, 2013

Quantum Aspects of Light Beams Carrying Orbital Angular Momentum, Presented at the VIII Reunión Española de Optoelectrónica, Alcalá de Henares, Madrid, July 10-12, 2013.

Quantum Aspects of Light Beams Carrying Orbital Angular Momentum, Presented at International Workshop on"Singularities and Topological Structures of Light," ICTP Trieste. Italy, July 8-12, 2013.

Weak Values and Direct Measurement of the Quantum Wavefunction, ICSSUR, Nürnberg, June 24, 2013.

Weak Values and Direct Measurement of the Quantum Wavefunction, Presented at CQO/QIM, Rochester, New York, June 16-20, 2013.

Nanotechnology for Advanced Photonic Materials and Structures, Presented at the SPIE Conference Nanotechnology VI, Grenoble, France, April 24, 2013.

Fifty Great Years: The Development of the Field of Nonlinear Optics, Presented at the Undergraduate Symposium of the Department of Physics and Astronomy, Western University, London ON, April 9, 2013.

Nonlinear Photonics (Encompassing nanophotonics and quantum nonlinear optics), presented at the LENS Workshop, Florence Italy, March 12, 2013.

Research in Quantum Nonlinear Optics, Presented at the Physics Department, Concordia University, March 6, 2013.

Multi-bit-per-photon QKD system based on encoding in orbital-angular-momentum states of light, SPIE Photonics West, February 6, 2013.

Slow Light, Fast Light, and their Applications, SPIE Photonics West, San Francisco, February 4, 2013.

Orbital-Angular-Momentum Encoding for Free Space QKD, Presented at the Symposium on the Physics of Quantum Electronics, Snowbird Utah, January 7, 2013.

Presentations in 2012:

Encoding Information on Light Fields Using OAM States (Especially Quantum Information), presented at the New York State Center for Complex Light Workshop, CCN, October 22, 2012.

The Promise of Quantum Nonlinear Optics, presented at the APS-DLS – OSA Joint Annual Meeting, Rochester, NY, USA, October 16, 2012.

Fifty Great Years: The Development of the Field of Nonlinear Optics, presented at 50 Years of Nonlinear Optics, NLO 50 International Symposium, ICFO, Barcelona, Spain, October 10, 2012.

Research in Quantum Nonlinear Optics, presented at the IEEE Photonics Conference, San Francisco, September 26, 2012.

Research in Quantum Nonlinear Optics, presented at the Energy Materials and Telecommunicat-ions Centre of INRS, September 14, 2012.

Photon Momentum and Optical Forces in Highly Dispersive (Slow-Light) Media, Presented at the SPIE Annual Meeting, San Diego, CA, August 12, 2012.

Quantum Imaging: Enhanced Image Formation Using Quantum States of Light, presented at the 2012 Karles Invitational Conference on Quantum Information Science and Technology, Naval Research Laboratory Washington, DC 20375, August 27-28, 2012.

Quantum Imaging: Enhanced Image Formation Using Quantum States of Light, presented at the 21st International Laser Physics Workshop (LPHYS'12), Calgary, Alberta, Canada, July 23, 2012.

A series of three lectures at the Erasmus Mundus Summer School in Photonics, Brussels, Belgium, July 2, 2012.

Nonlinear Optics, Past Successes and Future Challenges, presented at the Colloquium of the Department für Physik der Friedrich-Alexander-Universität, Erlangen-Nürnberg, June 18, 2012.

Research in Quantum Nonlinear Optics, presented at the Workshop on Novel Ideas in Optics, Purdue University, May 31-June 2, 2012.

Nonlinear Optics, Past Successes and Future Challenges, Plenary Talk presented at the Conference on Lasers and Electro-Optics and Quantum Electronics and Laser Science Conference (CLEO: 2012), San Jose, California, May 6-11, 2012.

Fundamentals and Applications of Slow Light in Photonic Crystal Structures, presented at the Extreme Photonics, Nanophotonics Summer School and Workshop on the Fundamentals and Applications of Slow Light, University of Ottawa, April 30, 2012.

Enhanced Nonlinear Optical Response from Metamaterials, IMEW-V Albuquerque, March 25, 2012.

Information in a Photon, Presented at Photonics West, San Francisco, January 25, 2012.

New Physics and New Applications with Slow Light, Presented at Photonics West, San Francisco, January 23, 2012.

High-Order Entanglement for Quantum Information, presented at PQE, Snowbird Utah, January 3, 2012.

Presentations in 2011

Slow Light, Fast Light, and their Applications, Presented at IIT, Delhi, December12, 2011.

A Chip-Scale High-Resolution Slow-Light Spectrometer for Sensing and Recognition, Chemical and Biological Defense Science and Technology (CBD S&T) Conference, Las Vegas, Nevada, USA, November 14-18, 2011.

A sequence of 4 lectures presented at the Training School on New Frontiers in Optical Technologies, Tampere University of Technology, Tampere, Finland, August, 2011.

Promises and Challenges of Ghost Imaging, presented at the OSA Topical Meeting on Signal Recovery and Synthesis, July 11, 2011.

Promises and Challenges in Quantum Nonlinear Optics, presented the University of Muenster, Physics Colloquium, June 30, 2011.at the Max Planck Institute for the Science of Light, July 4, 2011.

Information in a Photon, presented at the First International Workshop on High-Dimensional Entanglement, Como, Italy. June 20-24, 2011.

Quantum Imaging: Enhanced Image Formation Using Quantum States of light, Presented at Information Photonics, Ottawa, May 19, 2011.

Promises and Challenges in Quantum Nonlinear Optics, Presented at Photonics North, Ottawa, ON, May 16, 2011.

Slow Light, Fast Light, and their Applications, presented at CLEO, Baltimore, MD, May 5, 2011.

Pulse Propagation through Dispersive Optical Materials, Presented at the Keithley Session, APS Annual Meeting, Dallas, Texas, March 23, 2011.

Research in Quantum Nonlinear Optics, Colloquium, Department of Physics, Queen's University, Kingston, Ontario, February 17, 2011.

A Half Century of Nonlinear Optics, Colloquium, Department of Physics, Purdue University, February 10, 2011.

Energy Considerations in Slow and Fast Propagation of Light and Quantum Key Distribution in a High-Dimensional State Space: Exploiting the Transverse Degree of Freedom of the Photon, presented at Photonics West, January 25-26, 2011.

Information in a Photon, presented at the Winter Colloquium on the Physics of Quantum Electronics, January 5, 2011.

Updated October 25, 2024