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Employment and appointments

- **Professor of Electrical and Computer Engineering, Beckman Institute for Advanced Science and Technology, and Coordinated Science Laboratory, University of Illinois at Urbana-Champaign, (Assistant 2001-7, Associate 2007-14) August 2014 –**
- Diagnostic Photonics Inc., cofounder (2008), board member (2010-2015), Chief Scientific Officer, 2010–
- Guest Researcher, CIC NanoGUNE, San Sebastian-Donostia, Spain July 2011, 2012, 2013, 2014, 2015
- Visiting Professor, Vrije Universiteit (Free University), Amsterdam, January–May 2009
- Research Associate with Prof J C Schotland, Washington University in Saint Louis, August 1999 – August 2001

Education

- Ph.D. in Physics, University of Rochester, June 1999
  Thesis: Optical theorems in statistical wavefields with applications
  Advisor: Professor Emil Wolf
- M.A. in Physics, University of Rochester, May 1996
- B.S. in Engineering Physics, University of Illinois Urbana–Champaign, May 1994

Honors

- Faculty Entrepreneurial Fellow 2016-2017
- University Scholar (6 from $\sim$ 2000 UIUC faculty) 2016-2019
- Rose Award for Teaching Excellence (2 from $\sim$ 400 CoE faculty) 2016
- Rose Education Innovation Fellow (1 from $\sim$ 400 CoE faculty) 2015-2018
- Fellow of the Optical Society 2015
- Incomplete list of teachers ranked excellent by their students 13 times 2004-2016
- Society for Applied Spectroscopy William F. Meggers Award 2014
- Federation of Analytical Chemistry and Spectroscopy Societies Innovation Award 2012
- William L. Everitt Award for Teaching Excellence (1 selected from $\sim$ 400 CoE faculty) 2012
- College of Engineering Outstanding Advisor Award 2003-04, 2007-08, and 2011-12
- Fulbright Scholar (The Netherlands) 2008-2009
- Honorary Member, HKN, Spring 2006
- NSF CAREER Award 2003
- Arnold O. Beckman Research Award 2002

Teaching

- Graduate physical optics and inverse problems (ECE 569), Course director, Fall 2003, Fall 2004, Fall 2005, Fall 2006, Fall 2007, Fall 2009, Fall 2012, Fall 2014
- Innovation and Engineering Design (ECE 398), Course co-creator and director, Fall 2014, Fall 2015.
- Frontiers in Cancer (BioE 199) Co-creator and co-instructor Fall 2014, Fall 2015
- Senior Design (ECE 445), Course director, Spring 2004, Spring 2005, Summer 2005, Spring 2006, Fall 2007, Summer 2009, Fall 2009, Spring 2010, Spring 2011, Spring 2012, Spring 2013, Spring 2014, Spring 2015, Fall 2015.
- Graduate nonlinear and quantum optics (ECE 570), Course director, Spring 2003, Spring 2008, Fall 2013, Fall 2015.
- Junior-level solid state devices (ECE 340), Fall 2010, Fall 2011
- Advanced coherence theory (ECE 598PSC), Creator and course director, Spring 2007, 2011
- Junior-level math methods course (ECE 493/MATH 487), Co-creator, Fall 2003, Fall 2004
- Junior-level electromagnetics (ECE 329), Fall 2001-Spring 2003, Spring 2004.

Mentoring and advising

- Post-docs: Richard Frazin (9/02-11/03), Brynmor Davis (6/06-9/09), Daniel Marks (7/07-7/08), Alexander Govyadonov (at nanoGune, 2/11–9/15), Thomas van Dijk (5/11–5/14), Bradley Deutsch (8/12–8/15), Tomasz Wroebel (8/14–), Martin Schnell (1/16–), Tom Galvin (6/16–), Ilia Rasskazov (6/16–), Yue Zhou (8/16–)
- PhD Theses supervised:
  1. Jin Sun, "Near-field scanning optical tomography: Theory and modalities," March 2008.

2. Andrea Mitofsky, "Lie symmetries in statistical optics," August 2008.
3. Robert Schoonover, "Nonstationary statistical optics," March 2010.
4. Rohith K Reddy, "Mid-Infrared Spectroscopic Imaging and Tomography," Sept, 2012 (with R. Bhargava).
5. Yang Xu, *Topics in inverse scattering*, Expected 2016.
6. Lang Wang, Expected 2019.

- 8 MS theses, 5 undergrad theses supervised.
- $\sim$ 30 undergraduate advisees annually, James Scholar advisor, multiple independent studies

Memberships and associations

- The Optical Society
- The American Physical Society
- The Institute of Electrical and Electronics Engineers
- Union of Concerned Scientists
- Skeptics Society

Service and Outreach

- University
  - Technology and Entrepreneurship Center evaluation special committee (2012-2013)
  - Search committee for Associate Vice Chancellor for Research and Director of the Office of Sponsored Research Programs (2012)
  - UI Office of Technology Management Board of Advisors, (2010-2012)
  - UIUC Faculty Senate (2003-2005)
  - Organizer, UIUC Reading Day Retreat: Imaging, May (2006)
- College
  - Review Committee, Undergraduate Certificate Program in Innovation (Chair, 2013)
  - Review Subcommittee, BIOE MEng proposal and associated courses (2012-2013)
  - Co-op Advisory Committee (2009–)
  - Engineering Design Council (2009–)
  - Subcommittee on Bioengineering Senior Design (2011)
  - Subcommittee on undergrad minor in physics (2009)
- Beckman Institute
  - BI Development Advisory Committee (2009-2012)
  - Beckman Fellows Committee (2004-2007)
  - Lecturer Beckman Institute Academic Career Mentorship Workshop Nov. 2009
- Coordinated Science Lab: Policy and Planning Committee (2012–2013)
- Department
  - Cocreator and organizer, Saturday Engineering for Everyone (2014–)
  - Faculty liaison to the Alumni Board (2013–)
  - Leung Student Venture Fund awards (Chair, 2012–)
  - Alumni Awards Committee (2010–, chair 2013–)
  - Conflict oversight Committee (2010–)
  - Communications Director Search Committee (2013)
  - ABET Committee(2012–2013)
  - Fellowship Committee(2011–2013)
  - Graduate Admissions Committee (2009–2013)
  - Graduate Committee (2009–2011)
  - Graduate Recruiting Committee (2007-2008, Chair)
  - Faculty Search Committee (2005-2008)
  - Eta Kappa Nu (HKN) faculty advisor (2006-2008)
  - Strategic Planning Committee (2006)
  - Department Head Evaluation Committee (2005-2006, Secretary)
  - Advisory Committee (2005-2006, elected, committee on committees)
  - Qual Exam Committee (2005-2006, Chair)
  - Undergraduate Awards Committee (2002-2005)
- Optical Society of America
  - Editor-in-Chief, Journal of the Optical Society of America A, January 2016 –
  - Committee member, Mathematic in Imaging, a COSI colocated meeting 2016
  - Frontiers in Optics (FiO), OSA annual meeting, General Chair 2016
  - Deputy Editor, Journal of the Optical Society of America A, 2014– 2015
  - Frontiers in Optics (FiO), OSA annual meeting, Program Chair 2014

  - Topical Editor, Propagation and Scattering, Journal of the Optical Society of America A, 2010– 2014
  - Optics in Information Science subcommittee, Frontiers in Optics (FiO) OSA annual meeting, member 2010, chair 2011, chair 2012, member 2013
  - Co-organizer "The Future of Optics," a Special Symposium at the 2012 FiO
  - Organizer and chair of "Symposium on Coherence in Physical Optics: 50 years of the Wolf Equations" at the 2004 OSA Frontiers in Optics Meeting (formerly the Annual Meeting)
- Other conference and journal service
  - International program committee member, Near-field Optics 13 (NFO 13), (2014)
  - International program committee member, Near-field Optics 14 (NFO 14), (2016)
  - Associate Editor, Frontiers in Physics: Optics and Photonics (2013–2014).
  - IEEE MTT-S International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications, Technical Program Committee member (2013)
  - Reviewer for OSA, APS, ACS, AIP, and other journals in optics and physics
- Public outreach and nonuniversity education
  - Speaker, Pint of Science Chicago, 20 May 2015
  - Finalist, 2014 Flame Challenge, Alan Alda Center for Communicating Science, SUNY Stonybrook
  - Cofounder and coorganizer, Saturday Engineering for Everyone (2014–)
  - Lecturer and coorganizer, Biophotonics Summer School at UIUC (2009–2012, 2014)
  - Speaker at Franklin Middle school AVID program "Meet an Engineer," (Jan 2013)
  - Lecturer in Saturday Physics for Everyone series at UIUC (Dec 2011)
  - Short course "An introduction to inverse problems," at Vrije Universiteit, Spring 2009
  - Lecturer, NSF and DOE sponsored Los Alamos Summer School, 2002–2004
- Contest judging
  - Illinois Innovation Prize April 2014
  - HackIllinois April 2014, March 2015
  - First LEGO League (FLL) Mindstorms competition (ages 9-14) Dec. 2008, Dec. 2009
- Proposal reviewer for NSF, NIH, and Canadian Research Council, Science Foundation Ireland, Polish National Science Center

Principal areas of research

- **Near field microscopy:** Developed solutions of the inverse scattering problem for various modalities of near-field microscopy to enable quantitative 3-D subwavelength imaging [11, 13, 15, 16, 18, 29, 31, 50, 60, 64, 72]. Demonstrated results experimentally [19]. Proposed new experimental techniques [13, 24]. Generalized the optical theorem to evanescent fields [9]. Developed strongly-scattering tip model [39] and a new volume-scanning method based in this model [50, 72]. Solved the inverse problem for broad-band measurements in the near-field [53]. Demonstrated improved resolution for subsurface objects at higher harmonics in tapping mode NSOM [63]. Invented a new method of synthetic holography for high-throughput, high-speed SNOM [75]. Demonstrated computation of sub-surface permittivity and depth from SNOM measurements [78].
- **Fundamental optical physics and coherence theory:** Generalized the optical cross–section theorem for stochastic fields and random media [2, 4, 7, 9, 12, 20, 22]. Investigated scattering from non-local media and predicted novel effects [23]. Developed eikonal and transport (geometrical optics) approaches for calculation of two-point coherence functions [25, 41, 56]. Found the Lie algebras and corresponding conservation laws for the Wolf equations [45]. Proposed and validated model for partially coherent VCSEL arrays [32, 47, 54, 59]. Developed a cyclostationary statistical theory of coherence for ultrafast pulse trains [40, 48, 49] and demonstrated novel cyclostationary effects [61].
- **Optical diagnostics, tomography, and inverse scattering:** Characterized the size dependence in optical coherence tomography (OCT) measurements of scattering from sub-resolution scatterers [26]. Derived formulae for diffraction of evanescent fields from vibrating nanoresonators [35]. Proposed new methods in spectral self-interference microscopy [37]. Developed a robust method of determining nanoparticle polarizability [44, 58]. Developed a method of superresolusion for coherent scattering from nanoparticles [73]. Solved the inverse problem for low coherence interferometric forward scattering [74].
  Proposed and investigated novel techniques for diffraction tomography (3-D structural imaging) that circumvent the so–called phase problem [2, 7, 9, 12]. Solved the inverse problem for projected index coherence tomography (PICT) [17]. Developed a novel side-lobe suppression algorithm for OCT image processing [21]. Solved the inverse scattering problem for OCT [27, 28] to produce and implement interferometric synthetic aperture microscopy (ISAM) [30, 33, 34, 36, 38, 42, 43, 46, 55, 65, 66, 71, 80, 81, 83, 88, 90–92] and applied ISAM to multi-focal plane datasets to seamlessly stitch large volumes together with improved SNR [79]. Developed a tomographic extension of quantitative phase imaging [62]. Proposed and investigated new method in far-field super-resolved imaging based on spectroscopic measurements [73] Developed and demonstrated phase-sensitive fast confocal imaging based on synthetic holography. Demonstrated sub-nm height sensitivity [77], robust implementations with low-cost components [84], and computed refocusing in post-processing [95].

- **Spectroscopy and nonliear optics:** Discovered correlation-induced spectral shifts in ultra-fast pulse trains [48,61]. Put the so-called transflection and transmission modalities of FTIR spectroscopy on common footing through a first-principles analysis and demonstrated the calculation of one type of spectra from the other in experiments [51]. Showed that apparent structure and spectra strongly influence each other in FTIR imaging [51, 52, 57, 69]. Described fundamental challenges in in the interplay of spectroscopy and instrument design [76,85]. Developed a new method to incorporate prior information to recover structure and composition simultaneously in broad-band optical imaging [87]. Explained the competition between enhancement and extinction in SERS [68, 70, 86]. Discovered a new behavior of the optical gain in four-wave mixing at high pump intensities [94].

Journal publications

[1] J R Tucker, C Wang and **P S Carney**, "Silicon field–effect transistor based on quantum tunneling," Appl. Phys. Lett. **65** 618-620 (1994).

[2] **P S Carney**, E Wolf and G S Agarwal, "Statistical generalizations of the optical cross-section theorem with application to inverse scattering," Journ. Opt. Soc. Am. A **14** 3366–3371 (1997).

[3] T D Visser, **P S Carney** and E Wolf "Remarks on boundary conditions for scalar scattering," Phys. Lett. A **249**, 243-247 (1998).

[4] **P S Carney**, and Emil Wolf, "An Energy Theorem for scattering of partially coherent beams," Opt. Comm. **155** 1-6 (1998).

[5] G Gbur and **P S Carney**,"Convergence criteria and optimization techniques for beam moments," Pure Appl. Opt. **7**, 1221-1230 (1998).

[6] **P S Carney** and G Gbur, "Optimal apodizations for finite apertures," Journ. Opt. Soc. Am. A **16**, 1638-1640 (1999).

[7] **P S Carney**, E Wolf, and G S Agarwal, "Diffraction tomography using power extinction measurements," Journ. Opt. Soc. Am. A **16**, 2643-2648 (1999).

[8] A V Shchegrov and **P S Carney**, "Far-field contribution of evanescent modes to the electromagnetic Green tensor," Journ. Opt. Soc Am. A **16**. 2583-2584 (1999).

[9] **P S Carney**,"The optical theorem with fields containing evanescent waves," Journ. Mod. Opt. **46**, 891-899 (1999).

[10] **P S Carney**, D G Fischer, J T Foley, A T Friberg, A V Shchegrov, T D Visser and E Wolf, "Comment: Evanescent waves do contribute to the far field," Journ. Mod. Opt. **47**, 757-758 (2000)

[11] **P S Carney** and J C Schotland, "Inverse scattering for near-field microscopy," Appl. Phys. Lett. **77**, 2798-2800 (2000).

[12] **P S Carney** and E Wolf, "Power extinction diffraction tomography with partially coherent light," Opt. Lett., **26**, 1770-1772, (2001).

[13] **P S Carney**, V A Markel and J C Schotland, "Near-field tomography without phase retrieval," Phys. Rev. Lett. **86** 5874-5877 (2001).

[14] **P S Carney** and J C Schotland, "Three-dimensional total internal reflection microscopy," Opt. Lett. **26**, 1072-1074 (2001).

[15] **P S Carney** and J C Schotland, Determination of three-dimensional structure in photon scanning tunneling microscopy, Journ.Opt. Pure Appl. Opt, **4** S140-S144 (2002).

[16] **P S Carney** and J C Schotland, "Theory of total-internal-reflection tomography," J Opt. Soc. Am. A **20**, 542–547 (2003).

[17] A M Zysk, J J Reynolds, **P S Carney**, D L Marks, S A Boppart, "Projection index coherence tomography," Opt. Lett., **28** 701 (2003).

[18] R A Frazin, D G Fischer, and **P S Carney**, "Information content of the near-field: two-dimensional samples," Journ. Opt. Soc. Am. A **21** 1050-1057 (2004).

[19] **P S Carney**, R A Frazin, S I Bozhevolnyi, V S Volkov, A Boltasseva, and J C Schotland, "A computational lens for the near-field," Phys. Rev. Lett. **92** 163903 (2004).

[20] **P S Carney**, J C Schotland, and E Wolf, "A generalized optical theorem for reflection, transmission and extinction of power for scalar fields," Physical Review E **70** 036611 (2004).

[21] D L Marks, **P S Carney**, S A Boppart, "Adaptive spectral apodization for sidelobe reduction in optical coherence tomography images," Journ. Biomed. Optics, **9**, 1281-1287 (2004).

[22] D R Lytle II, **P S Carney**, J C Schotland, and E Wolf, "A generalized optical theorem for reflection, transmission and extinction of power for electromagnetic fields," Phys Rev E **71**, 056610 (2005).

[23] R Schoonover, JM Rutherford, O Keller, **P S Carney**, "Nonlocal constitutive relations and the quasi-homogeneous approximation," Phys. Lett. A. **342**, 363-367 (2005).

[24] D L Marks and **P S Carney**, "Near-field diffractive elements," Opt. Lett. **30** 1870–1872 (2005).

[25] A Zysk, J C Schotland, **P S Carney**, "Eikonal method for calculation of coherence functions," Phys. Rev. Lett. **95**, 043904 (2005).

[26] C Xu, **P S Carney**, and S A Boppart, "Wavelength-dependent scattering in spectroscopic optical coherence tomography," Opt. Express, **13**, 5450 - 5462 (2005).

[27] T S Ralston, D L Marks, **P S Carney**, and S A Boppart, "Inverse scattering for optical coherence tomography," Journ. Opt. Soc. Am. A, **23**, 1027-1037, (2006).

[28] D L Marks, T S Ralston, **P S Carney**, and Stephen A. Boppart, "Inverse scattering for rotationally-scanned optical coherence tomography," Journ. Opt. Soc. Am. A, **23**, 2433-2439 (2006). [1]

[29] J Sun, J C Schotland, and **P S Carney**, "Near-Field Scanning Optical Tomography: A Nondestructive Method for Three-Dimensional Nanoscale Imaging ," IEEE Journ. Special Topics in Quant. Electron., **12**, 1072-1082, (2006).

[30] T S Ralston, D L Marks, S A Boppart, and **P S Carney**, "Inverse scattering for high-resolution interferometric microscopy," Opt. Lett, **31**, 3585-3587 (2006).

[31] G Y Panasyuk, V A Markel, **P S Carney**, and J C Schotland, Nonlinear inverse scattering and three-dimensional near-field optical imaging, Appl. Phys. Lett. **89**, 221116, (2006).

[32] A C Lehman, J J Raftery, Jr., **P S Carney**, K D Choquette, "Coherence of Photonic Crystal Vertical Cavity Surface Emitting Laser Arrays," IEEE Journ. Quant. Elect., **43**,25-30 (2007).

[33] T S Ralston, D L Marks, **P S Carney** and S A Boppart, "Interferometric synthetic aperture microscopy," Nature Physics, **3**, 129-134, (2007). [1]

[34] B J Davis, S C Schlachter, D L Marks, T S Ralston, S A Boppart and **P S Carney**, "Non-paraxial vector-field modeling of optical coherence tomography and interferometric synthetic aperture microscopy," Journ. Opt. Soc. Am A, **24**,2527-2542, (2007).

[35] M D Karabacak, K L Ekinci, S B Ippolito, C H Gan, G J Gbur, M S Ünlü, B B Goldberg, **P S Carney**, "Diffraction of evanescent waves and nanomechanical displacement detection," Opt. Lett., **32**, 1881-1883, (2007).[2]

[36] B J Davis, D L Marks, T S Ralston, S A Boppart and **P S Carney**, "Autocorrelation artifacts in optical coherence tomography and interferometric synthetic aperture microscopy," Opt. Lett, **32**, 1441-1443, (2007). [1]

[37] B J Davis, A K Swan, M S Ünlü, W C Karl, B B Goldberg, J C Schotland, and **P S Carney**, "Spectral self-interference microscopy for low-signal nanoscale axial imaging," J. Opt. Soc. Am. A **24**, 3587-3599 (2007). [1]

[38] D L Marks, T S Ralston, S A Boppart, and **P S Carney**, "Inverse scattering for frequency-scanned full-field optical coherence tomography," J. Opt. Soc. Am A, **24**, 1034-1041 (2007).

[39] J Sun, J C Schotland and **P S Carney**, "Strong probe effects in near-field optics,", J. Appl. Phys., **102**, 103103 (2007).

[40] R W Schoonover, B J Davis, R A Bartels, **P S Carney**, "Optical interferometry with pulsed fields," Journ. Mod. Opt., **55**, 1541-1556 (2008).

[41] R W Schoonover, A M Zysk, **P S Carney**, J C Schotland, E Wolf, "Geometrical limits of stochastic electromagnetic fields," Phys. Rev. A 77, 043831 (2008).

[42] T S Ralston, D L Marks, **P S Carney**, and S A Boppart, "Real-time interferometric synthetic aperture microscopy," Opt. Express, **16**, 2555-2569 (2008).

[43] B J Davis, D L Marks, T S Ralston, **P S Carney** and S A Boppart, "Interferometric Synthetic Aperture Microscopy: Computed Imaging for Scanned Coherent Microscopy," Sensors, 8, pp. 3903-3931 (2008). *invited*

[44] B J Davis and **P S Carney**, "Robust determination of the anisotropic polarizability of nanoparticles using coherent confocal microscopy," J. Opt. Soc. Am. A **25**, 2102-2113 (2008). [3]

[45] A Mitofsky and **P S Carney**, "Symmetries and conservation laws for the wave equations of scalar statistical optics," Journ. Phys. A: Math. Theor. **41**, 415207 (2008) .

[46] D L Marks, B J Davis, S A Boppart and **P S Carney**, "Partially coherent illumination in full-field interferometric synthetic aperture microscopy," Journ. Opt. Soc. Am A **26**, 376–386 (2009). [3]

[47] A C Lehman Harren, K D Choquette, and **P S Carney**, "Partial coherence in coupled photonic crystal vertical cavity laser arrays," Opt. Lett., **34**, 905-907 , (2009).

[48] R W Schoonover, B J Davis, and **P S Carney**, "The generalized Wolf shift for cyclostationary fields," Optics Express, **17**, 4705-4711 (2009).

[49] R W Schoonover, B J Davis, R A Bartels, **P S Carney**, "Propagation of spatial coherence in fast pulses," Journ. Opt. Soc. Am A **26**, 1945-1953 (2009) [4]

[50] J Sun, J C Schotland, R Hillenbrand and **P S Carney**, "Nanoscale optical tomography based on volume-scanning near-field microscopy," Appl. Phys. Lett. **95** 121108 (2009). [2]

[1] Also published in the Virtual Journal of Biological Physical Research.
[2] Also published in the Virtual Journal of Nanoscale Science and Technology.
[3] Also published in the Virtual Journal for Biomedical Optics
[4] Also published in the Virtual Journal of Ultrafast Science

[51] B J Davis, **P S Carney**, R Bhargava, "Theory of mid-infrared absorption microspectroscopy I. Homogeneous samples," Anal. Chem. **82**, 34743486 (2010).

[52] B J Davis, **P S Carney**, R Bhargava, "Theory of mid-infrared absorption microspectroscopy II. . Heterogeneous samples," Anal. Chem. **82**, 34873499 (2010).

[53] B J Davis, J Sun, J C Schotland, **P S Carney**, "Inverse scattering near-field scanning optical microscopy with broadband illumination," Journ. Mod. Opt. **57** 809-815 (2010).

[54] D Siriani, K D Choquette, **P S Carney**, "Stochastic Coupled Mode Theory for Partially Coherent Laser Arrays," Journ. Opt. Soc. Am. A **27**, 501-508 (2010).

[55] T S Ralston, S G Adie, D L Marks, S A Boppart, **P S Carney**, "Cross-validation of interferometric synthetic aperture microscopy and optical coherence tomography," Opt. Lett. **35**, 1683-1685 (2010).

[56] A M Zysk, R W Schoonover, **P S Carney**, M A Anastasio, "Transport of intensity and spectrum for partially coherent fields," Opt. Lett. **35**, 2239-2241 (2010).

[57] B J Davis, **P S Carney**, R Bhargava, "Theory of infrared microspectroscopy for intact fibers," Anal. Chem. **83**, 525532 (2010).

[58] S Tripathi, B J Davis, K Toussaint, and **P S Carney**, "Determination of the second-order nonlinear susceptibility elements of a single nanoparticle using coherent optical microscopy," Journ. Phys. B **44**, 015401 (2011).

[59] D Siriani, **P S Carney**, K D Choquette, "Coherence of leaky-mode vertical-cavity surface-emitting laser arrays," Journ. Quant. Electon., 10.1109/JQE.2011.210773376 (2011).

[60] D G Fischer, R A Frazin, M Asipauskas, **P S Carney**, "Information content of the near-field: three-dimensional samples, " Journ. Opt. Soc Am. A, **28**, 206-306 (2011).

[61] R W Schoonover, R Lavarello, M Oelze, **P S Carney**, "Observation of generalized Wolf shifts in short pulse spectroscopy," Appl. Phys. Lett., **98**, 251107 (2011).

[62] Z Wang, D L Marks, **P S Carney**, L J Millet, M U Gillette, A Mihi, P V Braun, Z Shen, S G Prasanth, and G Popescu,"Spatial light interference tomography (SLIT)," Opt. Express, **19**, 19907–19918 (2011).

[63] R Krutokhvostov, A A Govyadinov, J M Stiegler, F Huth, A Chuvilin, **P S Carney**, R Hillenbrand, "Enhanced resolution in subsurface near-field optical microscopy by virtual tip sharpening," Opt. Express **20** 599 (2012).

[64] **P S Carney**, B Deutsch, A A Govyandinov and R Hillenbrand, "Phase in nanooptics," ACS Nano, **6**, 8-12 (2012). *invited*

[65] S G Adie, B W Graf, A Ahmad, **P S Carney**, S A Boppart, "Computational adaptive optics for broadband optical interferometric tomography in biological tissue," Proc. Nat. Acad. Sci., 1121193109, (2012).

[66] S G Adie, N D Shemonski, B W Graf, A Ahmad, **P S Carney**, and S A Boppart, "Guide-star-based computational adaptive optics for broadband interferometric tomography," Appl. Phys. Lett. **101**, 221117 (2012).

[67] R Reddy, M Walsh, M Schulmerich, **P S Carney**, and R Bhargava, "High-definition infrared spectroscopic imaging" Appl. Spec. **67** 86-92 (2013).

[68] T van Dijk, S T Sivapalan, B M DeVetter, T K Yang, M V Schulmerich, C J Murphy, R Bhargava, and **P S Carney**, "Competition between extinction and enhancement in surface enhanced Raman spectroscopy," Journ. Phys Chem. Lett., **4**, 1193-1196 (2013).

[69] T van Dijk, D Mayerich, **P S Carney** and R Bhargava, "Recovery of absorption spectra from Fourier transform infrared microspectroscopic measurements of intact spheres," Appl. Spec. **67** 546–552, (2013).

[70] S Sivapalan, B Devetter, T Yang, T van Dijk, M Schulmerich, **P S Carney**, R Bhargava, and C Murphy, "Off-resonance SERS from gold nanorod suspensions as a function of aspect ratio: not what we thought," ACS Nano **26**, 2099–2105, DOI: 10.1021/nn305710k (2013).

[71] A Ahmad, N D Shemonski, S G Adie, H Kim, W W Hwu, **P S Carney**, and S A Boppart, "Real-time in vivo computed optical interferometric tomography," Nat. Phot. **7** 444-448 (2013).

[72] A A Govyadinov, I Amenabar, F Huth, **P S Carney**, and R Hillenbrand, "Quantitative measurement of local infrared absorption and dielectric function with tip-enhanced near-field microscopy," Journ. Phys Chem. Lett. **4**, 1526-1531 (2013).

[73] T van Dijk, D Mayerich, R Bhargava, and **P S Carney**, "Rapid spectral-domain localization," Opt. Express **21**, 12822-12830, DOI: 10.1364/OE.21.012822 (2013). [3]

[74] T Kim, R Zhou, M Mir, S D Babacan, **P S Carney**, L L Goddard, and G Popescu, "White-light diffraction tomography of unlabelled live cells," Nat. Phot. DOI: 10.1038/nphoton.2013.350 (2014).

[75] M Schnell, **P S Carney** R Hillenbrand, "Synthetic optical holography for rapid nanoimaging," Nat. Commun., **5** DOI: 10.1038/ncomms4499 (2014).

[76] D Mayerich, T van Dijk, M Walsh, M Schulmerich, **P S Carney** and R Bhargava, "On the importance of image formation optics in the design of infrared spectroscopic imaging systems," Analyst, **139** (16), 4031-4036 DOI: 10.1039/C3AN01687K (2014).

[77] M Schnell, M J Perez-Roldan, **P S Carney** and R Hillenbrand, "Quantitative confocal phase imaging by synthetic optical holography," Opt. Exp. **22**, 15267-15276, DOI: 10.1364/OE.22.015267 (2014).[3]

[78] A A Govyadinov, S Mastel, F Golmar, A Chuvilin, **P S Carney**, and R Hillenbrand, "Recovery of permittivity and depth from near-field data as a step towards optical nanotomography," ACS Nano, DOI:10.1021/nn5016314 (2014).

[79] Y Xu, X K B Chng, S G Adie, S A Boppart, and **P S Carney**, "Multifocal interferometric synthetic aperture microscopy," Opt. Exp. **22**, 16606-16618, DOI: 10.1364/OE.22.016606 (2014).[3]

[80] N Shemonski, S Adie, Y Liu, F South, **P S Carney**, and S Boppart, "Stability in computed optical interferometric tomography (Part I): Stability requirements," Opt. Express **22**, 19183-19197, DOI: 10.1364/OE.22.019183 (2014).[1]

[81] N Shemonski, S Adie, Y Liu, F South, **P S Carney**, and S A Boppart, "Stability in computed optical interferometric tomography (Part II): In vivo stability assessment," Opt. Express **22**, 19314-19326, DOI: 10.1364/OE.22.019314 (2014). [1]

[82] Y-Z Liu, N D Shemonski, S G Adie, A Ahmad, A J Bower, **P S Carney**, and S A Boppart, "Computed optical interferometric tomography for high-speed volumetric cellular imaging," Biomed. Opt. Exp., **5**, 2988-3000, DOI: 10.1364/BOE.5.002988 (2014).

[83] N D Shemonski, S S Ahn, Y-Z Liu, F A South, **P S Carney**, S A Boppart, "Three-dimensional motion correction using speckle and phase for in vivo computed optical interferometric tomography," Biomed. Opt. Exp. **5** 4131-4143 DOI: 10.1364/BOE.5.004131 (2014).

[84] B Deutsch, M Schnell, R Hillenbrand, **P S Carney**, "Synthetic optical holography with nonlinear-phase reference," Opt. Exp. **22**, 26621-26634 DOI: 10.1364/OE.22.026621 (2014). [1]

[85] T van Dijk, D Mayerich, **P S Carney** and R Bhargava, "Infrared Spectroscopic Imaging: Recent trends in using theory, computation, modeling and visualization to enhance information quality," Analyst, *in press* (2014).

[86] X K B Chng, T van Dijk, R Bhargava, and **P S Carney**, "Enhancement and extinction effects in surface-enhanced stimulated Raman spectroscopy," Phys. Chem. Chem. Phys., DOI:10.1039/C4CP05089D (2015).

[87] B Deutsch, R Reddy, D Mayerich, R Bhargava, and **P S Carney**, "Compositional prior information in computed infrared spectroscopic imaging," Journ. Opt. Soc. Am. A **32**(6), 1126-1131 (2015). [3]

[88] N D Shemonski, F A South, Y-Z, S G Adie, **P S Carney**, and S A Boppart, "Computational high-resolution optical imaging of the living human retina, " Nat. Photon., DOI: 10.1038/NPHOTON.2015.102 (2015).

[89] A M Zysk, K Chen, E Gabrielson, L Tafra, E A May Gonzalez, J K Canner, E B Schneider, A J Cittadine, **P S Carney**, S A Boppart, K Tsuchiya, K Sawyer, L K Jacobs, " Intraoperative assessment of final margins with a handheld optical imaging probe during breast conserving surgery may reduce the reoperation rate: Results of a multi-center study," Ann. Surg. Oncol., DOI: 10.1245/s10434-015-4665-2 (2015).

[90] F A South, Y-Z, Liu, **P S Carney**, and S A Boppart, "Computed Optical Interferometric Imaging: Methods, Achievements, and Challenges, " IEEE Journ. Special Topics in Quant. Electron., 10.1109/JSTQE.2015.2493962 (2015).

[91] F A South, Y-Z, Liu, **P S Carney**, and S A Boppart, "Polarization-sensitive interferometric synthetic aperture microscopy," Appl. Phys. Lett., doi: 10.1063/1.4936236, **107**, 211106 (2015).

[92] Y Xu, Y-Z Liu, S A Boppart, and **P S Carney**, "Automated interferometric synthetic aperture microscopy and computational adaptive optics for improved optical coherence tomography," Appl. Opt. **55**, 2034-2041, (2016).

[93] Y Xu, D Darga, J Smid, A M Zysk, D Teh, S A Boppart, and **P S Carney**, "Filtering and Unwrapping Noisy Wrapped Doppler Optical Coherence Tomography Images for Extended Microscopic Fluid Velocity Measurement Range," Opt. Lett., **41**, 4024-4027 (2016)

[94] T van Dijk, R Bhargava, and **P S Carney**, "A nonlinear Ewald-Oseen extinction theorem and application to gain factor in third-order optical processes" *submitted* (2016).

[95] S Buercklin, M Schnell, R Hillenbrand, **P S Carney**, "Computational refocusing with confocal synthetic optical holography," *submitted* (2016).

Substantial reviewed proceedings

1. **P S Carney** and J C Schotland, "Inverse scattering with subwavelength resolution in the near zone," Proc. SPIE **4261**, 1-6 (2001).
2. Meng Lu, Mingyu Lu, **P S Carney**, and E Michielssen, "FDTD simulation of 3-D surface plasmon polariton band gap waveguide structures," IEEE Antennas and Propagation Society Symposium 2004 Digest **3** 3155-3158 (2004).
3. T S Ralston, D L Marks, **P S Carney**, and S A Boppart, "Phase stability technique for inverse scattering in optical coherence tomography." Proc. IEEE International Symposium on Biomedical Imaging, 10.1109/ISBI.2006.1624982, 578-581 (2006).
4. B J Davis, T S Ralston, D L Marks, S A Boppart, **P S Carney**, "Interferometric Synthetic Aperture Microscopy: Physics-Based Image Reconstruction from Optical Coherence Tomography Data, " IEEE International Conference on Image Processing, 2007, **4**, IV - 145 — IV - 148 (2007).
5. R Reddy, B J Davis, **P S Carney**, R Bhargava, "Modeling Fourier Transform Infrared Spectroscopic Imaging of Prostate and Breast Cancer Tissue Specimen," Proc. IEEE International Symposium on Biomedical Imaging, ISBI (2011)
6. R Bhargava, M Pool, A M Smith, **P S Carney**, D Pan, "Works in Progress: a Challenge-Inspired Undergraduate Experience," *2015 ASEE Annual Conference and Exposition, Seattle, Washington, 2015, June.* ASEE Conferences, 2015. doi: 10.18260/p.25110, https://peer.asee.org/25110 Internet. 24 Dec, 2015

Book chapters

1. **P S Carney** and J C Schotland, "Near-Field Tomography," a chapter from the book "Inside Out: Inverse Problems" by Gunther Uhlman, ed. (Cambridge University Press, Cambridge, 2003). *invited*
2. D G Fischer and **P S Carney**, "Total Internal Reflection Tomography (TIRT) for Three-Dimensional Sub-Wavelength Imaging," Tribute to Emil Wolf: Science and Engineering Legacy of Physical Optics, SPIE Press, 2004.
3. S G Adie, B J Davis, T S Ralston, D L Marks, **P S Carney**, and S A Boppart , "Interferometric Synthetic Aperture Microscopy," Biomedical Applications of Light Scattering, McGraw Hill, 2009. *invited*
4. **P S Carney**, S G Adie, and S A Boppart , "Interferometric Synthetic Aperture Microscopy," Emerging Imaging Technologies in Medicine, Taylor and Francis, 2012. *invited*
5. S G Adie, N D Shemonski, T S Ralston, **P S Carney** and S A Boppart, "Interferometric Synthetic Aperture Microscopy and Computational Adaptive Optics," Optical Coherence Tomography: Technology and Applications (2^{nd} ed.), Springer, 2015.

Editorials

1. F Gori, and **P S Carney**, "Policy, procedures and goals at JOSA A: editorial," Journ. Opt. Soc. Am. A **32**(8), ED1-ED2, (2015).
2. F Gori, and **P S Carney**, "Introducing JOSA A Tutorials: editorial," Journ. Opt. Soc. Am. A **32**(12), ED3, (2015).
3. **P S Carney**, "Celebrating the new and old: editorial," Journ. Opt. Soc. Am. A **33**(1), ED1-ED2, (2016).
4. **P S Carney**, "The dedicated volunteers of JOSA A: editorial," Journ. Opt. Soc. Am. A **33**(3), ED3-ED6, (2016).
5. **P S Carney**, "A new addition to the JOSA A team: editorial," Journ. Opt. Soc. Am. A **33**(4), ED7, (2016).
6. **P S Carney**, "Image science at JOSA A: editorial," Journ. Opt. Soc. Am. A **33**(10), ED8, (2016)

Popular press

1. T S Ralston, D L Marks, S A Boppart, and **P S Carney**, " Interferometric synthetic aperture microscopy: Inverse scattering for optical coherence tomography," Optics and Photonic News, Dec., (2006).
2. T S Ralston, S G Adie, D L Marks, B J Davis, **P S Carney**, S A Boppart,"Real-time interferometric synthetic aperture microscopy," Dec., Optics and Photonics News (2008).
3. T S Ralston, G L Charvat, S G Adie, B J Davis, **P S Carney** and S A Boppart "Interferometric Synthetic Aperture Microscopy: Microscopic Laser Radar," Opt. Photonics News, 33-38, June (2010).
4. **P S Carney** and S A Boppart, "Interferometric synthetic aperture microscopy eliminates OCT compromises," Laser Focus World, January (2011).
5. **P S Carney** and S A Boppart, "Depth of field and resolution meet in new OCT approach," BioOptics World **4** 19, (2011).
6. F South, N Shemonski, Y Liu, S G Adie, **P S Carney**, and S A Boppart, Computational aberration correction for imaging of the human retina, Optics and Photonic News, Dec., (2015).

Patents

1. US Patent Number 6,775,349. Title: System and method for scanning near-field optical tomography. Inventors: Schotland, John Carl ; **Carney, Paul Scott**
2. US Patent Number 6,628,747. Title: System and method for dual-beam internal reflection tomography Inventors: Schotland, John Carl ; Markel, Vadim Arkadievich ; **Carney, Paul Scott**
3. US Patent Number 6,618,463. Title: System and method for single-beam internal reflection tomography Inventors: Schotland, John Carl ; **Carney, Paul Scott**
4. US Patent Number 7,643,155. Title: Partially Coherent Illumination for Inverse Scattering Full-Field Interferometric Synthetic aperture Microscopy. Inventors: Daniel Marks, Brynmor J Davis, Stephen Boppart, and **Paul Scott Carney**.
5. US Patent Number 7,969,650. Title: Multiplex Near-Field Microscopy with Diffractive Elements. Inventors: Daniel Marks and **Paul Scott Carney**.
6. US Patent Number 7,602,501. Title: Interferometric synthetic aperture microscopy. Inventors: Tyler Ralston, Daniel Marks, Stephen Boppart, and **Paul Scott Carney**.
7. US Patent Number 8,045,161, Title: Robust Determination of the Anisotropic Polarizability of Nanoparticles Using Coherent Confocal Microscopy. Inventors: Brynmor J Davis and **Paul Scott Carney**.
8. US Patent Number 8,089,630, Title: Spectral Near-Field Optical Tomography. Inverntors: Brynmor J Davis, Jin Sun, John C Schotland, and **Paul Scott Carney**.
9. US Patent Number 7,978,343.,Title: Nanoscale optical tomography based on volume-scanning near-field microscopy. Inventors: Rainer Hillenbrand, Jin Sun, John C Schotland, and **Paul Scott Carney**.
10. US Patent Number 8,334,976, Title: Second-Order Nonlinear Susceptibility of a Nanoparticle Using Coherent Optical Microscopy Inventors: Brynmor Davis, Santosh Tripathi, Kimani Toussaint, and **Paul Scott Carney**.
11. US Patent Number 8,599,388, Title: Coherent Optical Mapping of Particles. Inventors: Thomas van Dijk, Rohit Bhargava, and **Paul Scott Carney**

12. PCT WO 2014/051680, Title: Synthetic optical holography. Inventors: Martin Schnell, Rainer Hillenbrand and **Paul Scott Carney**
13. US Patent Number 8,731,272, Title: Computational Adaptive Optics for Interferometric Synthetic Aperture Microscopy and Other Interferometric Imaging, Steven Adie, Stephen Boppart, and **Paul Scott Carney**.
14. US Patent 9,213,313, Title: Synthetic optical holography. Inventors: Martin Schnell, Rainer Hillenbrand and **Paul Scott Carney**.
15. US Patent 9,404,857 Title: White Light Diffraction Tomography of Unlabeled Live Cells. Inventors: Gabriel Popescu, Lynford Goddard, **Paul Scott Carney**, Taewoo Kim, Renjie Zhou, Mustafa Mir, S. Derin Babacan.

Recent invited talks (5 years)

1. **P S Carney**, *Lens vs algorithms: optical imaging in the age of computers*, University of Houston, 4 April 2016.
2. **P S Carney** *Synthetic optical holography,* Boston University, ECE Distinguished Lecturer Series, 4 February 2016.
3. **P S Carney** *From subatomic physics to a view of your kidneys*, Pint of Science, The Beer Bistro, Chicago, IL May 2015.
4. **P S Carney** *Nanoholography: Coherent multiplex imaging in the near-field*, DINAMO, El Chaltan, Argentina, April 2015.
5. **P S Carney** *Synthetic optical holography holography: Coherent multiplex imaging*, Duke, NC, April 2015.
6. **P S Carney** *Problems, projects, and challenges: Intrinsically motivated learning*, weSTEM 2015, Champaign, IL February 2015.
7. **P S Carney** *Light localization in near-field optics: theoretical foundations of scattering and propagation in the near-field, a tutorial*, Donostia International Physics Center School on Scanning Probe Microscopy, a tribute to Heinrich Rohrer, September 2014.
8. **P S Carney** *Synthetic optical holography for probe microscopy,* Donostia International Physics Center School on Scanning Probe Microscopy, a tribute to Heinrich Rohrer, September 2014.
9. **P S Carney** *Synthetic optical holography for probe microscopy,* Trends in (Nano)Photonics 2014, Donostia International Physics Center, July 2014.
10. B Deutsch M Schnell, R Hillenbrand, **P S Carney**, *Synthetic Optical Holography*, Computational Optical Sensing and Imaging, June 2014.
11. **P. S Carney**, S. Buercklin, M. Schnell, and R. Hillenbrand, *Synthetic holography*, Electromagnetic optics with random light, June 2014, Joensuu, Finland.
12. **P. S. Carney**, *Lens vs algorithms: optical imaging in the age of computers*, Biological Physics seminar, UCLA, 8 May 2013.
13. **P. S. Carney**, *Nanoholography,* EE Colloquium, UCLA, 6 May 2013.
14. **P. S. Carney**, *Nanoholography,* iOptics, Champaign, Illinois, 16 April 2013.
15. **P. S. Carney**, *Inside out: How computers and physics have revolutionized medical imaging,* IEEE Central Illinois Section March/April 2013 meeting, Champaign, IL 11 April 2013.
16. **P. S. Carney**, *Nanoholography,* Adirondack Nanooptics Symposium, Inlet, NY, October 2012.
17. **P. S. Carney** *Light localization in near-field optics: theoretical foundations of scattering and propagation in the near-field*, tutorial, NFO 12, Donostia, Spain September 2012
18. R. Bhargava, **P. S. Carney**, B.J. Davis *Infrared microscopy for forensic applications: an emerging technology aided by fundamental optical theory,* SPIE BiOS, San Francisco, CA, January 2012
19. **P. S. Carney**, *Risks, rewards, and a path worth walking*, HKN Initiation Ceremony, Urbana, April 2012.
20. **P. S. Carney**, *Computed Microscopy*, Share the Vision, an OTM-sponsored symposium, Urbana, IL, April 2012.
21. **P. S. Carney**, *Adventures of a reluctant entrepreneur*, Keynote Address at Invention to Venture, Technology Entrepreneur Center, Urbana, IL April 2012.
22. **P. S. Carney**, *Computed Microscopy*, Share the Vision 2012, Champaign, IL, April 2012.
23. **P. S. Carney**, Thomas van Dijk and Rohit Bhargava, *Spectroscopy for Intact Particles*, OSA Computational Optical Sensing and Imaging, Monterey, CA, 27 June 2012.
24. **P. S. Carney**, *How physics has revolutionized medical imaging*, University of Illinois Department of Physics, Saturday Physics Series, 3 December 2011.
25. **P. S. Carney**, *How physics and modern computers have revolutionized imaging*, NanoGUNE, Donostia, Spain, July 2011.
26. R. Bhargava, A.K. Kodali, X. Llora, R.K. Reddy, M.J. Walsh, **P. S. Carney**, *Development of highly sensitive and specific vibrational spectroscopic imaging guided by new theory*, EAS 2011, Somerset, NJ, November 2011
27. R. Bhargava, T. van Dijk, R.K. Reddy, **P. S. Carney**, *Theory of resolution and image quality in mid-IR imaging,* FACSS 11, Reno, October 2011.
28. **P. S. Carney**, *Coherence theory for pulse trains*, Physics of Quantum Electronics, January 2011.

Recent contributed talks

1. Yang Xu, Donald Darga, Jason Smid, Adam M. Zysk, Daniel Teh, Stephen A. Boppart, and **P. S. Carney**,

"Filtering and Unwrapping Doppler Optical Coherence Tomography Velocity Maps," Imaging and Applied Optics, Computational Optical Sensing and Imaging (COSI), Heidelberg, Germany, July, 2016.

2. Martin Schnell, Sam Buercklin, Paulo Sarriugarte;,Rainer Hillenbrand, **P. S. Carney**, "Computational Refocusing in Phase-resolved Confocal Microscopy, " Imaging and Applied Optics, Digital Holography & 3-D Imaging (DH), Heidelberg, Germany, July 2016,
3. Luke Pfister, Yoram Bresler, Rohit Bhargava, and **P. S. Carney**, "Inverse Scattering with Chemical Composition Constraints for Spectroscopic Tomography," Imaging and Applied Optics, Mathematics in Imaging, Heidelberg, Germany, July 2016.
4. Luke Pfister, Rohit Bhargava, **P. S. Carney** and Yoram Bresler, "Mid-Infrared Spectroscopic Tomography," SIAM Conference on Imaging Science May, 2016.
   Luke Pfister, Rohit Bhargava, **P. S. Carney** and Yoram Bresler, "Mid-Infrared Spectroscopic Tomography," Gordon Research Conference on Image Science May, 2016.
5. David Mayerich, Rohit Bhargava, and **P. S. Carney**, "BIM-Sim: Interactive Simulation of Broadband Imaging Using Mie Theory," Microscopy & Microanalysis meeting in Columbus, Ohio, July 24-28, 2016.
6. Xiong Kai Benjamin Chng, Thomas van Dijk, Rohit Bhargava, **P. Scott Carney**, "Enhancement and extinction in surface enhanced stimulated Raman scattering," Frontiers in Optics, Tucson, October 2014.
7. Thomas van Dijk, David Mayerich, **P. S. Carney**, Rohit Bhargava, "Recovery of Absorption Spectra from Fourier Transform Infrared Microspectroscopic Measurements of Intact Spheres,"OSA Frontiers in Optics, Orlando, October 2013.
8. Thomas van Dijk, Rohit Bhargava, **P. S. Carney**, "Optimization of the Raman Signal in Suspensions of Nanoparticle Aggregates," OSA Frontiers in Optics, Orlando, October 2013.
9. Yang XU, Xiong Kai Benjamin Chng, Steven G. Adie, Stephen A. Boppart, **P. S. Carney**, "Multifocal Interferometric Synthetic Aperture Microscopy," OSA Frontiers in Optics, Orlando, October 2013.
10. Nathan D. Shemonski, Yuan-Zhi Liu, Adeel Ahmad, Steven G. Adie, **P. S. Carney**, Stephen A. Boppart, "Real-time computed optical interferometric tomography," Paper 8934-67, Photonics West, February, 2014.
11. Nathan D. Shemonski, Steven G. Adie, **P. S. Carney**, Stephen A. Boppart, "Stability in computed optical interferometric tomography for in vivo imaging," Paper 8934-42, Photonics West, February, 2014.
12. M. Schnell, J. Chen, P. Alonso-González, A. Centeno, A. Pesquera, A. Zurutuza Elorza, **P. S. Carney**, R. Hillenbrand, "Noninvasive mapping of grain boundaries and multilayers in CVD grown graphene," Graphene Nanophotonics, March 2013 in Benasque, Spain
13. R Krutokhvostov, A A Govyadinov, J M Stiegler, F Huth, A Chuvilin, **P S Carney**, R Hillenbrand, "Enhanced Resolution in Subsurface Near-field Microscopy" Near Field Optics 2012, Donostia, Spain, September, 2012.
14. A.A. Govyadinov, F. Huth, J. Stiegler, **P S Carney**, and R. Hillenbrand, "Quantitative determination of dielectric properties of nano- structures by s-SNOM in two and three dimensions," Near Field Optics 2012, Donostia, Spain, September, 2012.
15. Shemonski N.D., Adie S.G., Ahmad A., Kim H., Chaney E.J., Hwu W.W., **Carney P.S.** and Boppart S.A., "Real-time computed imaging in optical coherence tomography using interferometric synthetic aperture microscopy and computational adaptive optics," Gordon Research Conferences (Lasers in Medicine & Biology), Holderness, New Hampshire, 2012.
16. Adie S.G., Ahmad A, Shemonski N., Graf B.W., Kim H., Hwu W.W., **Carney P.S.** and Boppart S.A., "Interferometric synthetic aperture microscopy with computational adaptive optics for high-resolution tomography of scattering tissue", OSA Biomedical Optics (BIOMED), BW2A.1, Miami, Florida, 2012.
17. Adie S.G., Graf B.W., Ahmad A, Shemonski N., **Carney P.S**. and Boppart S.A., "Interferometric synthetic aperture microscopy with virtual adaptive optics aberration correction" (oral presentation only), SPIE Photonics West, San Francisco, 2012.
18. R.K. Reddy, D. Mayerich, M. Walsh, **P. S. Carney** , R. Bhargava, Rigorous Electromagnetic Model of Fourier Transform Infrared (FT-IR) Spectroscopic Imaging Applied to Automated Histology of Prostate Tissue Specimens, International Conference on Optics, Lasers and Spectroscopy (ICOLS), Madrid, Spain, March 2012
19. R. Reddy, D. Mayerich, M. Walsh, M. Schulmerich, **P. S. Carney**, R. Bhargava, Optimizing the Design of FT-IR Spectroscopic Imaging Instruments to Obtain Increased Spatial Resolution of Chemical Species, International Symposium of Biomedical Imaging (ISBI), Barcelona, Spain, May 2012
20. R.K. Reddy, **P. S. Carney**, R. Bhargava Overcoming Spectral Distortions in Fourier Transform Infrared (FT-IR) Spectroscopic Imaging FACSS 2011, Reno, October 2011
21. R.K. Reddy, B.J. Davis, **P. S. Carney**, R. Bhargava Modeling Fourier transform infrared spectroscopic imaging of Prostate and breast cancer tissue specimens IEEE International Symposium on Biomedical Imaging (ISBI), Chicago, March 2011
22. Adie S.G., Graf B.W., Ahmad A., Dabarsyah B., Boppart S.A. and **Carney P.S.**, "The impact of aberrations on object reconstruction with interferometric synthetic aperture microscopy", Proceedings of SPIE, 7889: 78891O, 2011.

Current Funding

Agency	Dates	Title or Description	Role	k$ (to PSC)
NIH	9/14-6/17	Real-Time In Vivo Image Reconstruction and Processing for Effective Analysis of Tissue Microstructure (Phase II) subaward	PI	150
IARPA	2/16-8/20	Standoff Illuminator for Measuring Absorbance and Reflectance Infrared Light Signatures (SILMARILS)	PI	2,700
European Union	1/16-1/18	Horizon 2020: Synthetic Optical Holography	PI	20
NIH	10/16-9/21	R01: Intraoperative Polarization-Sensitive OCT for Assessing Breast Tumor Margins	Co-I	450
UIUC	8/15-8/18	Rose Education Innovation Fellows Program	PI	18
UIUC	8/16-8/17	Strategic Instructional Improvement Program: Just In-Time Presentation Instruction	PI	9
UIUC	8/16-8/19	University Scholars Program	PI	45
UIUC	8/16-8/17	Faculty Entrepreneurial Fellows Program: Phase Sensitive Confocal Microscopy	PI	50

Carney cofounded Diagnostic Photonics as a vehicle to translate ISAM from university research to commercializations and clinical application. He was central to the series A (M$2.2) and Series B (M$3 closed, M$4 open) funding rounds and wrote the SBIR proposals for M$4.2 in funded grants over the last 4 years. The company is in it's third version of the instrument, has completed and published a pilot trial [89], and is conducting a large multisite (8 sites, 500 patients) trial currently. The device is CE marked, and has initial FDA clearance (510k) and is covered under four new CPT codes.

Currently funded proposals written for Diagnostic Photonics, Inc.:

Agency	Dates	Title or Description	Role	k$
NIH	9/14-6/17	Real-Time In Vivo Image Reconstruction and Processing for Effective Analysis of Tissue Microstructure (Phase II)	CSO	1,000
NIH	9/12-8/17	Computed Optical Margin Assessment for Breast Cancer (Fasttrack Phase I and II)	CSO	2,300

C.V. current as of September 21, 2016.