

## **GREG GBUR**

*Curriculum Vitae*

Full Professor

UNC Charlotte

Department of Physics and Optical Science

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### **CAREER OBJECTIVES**

I intend to extend the understanding and use of classical coherence theory in optical physics, with an eye towards useful applications of coherence phenomena. In particular, I am studying the properties of partially coherent wave propagation in random media such as atmospheric turbulence.

I plan to investigate, through exact numerical simulations, light interactions at subwavelength scales, with the goal of developing novel nano-scale optical devices.

I am interested in exploring the implications of invisibility and cloaking theory on the development of novel optical devices, as well as introducing new designs of such devices.

I would like to generate a better understanding of optics, and physics in general, within the nonscientific community, through teaching, lectures, publications and online outreach.

### **EDUCATION**

#### **Degrees:**

Ph.D., University of Rochester, 2001, theoretical physics

M.A., University of Rochester, 1996, physics

B.A., University of Chicago, 1993, physics (with honors)

### **PH.D. DISSERTATION**

title: *Nonradiating sources and the inverse source problem*,

advisor: Professor Emil Wolf

### **POSTDOCTORAL RESEARCH**

University of Rochester, under Professor Emil Wolf, April 2001- April 2002

Vrije Universiteit, Amsterdam, under Professor Taco Visser, April 2002-August 2004

### **HONORS, AWARDS, AND ACHIEVEMENTS**

GAANN (Department of Education) fellowship, 1994 - 1997

University of Rochester Department of Physics Susumu Okubo Prize, 1996

Air Force Office of Scientific Research AASERT fellowship, 1997-2000  
 University of Chicago Student Marshal, 1993  
 Member of University of Rochester Physics and Astronomy graduate admissions committee, 1997  
 Co-organizer of *The Natural World as Art and Science* 2006, UNC Charlotte  
 Optical Society of America Senior Member, 2013

## TEACHING EXPERIENCE

### *UNC Charlotte:*

Instructor, OPTI 6101/8101, *Math Methods for Physics*, Fall 2004, Fall 2005, Fall 2006, Fall 2008, Fall 2009, Fall 2010, Fall 2011, Fall 2012, Fall 2013, Fall 2014, Fall 2015, Fall 2016

Instructor, OPTI 6271, *Advanced Physical Optics*, Spring 2005, Spring 2009

Instructor, PHYS 3141, *Modern Physics*, Fall 2005, Spring 2006, Fall 2006, Spring 2007

Instructor, PHYS 3101, *Math Methods*, Spring 2006

Instructor, PHYS 4231, *Electromagnetic Theory I*, Spring 2008, Spring 2009, Spring 2010, Spring 2011

Instructor, PHYS 4232, *Electromagnetic Theory II*, Fall 2014

Instructor, OPTI 6104/8104, *Electromagnetic Waves*, Spring 2011, Spring 2012, Spring 2013, Spring 2014, Spring 2015, Spring 2016, Spring 2017, Spring 2018

Instructor, OPTI 6271/8271, *Modern Coherence Theory*, Fall 2013, Fall 2016

Co-instructor, OPTI 6000, *Nano-optics*, Fall 2011 (special topics course)

### *University of Rochester:*

Co-instructor with Professor Adrian Melissinos, *graduate mathematical methods for physicists 401- 403*, autumn 1999.

Grader, *graduate quantum optics II*, spring 2002.

Grader, *graduate classical coherence theory 534*, spring 2000.

Grader, *graduate classical coherence theory 534*, spring 1999.

Teaching assistant, *college physics 113 - 114*, autumn 1994 - spring 1995.

Guest lecturer, *graduate E&M II 416*, 4/24/2000 & 4/26/2000.

### *University of Chicago:*

undergraduate physics tutor, 1992 - 1993 academic year.

## AREAS OF RESEARCH

- Propagation of beams through turbulence. It has been observed that partially coherent beams and vortex beams propagate better in atmospheric turbulence than traditional Gaussian beams. I coauthored a paper on the spreading of such beams in turbulence, and confirmed that indeed they have certain advantages over their fully coherent counterparts. Further studies involve investigations of scintillation properties of various classes of partially coherent beams, for possible application in optical communication systems.

- Nano-scale electromagnetics. The discovery of enhanced light transmission through subwavelength holes and the role of surface plasmons in the enhancement has created new possibilities for subwavelength optical devices. I am undertaking exact numerical simulations of Maxwell's equations near subwavelength features in metal plates in order to obtain a deeper understanding of such phenomena, with an eye towards developing novel optical devices.
- Singular optics. The phase of an optical field can exhibit unusual behavior in the neighborhood of zeros of intensity, including optical vortices and saddles. My collaborators and I demonstrated that drastic spectral changes occur in the vicinity of such phase singularities for polychromatic fields. We are now currently investigating the properties of phase singularities of coherence functions.
- Inverse scattering problems. Methods such as computed tomography which can be used to create images of three-dimensional objects are of great importance in a variety of applications, including medical imaging, geophysics, materials testing, even archaeology. I have been involved in the development of a new method of diffraction tomography which requires only intensity measurements of the scattered field.
- Nonradiating sources, optical cloaking, and invisibility. It has been shown that there exist solutions to inhomogeneous wave equations which do not produce any radiation outside the domain of the source, as well as scattering objects that do not produce a scattered field. My thesis work investigated the properties of such objects and determined some new properties of them, particularly for partially coherent sources. I continue to investigate cloaks, invisible objects, and nonradiating sources.

## OTHER EXPERIENCE & ACTIVITIES

- Assisted in updating of seventh edition of *Principles of Optics* by Max Born and Emil Wolf (Cambridge University Press, 1999).
- Performed typesetting of front matter and several new articles for the collected papers of Emil Wolf (World Scientific Publishing, 2001).
- Developed algorithm in FORTRAN for stacking of CsI crystals for detector for Fermilab's KTeV research group, summer 1992.
- Wrote software in C and tested hardware for a readout system for the light output of a CsI crystal as part of bachelor's thesis, "*A readout system for the CsI test array*".
- Supervised the workers of a CsI crystal processing lab devoted to the testing and optimization of the light output of crystals for the KTeV detector, 1993-1994.
- Wrote FORTRAN code for analysis of data from the CLEO detector at Cornell in search of the rare  $B$  decay  $B \rightarrow K \nu \nu$ , summer 1995.
- Performed various measurements of the shape, durability, and porosity of a tube designed to be the inner wall of the drift chamber for the CLEO detector, 1995-1996.
- Generated figures for book by Emil Wolf on *Introduction to the Theory of Coherence and Polarization*.

- Maintains a popular science weblog, [Skulls in the Stars](#), that seeks to present science in an understandable way to the general public.
- Editor for [ResearchBlogging.org](#), a website that aggregates and comments on blogging about scientific research, from 2009-2010.
- Founder of a blog carnival, [The Giant's Shoulders](#), that focuses on the history of science, that ran from 2008-2014.
- Judge for elementary school science fair at Barringer Academy, Charlotte, NC, January 2011, January 2014.
- Performed science demonstrations for the British American School's Science Day, October 2014, and Family STEAM Nights in January 2017 and February 2018.
- Developed and performed indoor and outdoor interactive physics demonstrations for the 2012-2018 UNC Charlotte Science and Tech Expos.
- Chair of a planning subcommittee for OSA Frontiers in Optics meeting 2010.
- Member of planning subcommittee for OSA Frontiers in Optics meeting 2018.
- Topical editor for the Journal of the Optical Society of America A, 2014 to present.
- Written scholarly introductions to classic works of horror fiction by John Blackburn for Valancourt Books, including "Broken Boy," "Nothing but the Night," "The Flame and the Wind," "Bury Him Darkly," "The Face of the Lion," "The Cyclops Goblet," and "Our Lady of Pain." Also written introduction to Archie Roy's "Devil in the Darkness."
- Written literary reviews for issue 16, 17, 18, 19/20 of horror magazine "Dead Reckonings," 2014-2016.
- Co-organized "Partially Coherent Thoughts: Memorial Workshop for Emil Wolf" with Olga Korotkova in August 2018.

## PUBLICATIONS

1. G. Gbur and E. Wolf, "Sources of arbitrary states of coherence that generate completely coherent fields outside the source", *Opt. Lett.* 22 (1997), 943.
2. G. Gbur and P.S. Carney, "Convergence criteria and optimization techniques for beam moments", *Pure Appl. Opt.* 7 (1998), 1221.
3. M. Berry, J.T. Foley, G. Gbur and E. Wolf, "Nonpropagating string excitations", *Am. J. Phys.* 66(2) (1998), 121.
4. G. Gbur and E. Wolf, "Phase conjugation with random fields and with deterministic and random scatterers", *Opt. Lett.* 24 (1999), 10.
5. G. Gbur, D.F.V. James, and E. Wolf, "Energy conservation law for randomly fluctuating electromagnetic fields", *Phys. Rev. E* 59 (1999), 4594.
6. G. Gbur and K. Kim, "The quasi-homogeneous approximation for a class of three-dimensional primary sources", *Opt. Commun.* 163 (1999), 20; erratum in *Opt. Commun.* 167 (1999), 311.

7. P.S. Carney and G. Gbur, "Optimal apodizations for finite apertures", *J. Opt. Soc. Am. A* 16 (1999), 1638.
8. G. Gbur and E. Wolf, "Determination of density correlation functions from scattering of polychromatic light", *Opt. Commun.* 168 (1999), 39.
9. G. Gbur, J.T. Foley and E. Wolf, "Nonpropagating string excitations – finite length and damped strings", *Wave Motion* 30 (1999), 125.
10. G. Gbur and D.F.V. James, "Unpolarized sources that generate highly polarized fields outside the source", *J. Mod. Opt.* 47 (2000), 1171.
11. G. Gbur, "Uniqueness of the solution to the inverse source problem for quasi-homogeneous sources", *Opt. Commun.* 187 (2001), 301.
12. G. Gbur and E. Wolf, "The Rayleigh range of Gaussian Schell-model beams", *J. Mod. Opt.* 48 (2001), 1735.
13. G. Gbur and E. Wolf, "Relation between computed tomography and diffraction tomography", *J. Opt. Soc. Am. A* 18 (2001), 2132.
14. G. Gbur and E. Wolf, "The Rayleigh range of partially coherent beams", *Opt. Commun.* 199 (2001), 295.
15. G. Gbur, T.D. Visser and E. Wolf, "Anomalous behavior of spectra near phase singularities of focused waves", *Phys. Rev. Lett.* 88 (2002), 013901.
16. G. Gbur and E. Wolf, "Spreading of partially coherent beams in random media", *J. Opt. Soc. Am. A* 19 (2002), 1592.
17. G. Gbur, T.D. Visser and E. Wolf, "Singular behavior of the spectrum in the neighborhood of focus", *J. Opt. Soc. Am. A* 19 (2002), 1694.
18. E. Wolf and G. Gbur, "Determination of the scattering amplitude and of the extinction cross-section from measurements at arbitrary distances from the scatterer", *Phys. Lett. A* 302 (2002), 225.
19. T.D. Visser, G. Gbur and E. Wolf, "Effect of the state of coherence on the three-dimensional spectral intensity distribution near focus", *Opt. Commun.* 213 (2002), 13.
20. G. Gbur and E. Wolf, "Diffraction tomography without phase information", *Opt. Lett.* 27 (2002), 1890.
21. G. Gbur and E. Wolf, "Hybrid diffraction tomography without phase information", *J. Opt. Soc. Am. A* 19 (2002), 2194.

22. G. Gbur, T.D. Visser and E. Wolf, "Singular optics with polychromatic light", *Optics & Photonics News*, December 2002, p. 55.
23. G. Gbur, "Performing diffraction tomography without phase information", *Proceedings Symposium IEEE/LEOS Benelux Chapter*, 2002, Amsterdam, 151.
24. H.F. Schouten, T.D. Visser, G. Gbur, D. Lenstra, and H. Blok, "Creation and annihilation of phase singularities near a sub-wavelength slit", *Optics Express* 11 (2003), 371.
25. H.F. Schouten, G. Gbur, T.D. Visser and E. Wolf, "Phase singularities of the coherence functions in Young's interference experiment", *Opt. Lett.* 28 (2003), 968.
26. G. Gbur and T.D. Visser, "Coherence vortices in partially coherent beams", *Opt. Commun.* 222 (2003), 117.
27. G. Gbur, "Nonradiating sources and other 'invisible' objects", in E. Wolf (Ed.), *Prog. in Optics*, vol. 45 (Elsevier, Amsterdam, 2003), p. 273.
28. G. Gbur and T.D. Visser, "Can spatial coherence effects produce a local minimum of intensity at focus?", *Opt. Lett.* 28 (2003), 1627.
29. H.F. Schouten, T.D. Visser, G. Gbur, D. Lenstra and H. Blok, "Phase singularities and enhanced transmission at a subwavelength slit", *Optics & Photonics News*, December 2003, p. 23.
30. G.S. Agarwal, G. Gbur and E. Wolf, "Coherence properties of sunlight", *Opt. Lett.* 29 (2004), 459.
31. Y. Li, E. Wolf, G. Gbur and T.D. Visser, "Reply to comment: Optimum depth of the information pit on the data surface of a compact disk", *J. Mod. Opt.* 51 (2004), 779.
32. G. Gbur and E. Wolf, "The information content of the scattered intensity in diffraction tomography", *Information Sciences* 162 (2004), 3.
33. G. Gbur, T.D. Visser and E. Wolf, "'Hidden' singularities in partially coherent wavefields", *J. Opt. A* 6 (2004), S239.
34. H.F. Schouten, T.D. Visser, G. Gbur, D. Lenstra and H. Blok, "The diffraction of light by narrow slits in plates of different materials", *J. Opt. A* 6 (2004), S277.
35. G. Gbur, T.D. Visser and E. Wolf, "Complete destructive interference of partially coherent fields", *Opt. Commun.* 239 (2004), 15.

36. D. Shi, M.A. Anastasio, Y. Huang and G. Gbur, "Half-scan and single-plane intensity diffraction tomography for phase objects", *Phys. Med. Biol.* 49 (2004), 2733.
37. H.F. Schouten, T.D. Visser, G. Gbur, D. Lenstra and H. Blok, "Connection between phase singularities and the radiation pattern of a slit in a metal plate", *Phys. Rev. Lett.* 93 (2004), 173901.
38. G. Gbur, M.A. Anastasio, Y. Huang and D. Shi, "Spherical-wave intensity diffraction tomography", *J. Opt. Soc. Am. A* 22 (2005), 230.
39. H.F. Schouten, N. Kuzmin, G. Dubois, T.D. Visser, G. Gbur, P.F.A. Alkemade, H. Blok, G.W. 't Hooft, D. Lenstra and E.R. Eliel, "Plasmon-assisted two-slit transmission: Young's experiment revisited", *Phys. Rev. Lett.* 94 (2005), 053901.
40. G. Gbur, H.F. Schouten and T.D. Visser, "Achieving superresolution in near-field optical data readout systems using surface plasmons", *Appl. Phys. Lett.* 87 (2005), 191109.
41. M.A. Anastasio, D. Shi, Y. Huang and G. Gbur, "Image reconstruction in spherical-wave intensity diffraction tomography", *J. Opt. Soc. Am. A* 22 (2005), 2651.
42. G. Gbur and T.D. Visser, "Phase singularities and coherence vortices in linear optical systems", *Opt. Commun.* 259 (2006), 428.
43. C.H. Gan and G. Gbur, "Strategies for employing surface plasmons in near-field optical readout systems", *Opt. Exp.* 14 (2006), 2385.
44. M.A. Anastasio, D. Shi and G. Gbur, "Multispectral intensity diffraction tomography reconstruction theory: quasi-nondispersive objects", *J. Opt. Soc. Am. A* 23 (2006), 1359.
45. G. Gbur, "Simulating fields of arbitrary spatial and temporal coherence," *Opt. Exp.* 14 (2006), 7567.
46. G.S. Agarwal and G. Gbur, "Rotational frequency shifts for electromagnetic fields of arbitrary states of coherence and polarization," *Opt. Lett.* 31 (2006), 3080.
47. C.H. Gan, G. Gbur and T.D. Visser, "Surface plasmons modulate the spatial coherence in Young's interference experiment," *Phys. Rev. Lett.* 98 (2007), 043908.
48. N. Kuzmin, G.W. 't Hooft, E.R. Eliel, G. Gbur, H.F. Schouten and T.D. Visser, "Enhancement of spatial coherence by surface plasmons," *Opt. Lett.* 32 (2007), 445.

49. G. Gbur and O. Korotkova, "Angular spectrum representation for the propagation of arbitrary coherent and partially coherent beams through atmospheric turbulence," *J. Opt. Soc. Am. A* 24 (2007), 745.
50. D. M. Karabacak, K.L. Ekinici, C.H. Gan, G. Gbur, M. S. Ünlü, S. B. Ippolito, B. B. Goldberg, and P.S. Carney, "Diffraction of evanescent waves and nanomechanical displacement detection," *Opt. Lett.* 32 (2007), 1881.
51. O. Korotkova and G. Gbur, "Angular spectrum representation for propagation of random electromagnetic beams in a turbulent atmosphere," *J. Opt. Soc. Am. A* 24 (2007), 2728.
52. C.H. Gan and G. Gbur, "Strategies for employing surface plasmons in a near field transmission optical readout system," *Appl. Phys. Lett.* 91 (2007), 131109.
53. C.H. Gan and G. Gbur, "Phase and coherence singularities generated by the interference of partially coherent fields," *Opt. Commun.* 280 (2007), 249.
54. C.H. Gan, G. Gbur and T.D. Visser, "A New Role for Surface Plasmons," *Optics & Photonics News*, December 2007, p. 36.
55. G. Gbur and R.K. Tyson, "Vortex beam propagation through atmospheric turbulence and topological charge conservation," *J. Opt. Soc. Am. A* 25 (2008), 225.
56. T. van Dijk, G. Gbur, and T. D. Visser, "Shaping the focal intensity distribution using spatial coherence," *J. Opt. Soc. Am. A* 25 (2008), 575.
57. G. Gbur and G.A. Swartzlander, Jr., "Complete transverse representation of a correlation singularity of a partially coherent field," *J. Opt. Soc. Am. B* 25 (2008), 1422.
58. C.H. Gan and G. Gbur, "Spatial coherence conversion with surface plasmons using a three-slit interferometer," *Plasmonics* 3 (2008), 111.
59. Y. Gu and G. Gbur, "Topological reactions of correlation vortices," *Opt. Commun.* 282 (2009), 709.
60. D. Moses, C.H. Gan, and G. Gbur, "Directional, nonpropagating, and polychromatic excitations in one-dimensional wave systems," *Phys. Rev. E* 79 (2009), 026606.
61. S.M. Kim and G. Gbur, "Momentum conservation in partially coherent wavefields," *Phys. Rev. A* 79 (2009), 033844.
62. Y. Gu, O. Korotkova and G. Gbur, "Scintillation of nonuniformly polarized beams in atmospheric turbulence," *Opt. Lett.* 34 (2009), 2261-2263.



63. C.H. Gan and G. Gbur, "Extraordinary optical transmission through multi-layered systems of corrugated metallic thin films," *Opt. Exp.* 17 (2009), 20553.
64. Y. Gu and G. Gbur, "Measurement of atmospheric turbulence strength by vortex beam," *Opt. Commun.* 283 (2010), 1209.
65. G. Gbur and S.M. Kim, "Magnetization effect in momentum conservation in partially coherent wavefields," *Phys. Rev. A* 82 (2010), 043807.
66. Y. Gu and G. Gbur, "Scintillation of Airy beam arrays in atmospheric turbulence," *Opt. Lett.* 35 (2010), 3456.
67. Y. Gu and G. Gbur, "Scintillation of pseudo-Bessel correlated beams in atmospheric turbulence," *J. Opt. Soc. Am. A* 27 (2010), 2621.
68. G. Gbur and T.D. Visser, "The structure of partially coherent fields", in E. Wolf (Ed.), *Prog. in Optics*, vol. 55 (Elsevier, Amsterdam, 2010), p. 285.
69. G. Gbur, "Invisibility physics: Kerker's 'invisible bodies'", in B. Zivkovic, J. Goldman (Eds.), *The Open Laboratory 2010* (Coturnix, Chapel Hill, 2010), p. 179.
70. X. Pang, G. Gbur and T.D. Visser, "The Gouy phase of Airy beams," *Opt. Lett.* 36 (2011), 2492.
71. S. Sahin, G. Gbur and O. Korotkova, "Scattering of light from particles with semisoft boundaries," *Opt. Lett.* 36 (2011), 3957.
72. C.H. Gan, Y. Gu, T.D. Visser and G. Gbur, "Coherence converting plasmonic hole arrays," *Plasmonics* 7 (2012), 313.
73. C. Rosenbury, G. Gbur and Y. Gu, "Phase singularities, correlation singularities, and conditions for complete destructive interference," *J. Opt. Soc. Am. A* 29 (2012), 410.
74. Y. Gu and G. Gbur, "Reduction of turbulence-induced scintillation by nonuniformly polarized beam arrays," *Opt. Lett.* 37 (2012), 1553.
75. S.M. Kim and G. Gbur, "Angular momentum conservation in partially coherent wavefields," *Phys. Rev. A* 86 (2012), 043814.
76. G. Gbur, "Mpemba's baffling discovery," in *Best Science Writing Online 2012*, J. Ouellette and B. Zivkovic, eds. (Scientific American, New York, 2012), 108.
77. Y. Gu and G. Gbur, "Scintillation of nonuniformly correlated beams in atmospheric turbulence," *Opt. Lett.* 38 (2013), 1395.

78. G. Gbur, "Invisibility Physics: Past, Present, and Future," in E. Wolf (Ed.), *Prog. in Optics*, vol. 58 (Elsevier, Amsterdam, 2013), p. 65.
79. G. Gbur, "Partially coherent beam propagation in atmospheric turbulence [Invited]," *J. Opt. Soc. Am. A* 31 (2014), 2038.
80. C. S. D. Stahl and G. Gbur, "Complete representation of a correlation singularity in a partially coherent beam," *Opt. Lett.* 39 (2014), 5985.
81. E. Hurwitz and G. Gbur, "Null-field radiationless sources," *Opt. Lett.* 39 (2014), 6529.
82. G. Gbur, "Designing directional cloaks from localized fields," *Opt. Lett.* 40 (2015), 986.
83. G. Gbur, "Singular Optics," in *Optics Encyclopedia* (Wiley, 2015).
84. X. Pang, G. Gbur, and T.D. Visser, "Cycle of phase, coherence and polarization singularities in Young's three-pinhole experiment," *Opt. Exp.* 23 (2015), 34093.
85. G. Gbur, "Fractional vortex Hilbert's Hotel," *Optica* 3 (2016), 222.
86. E. Hurwitz and G. Gbur, "Localized PT-symmetric directionally invisible scatterers," *Phys. Rev. A* 93 (2016), 041803.
87. C. Stahl and G. Gbur, "Analytic calculation of vortex diffraction by a triangular aperture," *J. Opt. Soc. Am. A* 33 (2016), 1175.
88. M.K. Smith and G.J. Gbur, "Construction of arbitrary vortex and superoscillatory fields," *Opt. Lett.* 41 (2016), 4979.
89. E. Hurwitz and G. Gbur, "Optically switchable directional invisibility," *Opt. Lett.* 42 (2017), 1301.
90. C.S.D. Stahl and G. Gbur, "Partially coherent vortex beams of arbitrary order," *J. Opt. Soc. Am. A* 34 (2017), 1793.
91. Y. Wang and G. Gbur, "Hilbert's Hotel in polarization singularities," *Opt. Lett.* 42 (2017), 5154.
92. G. Gbur, "Partially coherent vortex beams," *Proc. SPIE* 10549 (2018), 1054903.
93. G. Gbur, "Nonuniqueness in imaging," *Encyclopedia of Modern Optics* (2<sup>nd</sup> ed.) 3 (2018), 156.

94. J. Yu and F. Wang and L. Liu and Y. Cai and G. Gbur, "Propagation properties of Hermite non-uniformly correlated beams in turbulence," *Opt. Exp.* 26 (2018), 16333.

## BOOKS

Gregory J. Gbur, *Mathematical Methods for Optical Physics and Engineering* (Cambridge University Press, Cambridge, 2011).

Gregory J. Gbur, *Singular Optics* (CRC Press, Boca Raton, 2017).

Gregory J. Gbur, *Falling Felines and Fundamental Physics* (in progress, to be published end of 2018)

## POPULAR ARTICLES

1. G. Gbur, "Visions of Invisibility in Fiction," *Optics and Photonics News* (July/August 2011), 16-17.
2. G. Gbur, "Les pérégrinations d'un escroc scientifique," *La Recherche* 458 (December 2011), 58-60.
3. G. Gbur, "Arago's Inadvertent Test of Relativity," *Optics and Photonics News* (May 2012), 18-19.
4. G. Gbur, "The Secret Molecular Life of Soap Films," *Optics and Photonics News* (July/August 2013), 18-20.
5. G. Gbur, "Robertson: l'homme au nom de la science," *La Recherche* 475 (May 2013), 60-62.
6. G. Gbur, "James Jeans' Almost-Atomic Theory," *Optics and Photonics News* (November 2013), 20-22.
7. G. Gbur, "Making Magnets Speak: the Barkhausen effect," *Open Lab* 2013.
8. G. Gbur, "Le mystère des chats qui retombent toujours sur leurs pattes," *La Recherche* 487, (Mai 2014), 54-58.
9. G. Gbur, "A Protective Cloak Against Earthquakes and Storms," *American Scientist* 103 (2015), 356-359.

10. G. Gbur, "Blogging on the tenure track," in *Science Blogging: The Essential Guide*, C. Wilcox, B. Brookshire, G. Goldman, eds. (Yale University Press, 2016).

### **PRESENTATIONS (only those I presented personally)**

1. G. Gbur, "*Partially coherent sources that generate completely coherent fields outside the source*", Rochester Theory Center Summer Symposium, August 1997, Rochester, NY.
2. G. Gbur and E. Wolf, "*Partially coherent sources which generate completely coherent fields outside the source*", 1997 Optical Society of America (OSA) Annual Meeting in Long Beach, CA.
3. G. Gbur, D.F.V. James, and E. Wolf, "*A new energy conservation law for randomly fluctuating electromagnetic fields*", 1997 OSA Annual Meeting in Long Beach, CA.
4. G. Gbur and E. Wolf, "*Phase conjugation with random fields and with random scatterers*", 1998 OSA Annual Meeting in Baltimore, MD.
5. G. Gbur and E. Wolf, "*Determination of density correlation functions from scattering of polychromatic light*", 1999 OSA Annual Meeting in Santa Clara, CA.
6. G. Gbur and E. Wolf, "*Relation between computed tomography (CAT) and diffraction tomography*", 2000 OSA Annual Meeting in Providence, RI.
7. "*Statistical beam shaping*", (presentation on behalf of Emil Wolf) at the 11th Annual AFOSR Electromagnetics Workshop, San Antonio, TX.
8. G. Gbur and E. Wolf, "*Diffraction tomography without phase information*", 2002 OSA Annual Meeting in Orlando, FL.
9. G. Gbur, "*Diffraction tomography without phase information*", seminar at Vrije Universiteit, October, 2002.
10. G. Gbur, "*Performing diffraction tomography without phase information*", poster at Symposium IEEE/LEOS Benelux Chapter, 2002, Amsterdam.
11. G. Gbur, "*New tricks on an old string*", seminar at University of Rochester at "Photons After Dark", August 1997.
12. G. Gbur, "*Non-radiating sources and the inverse source problem*", "Photons After Dark" talk, October 1996.
13. G. Gbur and E. Wolf, "*Singular optics in fields of different states of coherence*", Singular Optics 2003 talk, Kiev, Ukraine, June 2003.
14. G. Gbur and T.D. Visser, "*Can spatial coherence effects produce a local minimum of intensity at focus?*", ICO Topical Meeting on Polarization Optics, Joensuu, Finland, July 2003.
15. G. Gbur and T.D. Visser, "*Phase singularities in partially coherent fields*", Coherence and Polarization Workshop at CREOL, Orlando, August 2003.
16. G. Gbur and T.D. Visser, "*Coherence vortices in partially coherent beams*", 2003 OSA Annual Meeting in Tucson, AZ.
17. G. Gbur, "*Nonradiating sources and other 'invisible' objects*", seminar at Vrije Universiteit, January, 2004.

18. G. Gbur, “*Tomography and the phase problem*”, seminar at UNC Charlotte, February, 2004.
19. G. Gbur, G.S. Agarwal and E. Wolf, “*Coherence properties of sunlight*”, 2004 OSA Annual Meeting in Rochester, NY.
20. G. Gbur, T.D. Visser and E. Wolf, “*Complete destructive interference of partially coherent fields*”, 2004 OSA Annual Meeting in Rochester, NY.
21. G. Gbur, H.F. Schouten and T.D. Visser, “*Plasmon effects in near-field optical readout systems*”, 2004 Optics in the Southeast meeting in Charlotte, NC.
22. G. Gbur, “*Surface plasmon effects in extraordinary optical transmission*”, seminar at UNC Charlotte, January, 2005.
23. G. Gbur, “*Surface plasmon effects in extraordinary optical transmission*”, seminar at the University of Arizona, May, 2005.
24. G. Gbur, “*Nonradiating sources, nonscattering scatterers, and other ‘invisible’ objects*”, 2005 Inverse Scattering Workshop, Charlotte.
25. G. Gbur, H.F. Schouten and T.D. Visser, “*Surface Plasmon Effects in Near-Field Optical Readout Systems*”, 2005 OSA Annual Meeting in Tucson, AZ.
26. G. Gbur and T.D. Visser, “*Phase Singularities and Coherence Vortices in Linear Optical Systems*”, 2005 OSA Annual Meeting in Tucson, AZ.
27. G. Gbur, “*Partially coherent fields and atmospheric turbulence*”, AFOSR EM Workshop, San Antonio, TX.
28. G. Gbur, “*Developing ‘Superbeams’ for Improved Propagation Through Atmospheric Turbulence*”, Michigan Technological University, March, 2006.
29. G. Gbur, “*Strategies for Employing Surface Plasmons in Near-Field Optical Readout Systems*”, invited talk at NANO 2006, Mohegan Sun, CT.
30. G. Gbur, “*Simulating partially coherent beam propagation in turbulence*”, TCATS meeting, Tucson, AZ, May 2006.
31. G. Gbur and G.S. Agarwal, “*Rotational Doppler shifts for electromagnetic fields of arbitrary state of coherence and polarization,*” 2006 OSA Annual Meeting in Rochester, NY
32. G. Gbur, “*Getting more for less: surface plasmons in nano-optics,*” colloquim at University of Oklahoma, November 2006.
33. G. Gbur, “*Surface plasmon effects in nano-optics,*” The 88th Eastern Forum of Science and Technology, Shanghai, China, January 2007.
34. G. Gbur, “*Simulating partially coherent fields and other special beam classes in turbulence,*” Photonics West 2007 (invited).
35. G. Gbur, “*Getting more with less: surface plasmons in nano-optics,*” seminar at Mississippi State University, April 2007.
36. G. Gbur, “*Optical and coherence vortices and their relationships,*” seminar at Vrije Universiteit, September 2007.
37. G. Gbur, “*Optical and coherence vortices and their relationships,*” Correlation Optics 2007, Chernivtsi, Ukraine, September 2007 (invited).
38. G. Gbur and R.K. Tyson, “*Vortex beam propagation through atmospheric turbulence and topological charge conservation,*” 2007 OSA Annual Meeting in San Jose, CA.

39. G. Gbur, "Vortex beam propagation through atmospheric turbulence and topological charge conservation," AFOSR EM Workshop, San Antonio, TX 2008.
40. G. Gbur, "Vortex beam propagation through atmospheric turbulence and topological charge conservation," Photonics West 2008.
41. G. Gbur, "Partially coherent and vortex beam propagation through atmospheric turbulence," TCATS meeting, Dayton, OH, March 2008.
42. G. Gbur, "From Nonradiating Sources to Optical Cloaks: A Short History of the Physics of Invisibility," colloquium at the University of Miami, April 2008.
43. G. Gbur and G.A. Swartzlander, Jr., "Complete transverse representation of an optical correlation singularity," 2008 OSA Annual Meeting in Rochester, NY.
44. G. Gbur, "Strategies for reduction of scintillation in atmospheric beam propagation," AFOSR EM Workshop, San Antonio, TX 2009.
45. G. Gbur (as gg), co-moderator of "The Web and the History of Science," ScienceOnline09, Research Triangle Park, NC.
46. G. Gbur, "Studies of special beam classes in atmospheric turbulence," Workshop on Waves in Complex Media, June 2009 (invited).
47. G. Gbur, "Plasmonic effects in statistical optics," seminar in Department of Mathematics, UNC Charlotte, September 2009.
48. G. Gbur, "Intensity diffraction tomography," 2009 OSA Annual Meeting in San Jose, CA (invited).
49. G. Gbur, "Optimizing incoherent arrays of beams for turbulence applications," AFOSR EM Workshop, San Antonio, TX 2010.
50. G. Gbur, "Forgotten milestones in the history of optics," seminar in Department of Physics, UNC Charlotte, March 2010.
51. G. Gbur, "Coherence-converting plasmonic arrays," poster at 2010 OSA Annual Meeting in Rochester, NY.
52. G. Gbur, "Properties of special incoherent beam arrays in atmospheric turbulence," AFOSR EM Workshop, San Antonio, TX 2011.
53. G. Gbur, co-moderator of "Making the history of science work for you," ScienceOnline2011, Research Triangle Park, NC.
54. G. Gbur, co-moderator of "Blogging on the Career Path: Opportunities Emerging out of the Blogosphere," ScienceOnline2011, Research Triangle Park, NC.
55. G. Gbur and Y. Gu, "Scintillation of Airy beam arrays in atmospheric turbulence," Photonics West 2011.
56. G. Gbur, "Special beam arrays for scintillation reduction," OSA Application of Lasers for Sensing & Free Space Communication (LS&C), Toronto, July 2011 (invited).
57. G. Gbur, "Plasmonic Modification of Temporal Coherence," 2011 OSA Annual Meeting in San Jose, CA.
58. G. Gbur, "Nano-optics, surface plasmons and plasmonic Zeno effect," NC School of Science & Math, Durham, NC, November 2011.
59. G. Gbur, co-moderator of "Weird and Wonderful Stories in the History of Science," ScienceOnline2012, Raleigh, NC.

60. G. Gbur, "*How not to be seen: a brief history of the science of invisibility*," banquet lecture at OSA–Rochester Section Annual Business Meeting and Dinner 2012.
61. G. Gbur, "*Phase singularities in partially coherent wavefields*," 2012 OSA Annual Meeting in Rochester, NY (invited).
62. G. Gbur, "*Coherence, polarization, and vortex behavior on propagation in turbulence*," AFOSR EM Workshop, 2013.
63. G. Gbur, co-moderator of "*Everything old is new again: Using stories from the past to enlighten current events in science*," ScienceOnline2013, Raleigh, NC.
64. G. Gbur, "*How not to be seen: the history and science of invisibility*," popular science talk at UNC Charlotte for NC Science Festival, 2013.
65. G. Gbur, "*Optical coherence theory: probability, pinholes, and plasmons*," seminar at UNC Chapel Hill, November 2013.
66. G. Gbur, "*Partially coherent vortex beams and atmospheric propagation*," AFOSR EM Workshop, 2014.
67. G. Gbur, "*How not to be seen: the history and science of invisibility*," colloquium at Eastern Carolina University, November 2014.
68. G. Gbur, "*Partially coherent beams in atmospheric turbulence: an overview*," AFOSR EM Workshop, 2015.
69. G. Gbur, "Invisibility physics: Past, present and future," seminar at Northwestern Polytechnical University, Xi'an, China, June 2015.
70. G. Gbur, "*Partially coherent beams in atmospheric turbulence: an overview*," seminar at Northwestern Polytechnical University, Xi'an, China, June 2015.
71. G. Gbur, "*How Not to be Seen: The history and science of invisibility*," 2015 online seminar for the Department of Physics and Astronomy, The University of Central Arkansas.
72. C.S.D. Stahl and G. Gbur, "*Complete analytic solution to vortex beam diffraction through a triangular aperture*," Frontiers in Optics, San Jose, October 2015.
73. G. Gbur, "*The Science Chamber of Horrors*," Science Café at the Schiele Museum of Natural History, October 2015.
74. G. Gbur, "*Falling Felines and Fundamental Physics*," Thinking Matters presentation, UNC Charlotte, August 2015.
75. Part of an expert panel discussion for a screening of the movie "Particle Fever" at UNCC, April 2015.
76. G. Gbur, "*Partially coherent vortex beams and other optical vortex phenomena*," AFOSR Electromagnetics Workshop, January 2016.
77. G. Gbur, "*PT symmetry and invisibility in optics*," Waves and Structured Materials Workshop, UNC Charlotte, June 2016.
78. C. Stahl and G. Gbur, "*Partially coherent vortex beams of arbitrary order*," Frontiers in Optics, October 2016.
79. G. Gbur, "*Fractional vortex Hilbert's Hotel*," Frontiers in Optics, October 2016.
80. G. Gbur, "*Partially coherent vortex beams of arbitrary order*," OSA Laser Congress, October 2016.
81. G. Gbur, "*How not to be seen: the history and science of invisibility*," SPIE Visiting Lecturer talk at Rose Hulman University, January 2017.

82. G. Gbur, "*How not to be seen: the history and science of invisibility*," SPIE Visiting Lecturer talk at UC Irvine, January 2017.
83. G. Gbur, "*How not to be seen: the history and science of invisibility*," SPIE Visiting Lecturer talk at Instituto Tecnológico y de Estudios Superiores de Monterrey, April 2017.
84. G. Gbur, "*Fractional vortex plates and infinite hotels*," seminar at Roma Tre University, Rome, Italy, June 2017.
85. G. Gbur, "*Infinite hotels in swirling beams of light*," lecture at College of Charleston, October 2017.
86. G. Gbur, "*Investigations of partially coherent vortex beams*," AFOSR Portfolio Review Agenda, October 2017.
87. G. Gbur, "*Partially coherent vortex beams*," invited talk at Photonics West, February 2018.
88. G. Gbur, "*Partially coherent vortex beams in atmospheric turbulence*," AFOSR Atmospheric Workshop, Charlotte, NC, April 2018.
87. G. Gbur, "*How not to be seen: the history and science of invisibility*," SPIE Visiting Lecturer talk at INAOE, Puebla, Mexico, May 2018.
88. G. Gbur, "*Forgotten Milestones in the history of optics*," SPIE Visiting Lecturer talk at INAOE, Puebla, Mexico, May 2018.
89. G. Gbur, "*The Science Chamber of Horrors*," SPIE Visiting Lecturer talk at INAOE, Puebla, Mexico, May 2018.
90. G. Gbur, "Partially coherent vortex beams and orbital angular momentum," Trends in Electromagnetic Coherence, Joensuu, Finland, June 2018.
91. G. Gbur, "Non-Hermitian scatterers and directional invisibility," Nonlinear Localization in Lattices, Spetses, Greece, June 2018.
92. G. Gbur, "Vortex beams in atmospheric turbulence," OSA Incubator on Optical Angular Momentum, Washington, DC, August 2018.
93. G. Gbur, "Infinite hotels in swirling beams of light," SPIE Visiting Lecturer talk at University of Rochester, August 2018.
94. G. Gbur, "Nonradiating sources, invisibility, and history," Partially Coherent Thoughts: Memorial Workshop for Emil Wolf, August 2018.

## RESEARCH FUNDING

1. "Developing 'superbeams' for improved propagation through turbulence," AFOSR, November 2005 – January 2008, \$108,583, PI.
2. "A study of plasmonic enhanced transmission effects in nano-optics," DOE, September 2006 – August 2010, \$161,964, PI.
3. "Generation and use of 'superbeams' in turbulence and scattering applications," AFOSR, February 2008 – May 2011, \$195,254, PI.
4. "Design of partially coherent and vortex free-space optical communications systems," AFOSR, October 2011 – October 2012, \$94,327, PI.
5. "Exotic optical beam classes for free-space communication and sensing applications," AFOSR, December 2012 – December 2015, \$141,429, PI.
6. "Study and optimization of atmospheric propagation of partially coherent vortex beams," AFOSR, March 2016 – March 2019, \$222,793, PI.



## **PROFESSIONAL AFFILIATIONS**

*Optical Society of America*, member, 1997-present

*SPIE*, 2010-present

*American Association for the Advancement of Science*, 2011-2016

*American Physical Society*, 2011-2013