

## Curriculum Vitae

Miguel Angel Alonso González

### **PROFESSIONAL HISTORY**

- 2021-present: Professor, Ecole Centrale de Marseille, Researcher, Institut Fresnel.
- 2021-present: Senior Scientist, Laboratory for Laser Energetics, University of Rochester.
- 2016-present: Professor of Optics, The Institute of Optics, University of Rochester.
- 2018-2020: A\*MIDEX Chair of Excellence, Aix-Marseille Université, Institut Fresnel, Ecole Centrale Marseille.
- 2007-2016: Associate Professor, The Institute of Optics, University of Rochester.
- 2010: Visiting Professor, Department of Applied Physics, Aalto University, Finland.
- 2003-2007: Assistant Professor, The Institute of Optics, University of Rochester.
- 2001-2003: Researcher (Titular A), Centro de Ciencias Físicas, Universidad Nacional Autónoma de México, Cuernavaca, Mexico.
- 2000-2001: Associate Researcher (Asociado C), Centro de Ciencias Físicas, Universidad Nacional Autónoma de México, Cuernavaca, Mexico.
- 1997-2000: Postdoctoral Research Fellow, Department of Physics, Macquarie University, Sydney, Australia.
- 1991-1992: Optical cable engineer, Telecommunications Lab, Centro de Investigación y Desarrollo ConduMex (CIDECE), Querétaro, Mexico.

### **EDUCATION**

- PhD 1992-1996: University of Rochester, Rochester NY, US.
- BSc, 1985-1990: Ingeniero Físico (Engineer in Physics), Universidad Autónoma Metropolitana unidad Azcapotzalco, Mexico City, Mexico.

### **AWARDS**

- 2023: *SPIE G.G. Stokes Award in Optical Polarization*, SPIE, The international society for optics and photonics.
- 2017: *Chaire d'Excellence*, A\*MIDEX.
- 2017: *Distinguished Alumnus*, Universidad Autónoma Metropolitana (Mexico).
- 2013: Edward Peck Curtis Award for Excellence in Undergraduate Teaching, University of Rochester.
- 2009: Fellow, OSA, the Optical Society (now OPTICA).
- 2005-2009: CAREER Award, National Science Foundation.
- 1992-1994: CONACYT-FULBRIGHT-IIIE Scholarship.
- 1991: ATENALCYT/*Diario de México* medal to “The Best Students in Mexico”.
- 1991: “Medalla al Mérito Universitario”, Universidad Autónoma Metropolitana.

## **EDITORIAL WORK**

2020-present: Editor-in-Chief, *Optics Letters*.

2022: Guest Editor, feature issue “100 years of Emil Wolf, *Journal of the Optical Society of America A*.”

2014-2019: Associate Editor, *Optica*.

2017: Member, *Optics Express* 20<sup>th</sup> Anniversary Committee.

2009-2016: Chairman, *Spotlight on Optics*.

2007-2013: Deputy Editor, *Optics Express*.

2001-2007: Associate Editor, *Optics Express*.

## **EVENT ORGANIZATION**

2021: Co-Organizer, “Finnish-French Workshop on Structured Light and its Applications,” Tampere.

2021: Program Committee, “Computational Optics Conference,” Madrid.

2021: Program Committee, “International Optical Design Conference,” Virtual.

2020: Program Committee, “International Commission for Optics triennial meeting,” Dresden, Germany (postponed to 2022).

2018: Program Committee, “OSA’s Imaging and Applied Optics Congress,” Orlando.

2018: Program Committee, “Computational Optics Conference,” Frankfurt.

2017: Program Committee, “International Optical Design Conference,” Denver.

2016: Program Committee, “Latin American Optics and Photonics,” Medellín.

2014: Program Committee, “Latin American Optics and Photonics,” Cancún.

2014: Program Committee, “Classical Optics,” Hawaii.

2013, 15, 17, 19, 21: Program Committee, “Correlation Optics,” Chernivtsy, Ukraine.

2010: Co-Director, “International Workshop on Optics and Photonics,” Marrakech.

2010: Program Committee, “International Optical Design Conference,” Jackson Hole.

2008: Student volunteer coordinator, Frontiers in Optics, the Annual Meeting of the Optical Society of America, Rochester NY.

2007: Co-organizer, “Engineering for the Americas,” University of Rochester.

2006: Co-director, “Preparatory School on Mathematical Methods in Optics,” Abdus Salam International Centre for Theoretical Physics, Trieste, Italy.

2006: Program Committee, “International Optical Design Conference,” Victoria CA.

2004, 06, 08: Organizing Committee, “Educator’s Day,” Rochester NY.

2004: Organizer, “Singular Optics” Symposium, LS XX Conference, Rochester.

## **SERVICE**

2021-: External Advisory Board, General Engineering Program, Stevens Institute of Technology, Hoboken, USA.

2021: Evaluator, European Research Council.

2020: Faculty recruitment committee, Nazarbayev University, Kazakhstan.

2020: Evaluator, Leverhulme Trust, United Kingdom.

2017-2018: Joseph W. Goodman Book Writing Award Committee, OSA.

2017-2020: External Advisory Committee for the Centro de Investigaciones en Óptica (CIO), León, Mexico.

2016: Search Committee for Dean of Engineering and Applied Sciences, University of Rochester.

2016, 2017: Evaluator for I-SITE BFC (France).

2015-2019: Principal Investigator/Director, Graduate Assistance in Areas of National Need (GAANN) Award, The Institute of Optics, University of Rochester.

2012-2017: Chair, Graduate Admissions Committee, The Institute of Optics.

2015-2017: University of Rochester Faculty Council

2009-present: External Advisory Committee for the Centro de Investigación Científica y Educación Superior de Ensenada (CICESE), Ensenada, Mexico.

2013: Evaluator, National Research Foundation, South Africa.

2010-2012: Adolph Lomb Medal selection committee (OSA).

2012: Evaluator, ETH Zurich Research Commission.

2012: Evaluator, Shota Rustaveli National Science Foundation, Georgia.

2007-2012: Chair, Graduate Studies Committee, The Institute of Optics.

2005-2012: Coordinator, “What’s Up in Optics” seminar, The Institute of Optics.

2010: Evaluator, Distinguished Professor program, Academy of Finland and the Finnish Funding Agency for Technology and Innovation (TEKES).

2007-2009: Enrollment Advisory Group, University of Rochester.

2006: External Evaluation Committee, Physics Department, Roma Tre University.

2006: Research Computing Committee, University of Rochester.

2004-2007: Graduate Studies Committee, The Institute of Optics.

## **PATENTS**

1. M.A. Alonso, S. Head, M. Theisen, T.G. Brown, “Focused beam scatterometry apparatus and method,” Pat. 9,783,178 B2 (US, 2017).
2. M.A. Alonso G., “Bubble detection and elimination system for the optical fiber loose tube extrusion process,” Pat. 925112 (Mexico, 1992).

## **PUBLICATIONS**

### **Peer-reviewed journals:**

1. M.A. Alonso and G.W. Forbes, "Fractional Legendre transformation," *J. Phys. A: Math. Gen.* **28**, 5509-5527 (1995).
2. M.A. Alonso and G.W. Forbes, "Generalization of Hamilton's formalism for geometrical optics," *J. Opt. Soc. Am. A* **12**, 2744-2752 (1995).
3. M.A. Alonso and G.W. Forbes, "Semigeometrical estimation of Green's functions and wave propagators in optics," *J. Opt. Soc. Am. A* **14**, 1076-1086 (1997).
4. M.A. Alonso and G.W. Forbes, "Uniform asymptotic expansions for wave propagators via fractional transformations," *J. Opt. Soc. Am. A* **14**, 1279-1292 (1997).
5. M.A. Alonso and G.W. Forbes, "Asymptotic estimation of the optical wave propagator I: derivation of a new method," *J. Opt. Soc. Am. A* **15**, 1329-1340 (1998).
6. G.W. Forbes and M.A. Alonso, "Asymptotic estimation of the optical wave propagator II: relative validity," *J. Opt. Soc. Am. A* **15**, 1341-1354 (1998).
7. M.A. Alonso and G.W. Forbes, "New approach to semiclassical analysis in mechanics," *J. Math. Phys.* **40**, 1699-1718 (1999).
8. M.A. Alonso, A.A. Asatryan, and G.W. Forbes, "Beyond the Fresnel approximation for focused waves," *J. Opt. Soc. Am. A* **16**, 1958-1969 (1999).
9. K.B. Wolf, M.A. Alonso, and G.W. Forbes, "Wigner functions for Helmholtz wave fields," *J. Opt. Soc. Am. A* **16**, 2476-2487 (1999).
10. M.A. Alonso, "Measurement of Helmholtz wave fields," *J. Opt. Soc. Am. A* **17**, 1256-1264 (2000).
11. M.A. Alonso and G.W. Forbes, "Phase space distributions for high-frequency fields," *J. Opt. Soc. Am. A* **17**, 2288-2300 (2000).
12. M.A. Alonso and G.W. Forbes, "Uncertainty products for nonparaxial fields," *J. Opt. Soc. Am. A* **17**, 2391-2402 (2000).
13. G.W. Forbes and M.A. Alonso, "Measures of spread for periodic distributions and the associated uncertainty relations," *Am. J. Phys.* **69**, 340-347 (2001).
14. M.A. Alonso, "Radiometry and wide-angle wave fields. I. Coherent fields in two dimensions," *J. Opt. Soc. Am. A* **18**, 902-909 (2001).
15. M.A. Alonso, "Radiometry and wide-angle wave fields. II. Coherent fields in three dimensions," *J. Opt. Soc. Am. A* **18**, 910-918 (2001).
16. G.W. Forbes and M.A. Alonso, "Using rays better. I. Theory for smoothly varying media," *J. Opt. Soc. Am. A* **18**, 1132-1145 (2001).
17. M.A. Alonso and G.W. Forbes, "Using rays better. II. Ray families to match prescribed wave fields," *J. Opt. Soc. Am. A* **18**, 1146-1159 (2001).
18. M.A. Alonso and G.W. Forbes, "Using rays better. III. Error estimates and illustrative applications in smooth media," *J. Opt. Soc. Am. A* **18**, 1357-1370 (2001).

19. G.W. Forbes and M.A. Alonso, "Consistent analogues of the Fourier uncertainty relation," *Am. J. Phys.* **69**, 1091-1095 (2001).
20. M.A. Alonso, "Radiometry and wide-angle wave fields. III. Partial coherence," *J. Opt. Soc. Am. A* **18**, 2502-2511 (2001).
21. L.E. Vicent and M.A. Alonso, "Generalized radiometry as a tool for the propagation of partially coherent fields," *Opt. Commun.* **207**, 101-112 (2002).
22. M.A. Alonso and G.W. Forbes, "Stable aggregates of flexible elements give a stronger link between rays and waves," *Opt. Exp.* **10**, 728-739 (2002).
23. M.A. Alonso, G.S. Pogosyan, and K.B. Wolf "Wigner functions for curved spaces I: on hyperboloids," *J. Math. Phys.* **43**, 5857-5871 (2002).
24. M.A. Alonso, G.S. Pogosyan, and K.B. Wolf "Wigner functions for curved spaces II: on spheres," *J. Math. Phys.* **44**, 1472-1489 (2003).
25. G.W. Forbes, M.A. Alonso, and A.E. Siegman, "Uncertainty relations and minimum uncertainty states for the discrete Fourier transform and the Fourier series," *J. Phys. A: Math. Gen.* **36**, 7027-7047 (2003).
26. M.A. Alonso and A. Antillón, "Angle-impact representations for wave fields in convex cavities," *Opt. Commun.* **224**, 159-173 (2003).
27. M.A. Alonso, "Exact description of free electromagnetic wave fields in terms of rays," *Opt. Exp.* **11**, 3128-3135 (2003).
28. M.A. Alonso and M.J. Bastiaans, "Mapping-based width measures and uncertainty relations for periodic functions," *Signal Proc.* **84**, 2425-2435 (2004).
29. M.A. Alonso, "Wigner functions for nonparaxial, arbitrarily polarized electromagnetic wave fields in free space," *J. Opt. Soc. Am. A* **21**, 2233-2243 (2004).
30. R. Borghi, M. Santarsiero, and M.A. Alonso, "Highly focused spirally polarized beams," *J. Opt. Soc. Am. A* **22**, 1420-1431 (2005).
31. M.A. Alonso, O. Korotkova, and E. Wolf, "Propagation of the electric correlation matrix and the van Cittert-Zernike theorem for random electromagnetic fields," *J. Mod. Opt.* **53**, 969-978 (2006).
32. M.A. Alonso, R. Borghi, and M. Santarsiero, "Nonparaxial fields with maximum joint spatial-directional localization. I. Scalar case," *J. Opt. Soc. Am. A* **23**, 691-700 (2006).
33. M.A. Alonso, R. Borghi, and M. Santarsiero, "Nonparaxial fields with maximum joint spatial-directional localization. II. Vectorial case," *J. Opt. Soc. Am. A* **23**, 701-712 (2006).
34. M.A. Alonso, R. Borghi, and M. Santarsiero, "Joint spatial-directional features for fields focused at a complex point," *J. Opt. Soc. Am. A* **23**, 933-939 (2006).
35. M.A. Alonso, R. Borghi, and M. Santarsiero, "New basis for rotationally-symmetric nonparaxial fields in terms of spherical waves with complex foci" *Opt. Express* **14**, 6894-6905 (2006).
36. C.J.R. Sheppard, M.A. Alonso, M. Santarsiero, and R. Borghi, "Comment on 'Do evanescent waves really exist in free space?'," *Opt. Commun.* **266**, 448-449 (2006).

37. M.A. Alonso and R. Borghi, "Complete far-field asymptotic series for free fields," *Opt. Lett.* **31**, 3028-3030 (2006).
38. N.J. Moore, M.A. Alonso, and C.J.R. Sheppard, "Monochromatic scalar fields with maximum focal irradiance," *J. Opt. Soc. Am. A* **24**, 2057-2064 (2007).
39. J.C. Petruccelli and M.A. Alonso, "Propagation of partially coherent fields through planar dielectric boundaries using angle-impact Wigner functions I. Two dimensions," *J. Opt. Soc. Am. A* **24**, 2590-2603 (2007).
40. N.J. Moore, M.A. Alonso, and C.J.R. Sheppard, "Monochromatic electromagnetic fields with maximum focal energy density," *J. Opt. Soc. Am. A* **24**, 3115-3122 (2007).
41. M.A. Alonso and E. Wolf, "The cross-spectral density matrix of a planar, electromagnetic stochastic source as a correlation matrix," *Opt. Commun.* **281**, 2393-2396 (2008).
42. C.J.R. Sheppard, M.A. Alonso, and N.J. Moore, "Localization measures for high-aperture wavefields based on moments of the pupil," *J. Opt. A* **10**, 033001 (2008).
43. N.J. Moore and M.A. Alonso, "Closed form formula for Mie scattering of nonparaxial analogues of Gaussian beams," *Opt. Express* **16**, 5926-5933 (2008).
44. J.C. Petruccelli and M.A. Alonso, "Ray-based propagation of the cross-spectral density," *J. Opt. Soc. Am. A* **25**, 1395-1405 (2008).
45. N.J. Moore and M.A. Alonso, "Bases for the description of monochromatic, strongly focused, scalar fields," *J. Opt. Soc. Am. A* **26**, 1754-1761 (2009).
46. M.A. Alonso, "Diffraction of paraxial partially coherent fields by planar obstacles in the Wigner representation," *J. Opt. Soc. Am. A* **26**, 1588-1597 (2009).
47. J.C. Petruccelli and M.A. Alonso, "Propagation of nonparaxial partially coherent fields across interfaces using generalized radiometry," *J. Opt. Soc. Am. A* **26**, 2012-2022 (2009).
48. R. Borghi and M.A. Alonso, "Free-space asymptotic far-field series," *J. Opt. Soc. Am. A* **26**, 2410-2417 (2009).
49. N.J. Moore and M.A. Alonso, "Closed-form bases for the description of monochromatic, strongly focused, electromagnetic fields," *J. Opt. Soc. Am. A* **26**, 2211-2218 (2009).
50. S. Cho, J.C. Petruccelli and M.A. Alonso, "Wigner functions for paraxial and nonparaxial fields," *J. Mod. Opt.* **56**, 1843-1852 (2009).
51. J.C. Petruccelli, N.J. Moore, and M.A. Alonso, "Two methods for modeling the propagation of the coherence and polarization properties of nonparaxial fields," *Opt. Commun.* **283**, 4457-4466 (2010).
52. J.C. Petruccelli and M.A. Alonso, "Phase space distributions tailored for dispersive media," *J. Opt. Soc. Am. A* **27**, 1194-1201 (2010).
53. S. Vo, K. Fuerschbach, K.P. Thompson, M.A. Alonso, and J.P. Rolland, "Airy Beams: A geometric optics perspective", *J. Opt. Soc. Am. A* **27**, 2574-2582 (2010).
54. A.M. Beckley, T.G. Brown, and M.A. Alonso, "Full Poincaré beams," *Opt. Express* **18**, 10777-10785 (2010).

55. K.Y. Bliokh, M.A. Alonso, E.A. Ostrovskaya, and A. Aiello, "Angular momenta and spin-orbit interaction for nonparaxial light in free space," *Phys. Rev. A* **82**, 036825 (2010).
56. J.C. Petrucci and M.A. Alonso, "A generalized radiance model for the propagation of light within anisotropic media," *J. Opt. Soc. Am. A* **28**, 791-800 (2011).
57. S. Cho and M.A. Alonso, "Ambiguity function and phase space tomography for nonparaxial fields," *J. Opt. Soc. Am. A* **28**, 897-902 (2011).
58. M.A. Alonso, "The effect of orbital angular momentum and helicity in the uncertainty-type relations between focal spot size and angular spread," *J. Opt.* **13**, 064016 (2011).
59. M.A. Alonso, T. Setälä, and A.T. Friberg, "Optimal pulses for arbitrary dispersive media," *J. Eur. Opt. Soc. R.P.* **6**, 11035 (2011).
60. M.A. Alonso, "Wigner functions in optics: describing beams as ray bundles and pulses as particle ensembles," (review article) *Adv. Opt. Phot.* **3**, 272-365 (2011).
61. K.Y. Bliokh, E.A. Ostrovskaya, M.A. Alonso, O.G. Rodríguez-Herrera, D. Lara, and C. Dainty, "Spin-to-orbital angular momentum conversion in focusing, scattering, and imaging systems," *Opt. Express* **19**, 26132-26149 (2011).
62. M.R. Dennis, J.B. Götte, R.P. King, M.A. Morgan and M.A. Alonso, "Paraxial and nonparaxial polynomial beams and the analytic approach to propagation," *Opt. Lett.* **36**, 4452-4454 (2011).
63. K. Lombardo and M.A. Alonso, "Orthonormal basis for nonparaxial focused fields in two dimensions, and its application to modeling scattering and optical manipulation of objects," *Am. J. Phys.* **80**, 82-93 (2012).
64. J. Courtial, B. Kirkpatrick, and M.A. Alonso "Imaging with complex ray-optical refractive-index interfaces between complex object and image distances," *Opt. Lett.* **37**, 701-703 (2012).
65. M. Marasinghe, M. Premaratne, D. Paganin, and M.A. Alonso, "Coherence vortices in Mie scattered partially coherent fields," *Opt. Express* **20**, 2858-2875 (2012).
66. A.M. Beckley, T.G. Brown, and M.A. Alonso, "Full Poincaré beams II: Partial polarization," *Opt. Express* **20**, 9357-9362 (2012).
67. S. Cho, M.A. Alonso, and T.G. Brown, "Measurement of spatial coherence through diffraction from a transparent mask with a phase discontinuity" *Opt. Lett.* **37**, 2724-2726 (2012).
68. M.A. Alonso and M.A. Bandres, "Spherical fields as nonparaxial accelerating waves," *Opt. Lett.* **37**, 5175-5177 (2012).
69. R. Ramkhalawon, T.G. Brown, and M.A. Alonso, "Imaging the polarization of a light field," *Opt. Express* **21**, 4106-4115 (2013). Selected as "[Research Highlight](#)" in [Nature Photonics](#).
70. M.A. Alonso, "Ray-based diffraction calculations using stable aggregates of flexible elements," *J. Opt. Soc. Am. A* **30**, 1223-1235 (2013).
71. M.A. Bandres, M.A. Alonso, Ido Kaminer and Mordechai Segev, "Three-dimensional accelerating waves," *Opt. Express* **21**, 13917-13929 (2013).

72. M. Eggleston, T. Godat, E. Munro, M.A. Alonso, H. Shi, M. Bhattacharya, "Ray transfer matrix for a spiral phase plate," *J. Opt. Soc. Am. A* **30**, 2526-2530 (2013).
73. M.A. Alonso and M.A. Bandres, "Generation of nonparaxial accelerating fields through mirrors. I: two dimensions," *Opt. Express* **22**, 7124-7132 (2014).
74. M.A. Alonso and M.A. Bandres, "Generation of nonparaxial accelerating fields through mirrors. II: three dimensions," *Opt. Express* **22**, 14738-14749 (2014).
75. J.K. Wood, K.A. Sharma, S. Cho, T.G. Brown, and M.A. Alonso, "Using shadows for measuring spatial coherence," *Opt. Lett.* **39**, 4927-4930 (2014).
76. M.A. Alonso, T. Setälä, and A.T. Friberg, "Minimum uncertainty solutions for partially coherent fields and quantum mixed states," *N. J. Phys.* **16**, 123023 (2014).
77. M.A. Alonso and Andrew N. Jordan, "Can a Dove prism change the past of a single photon?," *Quantum Stud.: Math. Found.* DOI 10.1007/s40509-015-0044-8 (2015).
78. M.A. Alonso, "Is the Maxwell-Shafer fish eye lens able to form super-resolved images?," *New J. Phys.* **17**, 073013 (2015).
79. S. Sivankutti, E.R. Andresen, G. Bowmans, T.G. Brown, M.A. Alonso, and H. Rigneault, "Single shot polarimetry of multicore fiber," *Opt. Lett.* **41**, 2105-2108 (2016).
80. N.J. Moore and M.A. Alonso, "Mie scattering of highly focused, scalar fields: an analytic approach," *J. Opt. Soc. Am. A* **33**, 1236-1243 (2016).
81. J.H. Eberly, X.-F. Qian, A. Al Qasimi, H. Ali, M.A. Alonso, R. Gutiérrez-Cuevas, B.J. Little, J.C. Howell, T. Malhotra, and A.N. Vamivakas, "Quantum and Classical Optics – Emerging Links," *Phys. Scr.* **91**, 063003 (2016).
82. K.A. Sharma, T.G. Brown, and M.A. Alonso, "Phase-space approach to lensless measurements of optical field correlations," *Opt. Express* **24**, 16099-16110 (2016).
83. M.A. Alonso and G.W. Forbes, "Strehl ratio as the Fourier transform of a probability density of error differences," *Opt. Lett.* **41**, 3735-3738 (2016).
84. M.A. Alonso, X.-F. Qian, and J.H. Eberly, "Center-of-mass interpretation for bipartite purity analysis of N-party entanglement," *Phys. Rev. A* **94**, 030303(R) (2016).
85. K.J. Parker and M.A. Alonso, "The longitudinal iso-phase condition and needle pulses," *Opt. Express* **24**, 28669-28677 (2016).
86. M.R. Dennis and M.A. Alonso, "Swings and roundabouts: Optical Poincaré spheres for polarization and Gaussian beams," *Phil. Trans. R. Soc. A* **375**, 20150441 (2017).
87. A. Vella, H. Dourdent, L. Novotny, and M.A. Alonso, "Birefringent masks that are optimal for generating bottle fields," *Opt. Express* **25**, 9318-9332 (2017). Erratum, **25**, 19654 (2017).
88. M.A. Alonso and M.R. Dennis, "Ray-optical Poincaré sphere for structured Gaussian beams," *Optica* **4**, 476-486 (2017).

89. K.J. Parker, S. Chen and M.A. Alonso, "The ultrasound needle pulse," *IEEE Ultrasonics, Ferroelectrics and Frequency Control* **64**, 1045-1049 (2017).
90. R. Gutiérrez-Cuevas and M.A. Alonso, "Polynomials of Gaussians and vortex-Gaussian beams as complete, transversely confined bases," *Opt. Lett.* **42**, 2205-2208 (2017).
91. R. Gutiérrez-Cuevas and M.A. Alonso, "Scalar and electromagnetic nonparaxial bases composed as superpositions of simple vortex fields with complex foci," *Opt. Express* **25**, 14856-14870 (2017).
92. J. Verbeeck, K.Y. Bliokh, I.P. Ivanov, L. Clark, R. Van Boxem, A. Béché, R. Juchtmans, G. Guzzinati, M.A. Alonso, P. Schattschneider, F. Nori, "Theory and applications of free-electron vortex states," *Phys. Rep.* **690**, 1-70 (2017).
93. K. Liang and M.A. Alonso, "Understanding the effects of groove structures on the MTF," *Opt. Express* **25**, 18827-18841 (2017).
94. R. Gutiérrez-Cuevas and M.A. Alonso, "Complete confined bases for beam propagation in Cartesian coordinates," *J. Opt. Soc. Am. A* **34**, 1697-1702 (2017).
95. K. Liang and M.A. Alonso, "Effects of defocus and other quadratic errors on OTF," *Opt. Lett.* **42**, 5254-5257 (2017).
96. A. Vella and M.A. Alonso, "Poincaré sphere representation for spatially varying birefringence," *Opt. Lett.* **43**, 379-382 (2018).
97. K.A. Sharma, G. Costello, E. Vélez-Juárez, T.G. Brown and M.A. Alonso, "Measuring vector field correlations using diffraction," *Opt. Express* **26**, 8301-8313 (2018).
98. R. Gutiérrez-Cuevas, N.J. Moore, and M.A. Alonso, "Lorenz-Mie scattering of focused light via complex focus fields: An analytic treatment," *Phys. Rev. A* **97**, 053848 (2018).
99. X.-F. Qiang, M.A. Alonso, and J.H. Eberly, "Entanglement polygon inequality in qubit systems," *New J. Phys.* **20**, 063012 (2018).
100. T. Malhotra, R. Gutiérrez-Cuevas, J. Hassett, N. Vamivakas, and M.A. Alonso, "Measuring geometric phase without interferometry," *Phys. Rev. Lett.* **120**, 233602 (2018).
101. S. Sivankutty, V. Tsvirkun, G. Bouwmans, E.R. Andresen, D. Oron, H. Rigneault, and M.A. Alonso, "Single-shot noninterferometric measurement of the phase transmission matrix in multicore fibers," *Opt. Lett.* **43**, 4493-4496 (2018).
102. K. Liang, G.W. Forbes and M.A. Alonso, "Validity of the perturbation model for the propagation of MSF structure in 2D," *Opt. Express* **27**, 3390-3408 (2019).
103. M.R. Dennis and M.A. Alonso, "Gaussian mode families for systems of rays," *J. Phys. Photonics* **1**, 025003 (2019).
104. L.A. Alemán-Castañeda, B. Piccirillo, E. Santamato, L. Marrucci, and M.A. Alonso, "Shearing interferometry via geometric phase," *Optica* **6**, 396-399 (2019).
105. A. Vella, S.T. Head, T.G. Brown, and M.A. Alonso, "Simultaneous measurement of multiple parameters of a subwavelength structure based on the weak value formalism," *Phys. Rev. Lett.* **122**, 123603 (2019).

106. M. Yessenov, L. Mach, B. Bhaduri, D. Mardani, H.E. Kondakci, G.K. Atia, M.A. Alonso, and A.F. Abouraddy, "What is the maximum differential group delay achievable by a space-time wave packet in free space?," *Opt. Express* **27**, 12443-12457 (2019).
107. H. Aryan, K. Liang, M.A. Alonso, and T.J. Suleski "Predictive models for the Strehl ratio of diamond-machined optics," *Appl. Opt.* **58**, 3272-3276 (2019).
108. H.E. Kondakci, G.K. Atia, M.A. Alonso, and A.F. Abouraddy, "Classical entanglement underpins the invariant propagation of space-time wave packets," *Opt. Lett.* **44**, 2645-2648 (2019).
109. R. Gutiérrez-Cuevas, M.R. Dennis, and M.A. Alonso, "Generalized Gaussian beams in terms of Jones vectors," *J. Opt.* **21**, 084001 (2019).
110. L.A. Alemán-Castañeda and M.A. Alonso, "Study of reflectors for illumination via conformal maps," *Opt. Lett.* **44**, 3809-3812 (2019).
111. K. Liang, G.W. Forbes and M.A. Alonso, "Rapidly-Decaying Fourier-like bases," *Opt. Express* **27**, 32263-32276 (2019).
112. K. Liang and M.A. Alonso, "Effects on the OTF of MSF structures with random variations," *Opt. Express* **27**, 34665-34680 (2019).
113. K.Y. Bliokh, M.A. Alonso and M.R. Dennis, "Geometric phases in 2D and 3D polarized fields: geometrical, dynamical, and topological aspects," *Rep. Prog. Phys* **82**, 122401 (2019).
114. A. Vella and M.A. Alonso, "Optimal birefringence distributions for imaging polarimetry," *Opt. Express* **27**, 26799-26814 (2019).
115. K. Liang, G.W. Forbes and M.A. Alonso, "Validity of the perturbation model for the propagation of MSF structures in 3D," *Opt. Express* **28**, 20277-20295 (2020).
116. A. Zannotti, C. Denz, M.A. Alonso and M.R. Dennis, "Shaping caustics into propagation-invariant light," *Nature Comm.* **11**, 3597 (2020). [Selected for \*Optics in 2020\*, \*Optics and Photonics News \(OPN\)\*, Dec. 2020.](#)
117. V. Curcio, L.A. Alemán-Castañeda, T.G. Brown, S. Brasselet and M.A. Alonso, "Birefringent Fourier filtering for single molecule Coordinate and Height super-resolution Imaging with Dithering and Orientation," *Nature Comm.* **11**, 5307 (2020). [Press releases : CNRS, La Lettre d'AMU, Photoniques, Wiley Analytical Science.](#)
118. R. Gutiérrez-Cuevas, S.A. Wadood, A.N. Vamivakas and M.A. Alonso, "Modal Majorana sphere and hidden symmetries of structured Gaussian beams," *Phys. Rev. Lett.* **125**, 123093 (2020).
119. R. Gutiérrez-Cuevas and M.A. Alonso, "Platonic Gaussian beams: wave and ray treatment," *Opt. Lett.* **45**, 6759-6762 (2020).
120. J.S. Eismann, L.H. Nicholls, D.J. Roth, M.A. Alonso, P. Banzer, F.J. Rodríguez-Fortuño, A.V. Zayats, F. Nori and K.Y. Bliokh, "Transverse spinning of unpolarized light," *Nature Phot.* **15**, 156-161 (2021).
121. R. Gutiérrez-Cuevas and M.A. Alonso, "Analytic treatment of nonparaxial full-Poincaré fields: singularity structure and trapping properties," *J. Opt.* **23**, 024005 (2021).
122. S.A. Wadood, K. Liang, Y. Zhou, J. Yang, M.A. Alonso, X.F. Qian, T. Malhotra, S.M. Hashemi Rafsanjani, A.N. Jordan, R.W. Boyd, N.A. Vamivakas,

- “Experimental demonstration of superresolution of partially coherent light sources using parity sorting,” *Optics Express* **29**, 22034-22043 (2021).
123. K.Y. Bliokh, M.A. Alonso, D. Sugic, M. Perrin, F. Nori, and E. Brasselet, “Polarization singularities and Möbius strips in sound and water-surface waves,” *Phys. Fluids* **33**, 077122 (2021).
  124. M. Mazanov, D. Sugic, M.A. Alonso, F. Nori, and K.Y. Bliokh, “Transverse shifts and time delays of spatiotemporal vortex pulses reflected and refracted at a planar interface,” *Nanophotonics* **10**, 20210294 (2021).
  125. M. Yessenov, J. Free, Z. Chen, E.G. Johnson, M.P.J. Lavery, M.A. Alonso, and A.F. Abouraddy, “Space-time wave packets localized in all dimensions,” *Nature Comm.* **13**, 4573 (2022).
  126. R.D. Muelas-Hurtado, K. Volke-Sepúlveda, J.L. Ealo, F. Nori, M.A. Alonso, K.Y. Bliokh, and E. Brasselet, “Observation of Polarization Singularities and Topological Textures in Sound Waves,” *Phys. Rev. Lett.* **129**, 204301 (2022).
  127. K.J. Parker and M.A. Alonso, “The Spherical Harmonic Family of Beampatterns,” *Acoustics* **4**, 958-966 (2022).
  128. L.A. Alemán-Castañeda, S.Y.T. Feng, R. Gutiérrez-Cuevas, I. Herrera, T.G. Brown, S. Brasselet, M.A. Alonso, “Using fluorescent beads to emulate single fluorophores,” *J. Opt. Soc. Am. A* **39**, C167-C178 (2022).

**Articles under consideration:**

1. G.W. Forbes and M.A. Alonso, “Asymptotic expansions for field moments of bound states,” submitted (2022).
2. K.Y. Bliokh *et al.*, “Roadmap on structured waves,” submitted (2022).
3. R. Gutiérrez-Cuevas, D.H.J. O’Dell, M.R. Dennis, and M.A. Alonso, “The Ince oscillator: an exactly solvable model behind Bose-Hubbard dimers, Ince-Gauss beams, and aberrated optical cavities,” submitted (2022).
4. M.A. Alonso, “Geometric descriptions for the polarization for nonparaxial optical fields: a tutorial,” submitted (2022); [arxiv.org/abs/2008.02720](https://arxiv.org/abs/2008.02720).
5. D. Marco and M.A. Alonso, “Optical fields spanning the 4D space of nonparaxial polarization,” submitted (2022); [arxiv.org/abs/2212.01366](https://arxiv.org/abs/2212.01366).
6. A. Bhattacharjee, S. Biswas, M.A. Alonso, and A.K. Jha, “Coherence in the radial degree of freedom,” submitted (2022).

**Peer-reviewed conference proceedings:**

1. M.A. Alonso and G.W. Forbes, “Fractional Legendre transformation and its use in Hamilton’s formalism,” *Proceedings of the Second Iberoamerican Meeting on Optics*, SPIE Proceedings **2730**, 248-251 (1996).
2. G.W. Forbes and M.A. Alonso, “What on earth is a ray and how can we use them best?,” *Proceedings of the International Optical Design Conference 1998*, SPIE Proceedings **3482**, 22-31 (1999).
3. G.W. Forbes and M.A. Alonso, “The Holy Grail of ray-based optical modeling,” *Proceedings of the International Optical Design Conference 2002*, SPIE Proceedings **4832**, 186-197 (2002).

4. M.A. Alonso and G.W. Forbes, "Periodic minimum uncertainty states," *Proceedings of the 8<sup>th</sup> International Conference on Squeezed States and Uncertainty Relations*, H. Moya-Cessa et al., Eds. (Rinton, Princeton, 2003), 1-6.
5. M.A. Alonso and M.J. Bastiaans, "Mapping-based width measures and uncertainty relations for periodic functions," *Proceedings of the 3rd IEEE International Symposium on Signal Processing and Information Technology*, 2003. ISSPIT (2003), pp. 625-628.
6. G.W. Forbes and M.A. Alonso, "Stable aggregates of flexible elements link rays and waves," *Nonimaging Optics: Maximum Efficiency Light Transfer VII*, SPIE Proceedings **5185**, 125-136 (2004).
7. M.A. Alonso, "Exact description of electromagnetic waves in terms of rays," *2004 URSI EMTS International Symposium on Electromagnetic Theory Proceedings* (Edizioni Plus, Pisa 2004), pp. 242-244.
8. M.A. Alonso, "Stable aggregates of flexible elements: Making a silk purse from sow's ears," *2004 URSI EMTS International Symposium on Electromagnetic Theory Proceedings* (Edizioni Plus, Pisa 2004), pp. 346-348.
9. M.A. Alonso, "Wigner functions for nonparaxial classical optical fields," *Proceedings of the XXV International Colloquium on Group theoretical Methods in Physics*, G. S. Pogosyan, L. E. Vicent, and K. B. Wolf, Eds. Institute of Physics Conference Series **185** (2005), pp. 29-36.
10. J.C. Petrucci and M.A. Alonso, "Propagation of Partially Coherent, Partially Polarized Fields via a Wigner Representation in Direction and Angular Momentum," in *Conference on Coherence in Quantum Optics*, OSA Technical Digest (CD) (Optical Society of America, 2007), paper CSuA46.
11. R. Borghi and M.A. Alonso, "Efficient evaluation of far-field asymptotic series," *Proceedings of the 9th IEEE International Conference on Transparent Optical Networks*, 2007. ICTON (2007), vol. **3**, pp. 246-250.
12. D.P. Brown, A.K. Spilman, T.G. Brown, M.A. Alonso, R. Borghi, and M. Santarsiero, "Calibration of a reversed-wavefront interferometer for polarization coherence metrology," *Advanced Characterization Techniques for Optics, Semiconductors, and Nanotechnologies III*, SPIE Proc. **6672**, 667207 (2007).
13. J.C. Petrucci, N.J. Moore, and M.A. Alonso, "Methods for modeling nonparaxial fields," *Proceedings of the 9<sup>th</sup> Euro-American Workshop on Information Optics*, IEEE proceeding 10.1109/WIO.2010.5582523 (2010).
14. K.Y. Bliokh, M.A. Alonso, and E.A. Ostrovskaya, "Angular momentum of light revisited: Spin-orbit interactions in free space," *Complex Light and Optical Forces V*, SPIE Proceedings **7950**, 1-8 (2011).
15. M.A. Alonso, A.M. Beckley, and T.G. Brown, "Full Poincaré beams," *22nd Congress of the International Commission for Optics: Light for the Development of the World*, SPIE Proceedings **8011**, 80111M (2011).
16. N.J. Moore and M.A. Alonso, "Mie scattering for high numerical aperture fields," *22nd Congress of the International Commission for Optics: Light for the Development of the World*, SPIE Proceedings **8011**, 801162 (2011).
17. M.A. Alonso, J.C. Petrucci, and S. Cho, "Generalized phase space representations in classical optics," *22nd Congress of the International*

*Commission for Optics: Light for the Development of the World*, SPIE Proceedings **8011**, 80116E (2011).

18. M.A. Alonso and K.Y. Bliokh, “Angular momenta and spin-orbit interaction for nonparaxial beams,” *22nd Congress of the International Commission for Optics: Light for the Development of the World*, SPIE Proceedings **8011**, 80116H (2011).
19. M.A. Alonso, S. Cho and T.G. Brown, “Simple methods for measuring spatial coherence and their relation to the Wigner function,” *IEEE Proceedings of the 11<sup>th</sup> Euro-American Workshop on Information Optics*, 1-3 (2012).
20. M.A. Alonso, “Analytical techniques for the study of focused beams,” *Complex Light and Optical Forces VII conference, Photonics West*, SPIE proceeding **8637**, 863716 (2013).
21. M.A. Alonso, “The connection between rays and waves,” *Proceedings of Fringe 2013, 7<sup>th</sup> International Workshop on Advanced Optical Imaging and Metrology*, W. Osten, Ed. (Springer, Hiedelberg, 2013), pp. 457-466.
22. B.G. Zimmerman, R. Ramkhalawon, M.A. Alonso, and T.G. Brown, “Pinhole array implementation of Star Test Polarimetry,” *Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXI*, SPIE proceeding **8949**, 894912 (2014).
23. T.G. Brown, M.A. Alonso, A. Vella, M.J. Theisen, S.T. Head, S.R. Gillmer, and J.D. Ellis, “Focused beam scatterometry for deep subwavelength metrology,” *Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXI*, SPIE proceeding **8949**, 89490Y (2014).
24. T.G. Brown, M.A. Alonso, A. Vella, M.J. Theisen, and S.T. Head, “Weak measurements applied to process monitoring using focused beam scatterometry,” *Metrology, Inspection, and Process Control for Microlithography XXVIII*, SPIE proceeding **9050**, 90501F (2014).
25. K.A. Sharma, J.K. Wood, M.A. Alonso, and T.G. Brown, “Measurement of spatial coherence through the shadow of small obscurations,” *Reflection, Scattering, and Diffraction from Surfaces IV*, Proc. SPIE **9205**, 92050G (2014).
26. K. Liang, M.A. Alonso, “Using the pupil-difference probability density to understand OTF,” *Computational Optics II*, Proc. SPIE **10694**, 106940P (2018).
27. M.A. Alonso and A. Vella, “Birefringent distributions tailored for imaging and other applications”, *17<sup>th</sup> Workshop on Information Optics (WIO)*, IEEE 1-3 (2018). doi: 10.1109/WIO.2018.8643458
28. L.A. Alemán-Castañeda and M.A. Alonso, “Reflector design and study via conformal mappings”, *Nonimaging Optics : Efficient Design for Illumination and Solar Concentration XVII*, Proc. SPIE **11495**, 114950F (2020).
29. M.A. Alonso, “Abstract spaces, mappings and geometry in the study of optical systems”, *International Optical Design Conference*, Proc. SPIE **20078**, 120780U (2021); doi: 10.1117/12/2603639.

#### **Book chapters:**

1. M.A. Alonso, “Rays and waves”, in *Phase Space Optics: Fundamentals and Applications*, (McGraw-Hill, 2009), eds. B. Hennelly, J. Ojeda-Castañeda, and M. Testorf.

2. K.Y. Bliokh, A. Aiello and M.A. Alonso, “Spin-orbit interactions (SOI) of light” in *The Angular Momentum of Light*, (Cambridge University Press, 2013), eds. D. Andrews and M. Babiker, pp. 174-245.
3. M.A. Alonso and N.J. Moore, “Basis expansions for monochromatic field propagation” in *Mathematical Optics: Classical, Quantum, and Imaging Methods*, (CRC Press, 2013), eds. V. Lakshminarayanan, M.L. Calvo, and T. Alieva, pp. 97-141.
4. M.A. Alonso, “Modern Optics”, *The Princeton Companion to Applied Mathematics*, (Princeton U.P., 2015), ed. Nicholas J. Higham, pp. 673-680.
5. J.C. Petrucci and M.A. Alonso, “The Wigner function in optics”, *The Optics Encyclopedia* (Wiley VCH, 2015), pp. 1-22.
6. M.A. Alonso, “Foreword”, *Linear Canonical Transforms, Theory and Applications* (Springer Series in Optical Sciences 198, 2016), eds. J.J. Healy, M.A. Kutay, H.M. Ozaktas, J.T. Sheridan.
7. A. Vella and M.A. Alonso, “Maximum likelihood estimation in the context of an optical measurement” Chapter 7 of *Progress in Optics 65* (Elsevier, Amsterdam, 2020), pp. 231-311.

#### **Other publications:**

1. M.A. Alonso, “Radiometry and wide-angle wave fields,” summary included in the *Optics in 2001* special issue of *Optics and Photonic News* **12**, 52 (December 2001).
2. G.W. Forbes and M.A. Alonso, “Using rays better,” summary included in the *Optics in 2001* special issue of *Optics and Photonic News* **12**, 54 (December 2001).
3. M.A. Alonso, “Focus Issue: Rays in Wave Theory. Introduction,” *Opt. Exp.* **10**, 715 (2002).
4. E. Wolf, W.H. Knox, and M.A. Alonso, “Spatial coherence from ducks,” *Physics Today* **63**, March 2010, p. 11.
5. M.A. Alonso, “La théorie ondulatoire de Fresnel a-t-elle tué les rayons ? Comment réconcilier les rayons et les ondes,” *Photoniques* **100**, 29-33 (2020).
6. M.A. Alonso, “Editorial: Message from the Incoming Editor,” *Opt. Lett.* **45**, ED1 (2020).
7. M. Berry *et al.*, “A tribute to Marat Soskin,” *J. Opt.* **23**, 050201 (2021).
8. M.A. Alonso and M.R. Dennis, “The geometric phase made simple,” *Photoniques* **116**, 58-63 (2022).
9. G. Gbur *et al.*, “100 years of Emil Wolf: introduction,” *J. Opt. Soc. Am. A* **39**, EW1-EW2 (2022).

#### **SEMINARS AND CONFERENCE PRESENTATIONS**

##### **Invited Colloquia, Webinars and Online events**

1. *Optica Hamiltoniana*, Centro de Investigaciones en Optica (CIO), León, Mexico, January 1995.

2. *Transformación fraccional de Legendre*, Universidad de Las Américas, Cholula, Mexico, January 1997.
3. *Nuevos métodos para cálculos asintóticos en problemas de propagación de ondas*, Instituto de Física, Universidad Autónoma de San Luis Potosí, Mexico, January 1997.
4. *The fractional Fourier transform and its use in physics*, Analysis Colloquium of the Department of Mathematics, Macquarie University, Sydney, Australia, July 1997.
5. *Asymptotic estimates of wave fields and Gaussian packets*, Rochester Theory Center, Rochester, US, October 1997.
6. *Asymptotic construction of wavefields via phase space*, Moscow Electrodynamics Seminar, Moscow, Russia, October 1997.
7. *De los rayos a las ondas*, Universidad de Valencia, Spain, February 1999.
8. *Los campos de Helmholtz, su medición, incertidumbre, y función de Wigner*, Centro de Ciencias Físicas, Universidad Nacional Autónoma de México, Cuernavaca, Mexico, April 2000.
9. *Los campos de Helmholtz, su incertidumbre, y función de Wigner*, Instituto de Física, Universidad Nacional Autónoma de México, Mexico City, Mexico, June 2000.
10. *¿Que rayos con esta onda?*, Centro de Ciencias Físicas, Universidad Nacional Autónoma de México, Cuernavaca, Mexico, September 2000.
11. *Uncertainty products for periodic functions and applications for nonparaxial wave fields*, The Institute of Optics, University of Rochester, US, October 2000.
12. *Uncertainty products for periodic functions and applications for nonparaxial wave fields*, Steacie Institute for Molecular Sciences, NRC, Ottawa, Canada, November 2000.
13. *Uncertainty products for periodic functions and applications for nonparaxial wave fields*, Edward L. Ginzton Laboratory, Stanford University, Palo Alto, US, November 2000.
14. *Relaciones de incertidumbre para funciones periódicas y sus aplicaciones en la caracterización de campos de onda no paraxiales*, Centro de Investigación en Energía, Universidad Nacional Autónoma de México, Temixco, Mexico, November 2000.
15. *Ray-based methods for wave propagation*, Optical Sciences Center of the University of Arizona, Tucson, US, September 2002.
16. *¿Que rayos con esta onda?*, X anniversary of the Faculty of Sciences, Universidad Autónoma del Estado de Morelos, Cuernavaca, Mexico, September 2002.
17. *Ray-based methods for wave propagation*, Centro Internacional de Ciencias A.C., Cuernavaca, Mexico, October 2002.
18. *Ray-based methods for wave propagation*, University of Oklahoma, Norman, US, January 2003.

19. *Propagación de ondas usando rayos*, Centro de Ciencias Aplicadas y Desarrollo Tecnológico, Universidad Nacional Autónoma de México, Mexico City, Mexico, June 2003.
20. *Connecting Rays and Waves by Using Stable Aggregates of Flexible Elements*, Mathematical Physics Seminar, University of Rochester, US, August 2003.
21. *Connecting rays and waves*, Rochester section of the Optical Society of America, Rochester, US, September 2003.
22. *Propagazione dei campi ondulatori usando raggi*, Università di Roma Tre, Rome, Italy, May 2004.
23. *Ray-based propagation of wave fields using stable aggregates of flexible elements*, École Centrale Paris, Paris, France, June 2004.
24. *Ray-based methods for modeling the propagation of waves*, Laboratory of Laser Energetics, University of Rochester, US, September 2004.
25. *Propagación de ondas usando rayos*, Universidad Politécnica de Madrid, Madrid, Spain, September 2004.
26. *Wave propagation using rays*, Mathematics Department, University of Rochester, US, April 2005.
27. *Phase space and uncertainty relations in optics*, Department of Mathematics, University of Rochester, US, March 2007.
28. *Todo lo que usted siempre quiso saber sobre los campos de Helmholtz pero no se atrevió a preguntar*, Universidad Politécnica de Madrid, Spain, February 2008.
29. *Monochromatic focused fields: new approaches to describe an old, simple problem*, Physics dept., University of Rochester, US, February 2008.
30. *Several techniques for modeling the propagation of monochromatic fields through transparent media*, Physics department, University of North Carolina, Charlotte, US, May 2008.
31. *Métodos matemáticos para la descripción de campos monocromáticos*, Instituto Nacional de Astrofísica, Óptica y Electrónica (INAOE), Tonantzintla, Mexico, November 2008.
32. *Connecting rays and waves*, Optics and Quantum Electronics Seminar, Massachusetts Institute of Technology, Cambridge, US, November 2009.
33. *Rays and waves*, The Institute of Optics, University of Rochester, US, December 2009.
34. *Connecting Rays and waves*, National University of Ireland Galway, Galway, Ireland, April 2010.
35. *The connection between rays and waves*, UMK Symposium on New Materials, Aalto University, Espoo, Finland, April 2010.
36. *Rays and waves*, SMART Centre, National University of Singapore, Singapore, August 2010.
37. *Modelling focussed electromagnetic waves beyond the paraxial approximation*, Monash University, Melbourne, Australia, September 2010.
38. *Rays and waves*, University of Tampere, Tampere, Finland, October 2010.

39. *Rays and waves*, Physics Colloquium, University of Bristol, Bristol, England, November 2010.
40. *Simple mathematical models for strongly focused fields*, Theoretical Physics Seminar, University of Bristol, Bristol, England, November 2010.
41. *Simple mathematical models for strongly focused fields*, University of Glasgow, Glasgow, Scotland, November 2010.
42. *Simple mathematical models for strongly focused fields*, Imperial College, London, England, November 2010.
43. *Modeling focused fields beyond the paraxial approximation*, Rochester Section of the Optical Society of America, Rochester, US, March 2011.
44. *Simple mathematical techniques for describing (and even simpler experimental techniques for measuring) optical fields*, COSI Seminar Series at the University of Colorado at Boulder, Boulder, US, November 2012.
45. *The connection between rays and waves*, Rochester Institute of Technology, Rochester, US, March 2013.
46. *Turning rays into waves: stable aggregates of flexible elements*, University of Bristol, Bristol, UK, August 2013.
47. *The connection between rays and waves*, DTU, Copenhagen, Denmark, August 2013.
48. *The connection between rays and waves*, ZEISS, Oberkochen, Germany, September 2013.
49. *The connection between rays and waves*, ASML Engineering, Wilton, US, October 2013.
50. *Simple methods for modeling and measuring optical coherence and polarization*, Fresnel Institute, Marseille, France, June 2014.
51. *Understanding self-similar beams in terms of rays: visible and hidden geometry*, The Institute of Optics, University of Rochester, US, October 2014.
52. *Understanding self-similar beams in terms of rays: visible and hidden geometry*, University at Albany, Albany, US, October 2014.
53. *Understanding self-similar beams in terms of rays: visible and hidden geometry*, University of Ottawa, Ottawa, Canada, November 2014.
54. *Self-similar optical beams: visible and hidden geometry*, ICFO, Barcelona, Spain, November 2014.
55. *Understanding self-similar beams in terms of rays: visible and hidden geometry*, Colgate University, Hamilton, US, December 2014.
56. *Understanding self-similar beams in terms of rays: visible and hidden geometry*, Allegheny College, Meadville, US, January 2015.
57. *Rays and Waves*, Fresnel Institute, Marseille, France, July 2015.
58. *Wigner functions and coherence*, Fresnel Institute, Marseille, France, July 2015.
59. *Measurement of coherence and polarization*, Fresnel Institute, Marseille, France, July 2015.
60. *Modeling nonparaxial fields*, Fresnel Institute, Marseille, France, July 2015.

61. *What ray optics can tell us about nonparaxial fields*, Fresnel Institute, Marseille, France, July 2015.
62. *Coherence and polarization: modeling and measurement*, ASML, Wilton, US, July 2015.
63. *Hidden geometry: self-similar beams and their quantum analogs*, talk to the Society of Undergraduate Mathematics Students and the Society of Undergraduate Physics Students, University of Rochester, US, October 2015.
64. *Two sides of the Poincaré sphere. Polarization measurements and studies of beam structure*, INRS, Montreal, Canada, November 2015.
65. *Two sides of the Poincaré sphere. Polarization measurements and studies of beam structure*, Laboratory for Laser Energetics, Rochester, US, December 2015.
66. *Can [optical device]<sub>n</sub> perform [seemingly unphysical task]<sub>n</sub>?*, Center for Coherence and Quantum Optics, University of Rochester, US, February 2016.
67. *Two sides of the Poincaré sphere in optics*, Center for Image Science, Rochester Institute of Technology, Rochester, US, March 2016.
68. *Two sides of the Poincaré sphere in optics: Polarization and beam structure*, Photonics Laboratory, ETH, Zurich, Switzerland, June 2016.
69. *Two sides of the Poincaré sphere in optics*, Fresnel Institute, Marseille, France, June 2016.
70. *Can [optical device]<sub>n</sub> perform [seemingly unphysical task]<sub>n</sub>?*, Fresnel Institute, Marseille, France, June 2016.
71. *Graduate Studies at The Institute of Optics*, Journées des Doctorats student conference, Marseille, June 2016.
72. *My experience as a journal editor*, FEMTO-ST, Besançon, France, December 2016.
73. *Breve introducción a la teoría de coherencia y polarización ópticas*, Dept. de Ingeniería Electrónica, Universidad de Guadalajara, Mexico, December 2016.
74. *Haces ópticos autosimilares y su representación geométrica*, Dept. de Ingeniería Electrónica, Universidad de Guadalajara, Mexico, December 2016.
75. *Can [optical device]<sub>n</sub> perform [seemingly unphysical task]<sub>n</sub>?*, The Institute of Optics, University of Rochester, US, June 2017.
76. *Two sides of the Poincaré sphere in optics: Polarization and beam structure*, Department of Physics, University of Toronto, Canada, July 2017.
77. *Two sides of the Poincaré sphere in optics: Polarization and beam structure*, Department of Physics, University of Bristol, UK, November 2017.
78. *Can [optical device]<sub>n</sub> perform [seemingly unphysical task]<sub>n</sub>?*, Università di Napoli Federico II, Italy, November 2017.
79. *Rays and Waves*, Università La Sapienza, Italy, November 2017.
80. *Can [optical device]<sub>n</sub> perform [seemingly unphysical task]<sub>n</sub>?*, Quaid-I-Azam University, Islamabad, Pakistan, December 2017.

81. *Two sides of the Poincaré sphere in optics: polarization and beam structure*, Quaid-I-Azam University, Islamabad, Pakistan, December 2017.
82. *Spatially-varying birefringence and its applications in imaging*, Institut Fresnel, Marseille, France, March 2018.
83. *Spatially-varying birefringence and its applications in imaging*, Universitat Politècnica de Catalunya, Terrassa, Spain, April 2018.
84. *Several aspects of the geometric phase in optics*, ETH Zurich, Switzerland, November 2018.
85. *The mathematics and geometry of wave propagation*, Pontificia Universidad Católica del Perú, Lima, Peru, November 2018.
86. *Spatially-varying birefringence and its applications in imaging*, KTH, Kista, Suede, December 2018.
87. *The several faces of the geometric phase in optics*, SPIE Student Chapter Colloquium, University of Rochester, Rochester NY, US, August 2019.
88. *The geometry hidden in light*, Rochester Section of OSA, the Optical Society, Rochester, US, December 2019.
89. *Demystifying the Publishing Process*, webinar (with Kurt Busch, EiC J.Opt. Soc. Am. A) organized by OSA (The Optical Society), August 2020.
90. *La geometría evidente y escondida en la óptica*, Centro de Investigaciones Científicas y de Educación Superior de Ensenada, Ensenada, Mexico, Sept. 2020.
91. *The Poincaré sphere, its generalizations, and their several applications in optics*, [SPIE's Henri Poincaré Webinar Series on Polarization and Related Phenomena](#), Sept. 2020.
92. *La geometría evidente y escondida en la óptica*, Centro de Investigaciones en Optica, Ensenada, Mexico, Oct. 2020.
93. *The Poincaré sphere, its generalizations, and their several applications in optics*, Monthly Online Colloquium of the Optics and Photonics Society of Iran, Nov. 2020.
94. [Demystifying the Publishing Process](#), webinar organized by the Marseille ElectroMagnetism and Optics Student Chapter, Feb. 2021.
95. [The Poincaré sphere, its generalizations, and their several applications in optics](#) (via visio), LOMA Seminar, U. Bordeaux, France (online), Mar. 2021.
96. *3D Polarization*, Institut Fresnel, Marseille, France, Oct. 2021.
97. *The structure of light: tailoring and measuring intensity, phase and polarization*, Queens College of the City University of New York, USA (online), Nov. 2021.
98. *The structure of light: tailoring and measuring intensity, phase and polarization*, Stevens Institute of Technology, Hoboken NJ, USA (online), Apr. 2022.
99. *Rays and waves*, three-lecture series for the Quantum Information and Coherence Talk series, Indian Institute of Technology Kanpur, India, Apr. 2022.

100. *The Poincaré sphere, its generalizations, and their several applications in optics*, Institute Lecture Series, Indian Institute of Technology Kanpur, India, Apr. 2022.
101. *The structure of light: tailoring and measuring intensity, phase and polarization*, Optica student chapter, Indian Institute of Technology Roorkee, India (online), May 2022.

**Invited conference talks:**

1. *The fractional Legendre transformation and its use in Hamilton's formalism*, Segunda Reunión Iberoamericana de Optica, Guanajuato, Mexico, September 1995.
2. *How far can rays take us?* (given by co-author), Progress in Electromagnetics Research Symposium (PIERS 2000) Meeting, Cambridge, US, July 2000.
3. *A foundation for wave asymptotics based on collectively stable superpositions of flexible elements* (given by co-author), URSI International Symposium on Electromagnetic Theory, Victoria, Canada, May 2001.
4. *Stable aggregates of flexible elements as a link between rays and waves*, SPIE 48<sup>th</sup> Annual Meeting, San Diego, US, August 2003.
5. *New wave-based radiance analogues and their applications*, Frontiers in Optics, the Optical Society of America's Annual Meeting, Tucson, US, October 2003.
6. *Research Opportunities in Optics*, panel discussion, Joint Annual Conference of the National Society of Black Physicists and the National Society of Hispanic Physicists, Washington D.C., US, February 2004.
7. *Stable aggregates of flexible elements: Making a silk purse from saw's ears*, 2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy, May 2004.
8. *Wigner functions for nonparaxial classical optical fields*, plenary talk, XXV International Colloquium on Group Theoretical Methods in Physics, Cocoyoc, Mexico, August 2004.
9. *Ray-based diffraction calculations using SAFE*, 2005 Joint Annual Conference of the National Society of Black Physicists and the National Society of Hispanic Physicists, Orlando, US, February 2005.
10. *Scalar and vectorial minimum uncertainty fields for nonparaxial propagation* (given by co-author), Topical Meeting on Advanced Imaging of the European Optical Society, London, England, July 2005.
11. *Polarization ray tracing of wave fields*, (tutorial), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2006.
12. *Phase space and the connection between rays and waves*, Topical Meeting on Optoinformatics'08, St. Petersburg, Russia, September 2008.
13. *Métodos matemáticos para la propagación de ondas*, 2<sup>do</sup> Taller del Cuerpo Académico de Optoelectrónica y Fotónica at the Benemérita Universidad Autónoma de Puebla, Puebla, Mexico, November 2008.
14. *Connecting rays and waves*, Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, October 2009.

15. *Models for paraxial and nonparaxial, coherent and partially coherent electromagnetic waves*, Optics Days 2010, the Finnish Optical Society's Annual Meeting, Tampere, Finland, May 2010.
16. *Methods for modeling nonparaxial fields*, 9<sup>th</sup> Euro-American Workshop on Information Optics, Helsinki, Finland, July 2010.
17. *Full Poincaré beams*, International Commission for Optics Triennial meeting, Puebla, Mexico, August 2011.
18. *Coherence and polarization for nonparaxial fields*, 10<sup>th</sup> International conference on Correlation Optics, Chernivtsi, Ukraine, September 2011.
19. *Simple models for focused fields*, Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, October 2011.
20. *Generalized Wigner functions in classical optics*, Imaging and Applied Optics: OSA Optics and Photonics Congress, Monterey, US, June 2012.
21. *Simple methods for measuring spatial coherence and their relation to the Wigner function*, 11<sup>th</sup> Euro-American Workshop on Information Optics, Quebec City, Canada, August 2012.
22. *Analytical techniques for the study of focused beams*, OPTO Complex Light and Optical Forces VII conference, Photonics West, San Francisco, US, February 2013.
23. *The connection between rays and waves*, Euro-American Workshop on Information Optics, Tenerife, Spain, July 2013.
24. *The connection between rays and waves*, Fringe 2013, Nürtingen, Germany, September 2013.
25. *New methods for the description and measurement of coherence and polarization*, Correlation Optics 2013, Chernivtsy, Ukraine, September 2013.
26. *Novel schemes for modeling and measuring of coherence and polarization*, Frontiers in Optics, Orlando, US, October 2013.
27. *2D harmonic oscillators, quadratic mappings and caustics: understanding Gaussian beams in terms of rays*, Mathematical Physics, Symposium in honor of Kurt Bernardo Wolf on the occasion of his 70<sup>th</sup> birthday, Cuernavaca, Mexico, November 2013.
28. *Understanding propagation-invariant fields in terms of rays* (keynote), 23<sup>rd</sup> Congress of the International Commission for Optics, Santiago de Compostela, Spain, August 2014.
29. *Geometrical description of Ince-Gaussian cavity modes and other propagation-invariant beams*, 2<sup>nd</sup> International Symposium on Optics and its Applications, Yerevan, Armenia, September 2014.
30. *Ray-based picture of propagation-invariant beams* (tutorial), Latin-American Optics and Photonics (LAOP) conference, Cancún, Mexico, November 2014.
31. *Semiclassical treatment of 2D harmonic oscillators and its application to understanding propagation invariant beams in terms of rays* (Plenary), the IX<sup>th</sup> International Symposium on Quantum Theory and Symmetries, Yerevan, Armenia, June 2015.

32. *What ray optics can tell us about self-similar beams*, 3<sup>rd</sup> International Conference on Orbital Angular Momentum, New York, US, August 2015.
33. *Understanding self-similar beams in terms of rays: visible and hidden geometry*, Mexican Optics and Photonics Meeting 2015, León, Mexico, September 2015.
34. *Hidden geometry: self-similar beams and their quantum analogs*, I-CILCA, Puebla, Mexico, November 2015.
35. *Haces autosimilares: un estudio en términos de rayos*, Primer Escuela de Optica y Fotónica SPIE-UNAM, Mexico City, Mexico, November 2015.
36. *Two sides of the Poincaré sphere in optics*, WE-Heraeus-Seminar on Nanophotonics and Complex Spatial Modes of Light, Physikzentrum Bad Honnef, Germany, January 2016.
37. *Optimal birefringence distributions for different applications*, International Workshop on Structured Light and Matter: Concepts and Applications, Institute for Advanced Studies in Basic Sciences, Zanjan, Iran, September 2016.
38. *The ray optics of self similarity*, International Workshop on Structured Light and Matter: Concepts and Applications, Institute for Advanced Studies in Basic Sciences, Zanjan, Iran, September 2016.
39. *Propagation-invariant beams: a ray-optical perspective*, Frontiers in Optics, OSA's Annual Meeting, Rochester, US, October 2016.
40. *Classical polarization clarifies quantum entanglement*, Incubator on Emerging Connections: Classical and Quantum Optics, Washington DC, US, October 2016.
41. *Two Sides of the Poincaré Sphere*, Frontiers in Optics and Photonics Education, FEMTO ST, Besançon, France, December 2016.
42. *Structured Gaussian beams: ray and wave pictures*, Quantum Field Framework for Structured Light Interaction, Banff International Research Station, Banff, Canada, April 2017.
43. *Waves, Optical Coherence and Phase Space*, International Conference on Computational Photography, Stanford University, Stanford, US, May 2017.
44. *Optimal Birefringence Distributions for Polarimetry and Other Applications*, Correlation Optics 2017, Chernivtsy, Ukraine, September 2017.
45. *Correlations between multicomponent fields: geometrical aspects*, 2<sup>nd</sup> Joensuu Conference on Coherence and Random Polarization, Joensuu, Finland, June 2018.
46. *Birefringence distributions tailored for imaging and other applications*, Workshop on Information Optics, Quebec, Canada, July 2018.
47. *Correlations of vector fields*, Emil Wolf Memorial Workshop, Rochester, US, August 2018.
48. *Photonique et Géométrie*, Journée Recherche 2018: Photonique, Centrale Marseille, France, September 2018.
49. *Several faces of the geometric phase in optics*, Robert Boyd 70<sup>th</sup> Birthday Symposium, Ottawa, Canada, October 2018.
50. *Applications des dispositifs avec birefringence variable en polarimétrie et imagerie*, Traitement des Signaux Polarimétriques Optiques et Radar, Paris, France, October 2018.

51. *Structured Gaussian beams: ray and wave pictures* (plenary), 2<sup>nd</sup> International Workshop on Biophotonics and Optical Angular Momentum BIOAM-2018, Paris, France, October 2018.
52. *Geometric phases in optics*, Latin-American Optics and Photonics (LAOP) conference, Lima, Peru, November 2018.
53. *Nonparaxial polarization, description and applications*, International Conference on Optical Angular Momentum (ICOAM), Ottawa, Canada, June 2019.
54. *Nonparaxial polarization: basic elements and applications in fluorescence microscopy*, Workshop on Information Optics, Stockholm, July 2019.
55. *Rays, waves and semiclassical*, Carlos Stroud Retirement Celebration, Rochester NY, US, August 2019.
56. *The polarization of nonparaxial fields: description and applications*, 11th Rochester Conference on Coherence and Quantum Optics, Rochester NY, August 2019.
57. *Structured light: geometrical and topological aspects*, Conference on Nanophotonics: Foundations and Applications, Monte Verità, Switzerland, Sept 2019.
58. *La geometría evidente y escondida en la óptica* (plenary), LXII Congreso Nacional de Física, Villahermosa, Mexico, Oct 2019.
59. *La théorie ondulatoire de Fresnel a-t-elle tué les rayons ? Comment réconcilier les rayons et les ondes*, Bicentenaire de la Théorie Ondulatoire de la Lumière, Marseille, France, Jan. 2020.
60. *The geometry behind beam structure and caustics* (plenary), Ultrafast Light 2020, Moscow, Russia (online), Sept. 2020.
61. *Abstract spaces, mappings, and geometry in the study of optical systems*, International Optical Design Conference (online), June 2021.
62. *The Poincaré sphere, its generalizations, and their several applications in optics*, XII Reunión Nacional de Optoelectrónica (Optoel 2021), Spain (online), June 2021.
63. *Abstract spaces, mappings, and geometry in the study of optical systems*, Correlation Optics 2021, Chernivtsy, Ukraine (online), September 2021.
64. *Tailoring and measuring intensity, phase and polarization*, Finnish-French Workshop on Structured Light and its Applications, Tampere, Finland, November 2021.
65. *Polarized microscopy for single molecule's orientation and localization imaging*, Photonics West, San Francisco, US, January 2022.
66. *Three-dimensional polarization and its application in microscopy*, Photonics West, San Francisco, US, January 2022.
67. *The geometry and topology of 3D polarization*, Photonics North, Niagara Falls, Canada, May 2022.
68. *Geometry and topology in 3D polarization*, International Conference on Optical Angular Momentum (ICOAM), Tampere, Finland, June 2022.

69. *Geometry and topology in 3D polarization*, 25<sup>th</sup> Congress of the International Commission for Optics, Dresden, Germany, September 2022.
70. *Futuro y perspectivas de la óptica y la fotónica en México*, online roundtable organized by the Mexican Academy of Optics, November 2022.

#### **Contributed conference talks and posters**

1. *Fractional Legendre transformation and a generalization of the wave-aberration function*, Optical Society of America Annual Meeting, Dallas, US, October 1994.
2. *New representations in Hamiltonian optics and their applications in asymmetric systems*, Optical Industrial Associates Meeting, Rochester, US, October 1994.
3. *The fractional Legendre transformation and its use in Hamilton's formalism* (poster), Australian Optical Society Biennial Meeting, Brisbane, Australia, July 1995.
4. *Generalization of Hamilton's formalism for Geometrical Optics*, Optical Society of America Annual Meeting, Portland, US, September 1995.
5. *New method for asymptotic calculations in wave propagation*, Optical Society of America Annual Meeting, Rochester, US, October 1996.
6. *Asymptotic propagation of wavefields*, Optical Society of America Annual Meeting, Long Beach, US, October 1997.
7. *What on earth is a ray and how can we use them best?* (given by co-author), International Optical Design Conference, Kona Hawaii, US, June 1998.
8. *Wigner functions for Helmholtz wave fields* (poster), Optical Society of America Annual Meeting, Santa Clara, US, September 1999.
9. *Asymptotics of phase-space distributions in wave physics* (poster), Optical Society of America Annual Meeting, Santa Clara, US, September 1999.
10. *Using rays better*, Optical Society of America Annual Meeting, Providence, US, October 2000.
11. *Uncertainty products for nonparaxial wavefields*, Optical Society of America Annual Meeting, Providence, US, October 2000.
12. *Wave fields and radiometry* (poster), Optical Society of America Annual Meeting, Providence, US, October 2000.
13. *Semiclassical wave propagation using stable aggregates of flexible elements* (poster), Quantum Chaos, Theory and Applications conference, Cocoyoc, Mexico, July 2001.
14. *Refraction and diffraction using stable aggregates of flexible elements*, Optical Society of America Annual Meeting, Long Beach, US, October 2001.
15. *Uncertainty relations and minimum uncertainty states for periodic distributions* (poster), Optical Society of America Annual Meeting, Long Beach, US, October 2001.
16. *Radiometría y coherencia parcial* (given by co-author), XLIV Congreso Nacional de Física, Morelia, Mexico, October 2001.
17. *The Holy Grail of ray-based optical modeling* (given by co-author), International Optical Design Conference, Tucson, US, June 2002.

18. *Métodos para el modelado de la propagación de ondas por medio de rayos* (poster), 2nd Symposium La Optica en la Industria, León, Mexico, July 2002.
19. *Métodos matemáticos para la propagación de ondas*, X Summer School in Physics, Cuernavaca, Mexico, July 2002.
20. *Wigner functions for curved spaces: on hyperboloids*, IV Workshop on Classical and Quantum Integrable Systems, Cuernavaca, Mexico, September 2002.
21. *Relaciones de incertidumbre para distribuciones periódicas* (poster), XLV Congreso Nacional de Física, León, Mexico, October 2002.
22. *Funciones de Wigner para espacios curvos: el potencial de Poeschl-Teller* (poster), XLV Congreso Nacional de Física, León, Mexico, October 2002.
23. *Propagación de ondas usando rayos* (poster), XLV Congreso Nacional de Física, León, Mexico, October 2002.
24. *Periodic minimum uncertainty states*, 8th International Conference on Squeezed States and Uncertainty Relations, Puebla, Mexico, June 2003.
25. *Generalized radiometric description of free wave fields*, International Nonimaging Optics Workshop, San Diego, US, August 2003.
26. *Exact description of electromagnetic waves in terms of rays*, 2004 URSI International Symposium on Electromagnetic Theory, Pisa, Italy, May 2004.
27. *Semiclassical solution of wave equations using stable aggregates of flexible elements*, Workshop on Quantum and Semiclassical Molecular Dynamics of Nanostructures, Center of Nonlinear Studies, Los Alamos National Laboratories, Los Alamos, US, July 2004.
28. *Ray-based diffraction using SAFE* (poster), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2004.
29. *Uncertainty relations for periodic functions and their applications in physics*, 2005 Joint Annual Conference of the National Society of Black Physicists and the National Society of Hispanic Physicists, Orlando, US, February 2005.
30. *Exact representation of electromagnetic wave fields in terms of rays*, Topical Meeting on Advanced Imaging of the European Optical Society, London, England, June 2005.
31. *Exact ray-based representation of the polarization of nonparaxial electromagnetic fields* (poster), Frontiers in Optics, the Optical Society of America's Annual Meeting, Tucson, US, October 2005.
32. *Nonparaxial fields with maximum joint spatial-directional localization*, Frontiers in Optics, the Optical Society of America's Annual Meeting, Tucson, US, October 2005.
33. *Wigner functions for nonparaxial fields: Interfaces* (poster), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2006.
34. *Coherence/polarization measurements by reversed wavefront interferometers* (poster), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2006.

35. *Propagation of partially coherent, partially polarized fields via a Wigner representation in direction and angular momentum* (poster), Ninth Rochester Conference on Coherence and Quantum Optics, Rochester, US, June 2007.
36. *Efficient evaluation of far field asymptotic series* (given by coauthor), Ninth International Conference on Transparent Optical Networks, Rome, Italy, July 2007.
37. *A ray-based framework for propagating partially coherent field information through optical systems* (given by coauthor), Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, September 2007.
38. *Fields with maximum focal irradiance* (given by student), Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, September 2007.
39. *Series of corrections to far-field estimates* (poster), Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, September 2007.
40. *A closed form for the Mie scattering of an electromagnetic generalized Gaussian beam with any angular extent* (given by student), Progress in Electromagnetic Research Symposium, Cambridge, US, June 2008.
41. *Superasymptotics of free-space far-field estimates* (poster), International Commission for Optics Triennial meeting, Sydney, Australia, June 2008.
42. *Mie scattering of nonparaxial Gaussian-like beams*, International Commission for Optics Triennial meeting, Sydney, Australia, June 2008.
43. *Wigner functions for nonparaxial fields*, International Commission for Optics Triennial meeting, Sydney, Australia, June 2008.
44. *Mie scattering of nonparaxial electromagnetic Gaussian-like beams*, Topical Meeting on Optoinformatics'08, St. Petersburg, Russia, September 2008.
45. *Closed form formula for Mie scattering of generalized Gaussian beams* (given by coauthor), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2008.
46. *Diffraction effects in Wigner functions for paraxial and nonparaxial fields* (given by student), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2008.
47. *Exact ray-based nonparaxial propagation of coherence and polarization through anisotropic media* (given by student), Frontiers in Optics, the Optical Society of America's Annual Meeting, Rochester, US, October 2008.
48. *Two methods for propagation of nonparaxial partially coherent fields with any state of coherence and polarization*, Koli Workshop on Partial Electromagnetic Coherence and 3D Polarization, Koli, Finland, May 2009.
49. *Bases for the description of focused electromagnetic fields*, Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, October 2009.
50. *Phase space distributions for dispersive media*, Frontiers in Optics, the Optical Society of America's Annual Meeting, San Jose, US, October 2009.
51. *Directional complete basis for wavefields in two dimensions* (given by student), 24<sup>th</sup> National Congress on Undergraduate Research (NCUR), Missoula, US, April 2010.

52. *Generalized Wigner functions in classical optics: achieving an exact rectilinear propagation model for optical fields*, 5<sup>th</sup> EOS Topical Meeting on Advanced Imaging Technologies (AIT 2010), Engelberg, Switzerland, June 2010.
53. *Modeling focused fields through complex-focus bases*, 5<sup>th</sup> EOS Topical Meeting on Advanced Imaging Technologies (AIT 2010), Engelberg, Switzerland, June 2010.
54. *Ambiguity function and phase space tomography for nonparaxial fields* (given by student), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
55. *Full Poincaré beams*, *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
56. *Angular momenta and spin-orbit interaction of non-paraxial light in free space* (given by coauthor), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
57. *Bases for focused waves in two dimensions* (poster), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
58. *Mie scattering of arbitrary focused fields* (given by student), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
59. *A geometric optics description of Airy beams* (given by coauthor), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
60. *Diffraction Free Stokes Distributions in a Full Poincaré Beam* (given by coauthor), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2010.
61. *Ambiguity function and phase space tomography for nonparaxial partially coherent optical fields* (given by student), *Signal Recovery and Synthesis*, Toronto, Canada, July 2011
62. *Mie scattering for high numerical aperture fields* (given by student), *International Commission for Optics Triennial meeting*, Puebla, Mexico, August 2011.
63. *Generalized phase space representations in classical optics*, *International Commission for Optics Triennial meeting*, Puebla, Mexico, August 2011.
64. *Angular momenta and spin-orbit interaction for nonparaxial beams* (poster), *International Commission for Optics Triennial meeting*, Puebla, Mexico, August 2011.
65. *Coherence retrieval by measuring the diffracted field from a binary planar phase mask* (given by student), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, San Jose, US, October 2011.
66. *Measurement of spatial coherence through diffraction from a transparent mask with a phase discontinuity: experimental results* (given by student), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2012.
67. *Changes in the degree of polarization through a paraxial focus* (given by student), *Frontiers in Optics*, the Optical Society of America's Annual Meeting, Rochester, US, October 2012.

68. *Coherence measurements from two-dimensional binary phase masks: Theory and experimental results* (poster), The Tenth Rochester Conference on Coherence and Quantum Optics (CQO-X), Rochester, US, June 2013.
69. *3D accelerating electromagnetic waves* (given by coauthor), CLEO-QELS 2013, San Jose, US, June 2013.
70. *Three-dimensional nonparaxial accelerated waves and pulses that follow circular paths*, Progress in Electromagnetics Research Symposium (PIERS 2013), Stockholm, Sweden, August 2013.
71. *Spin-orbit interaction and uncertainty-type inequalities for strongly focused fields*, Progress in Electromagnetics Research Symposium (PIERS 2013), Stockholm, Sweden, August 2013.
72. *Ray transfer matrix for a spiral phase plate* (given by coauthor), Frontiers in Optics, Orlando FL, October 2013.
73. *Imaging the polarization state of a light field*, 1<sup>st</sup> Joensuu Conference on Coherence and Random Polarization, Joensuu, Finland, June 2014.
74. *Ray-based propagation of partially coherent electromagnetic field past interfaces* (given by coauthor), 1<sup>st</sup> Joensuu Conference on Coherence and Random Polarization, Joensuu, Finland, June 2014.
75. *Measuring spatial coherence through the shadow of small obstacles*, 1<sup>st</sup> Joensuu Conference on Coherence and Random Polarization, Joensuu, Finland, June 2014.
76. *Measurement of spatial coherence through the shadows of small obscurations* (given by student), SPIE 59th Annual Meeting, San Diego, US, August 2014.
77. *Measuring spatial coherence through the shadow of small obstacles* (poster), 23<sup>rd</sup> Congress of the International Commission for Optics, Santiago de Compostela, Spain, August 2014.
78. *Imaging the polarization state of a light field* (poster), 23<sup>rd</sup> Congress of the International Commission for Optics, Santiago de Compostela, Spain, August 2014.
79. *Measuring spatial coherence through the shadow of small obstacles* (given by student), Frontiers in Optics, Tucson, US, October 2014.
80. *Measuring Spatial Coherence Without Lenses: a Phase-Space Approach* (given by student), Computational Optical Sensing and Imaging (COSI), Arlington, US, June 2015.
81. *Off-null measurements applied to process monitoring using focused beam scatterometry* (given by student), Applied Advanced Optical Metrology Solutions, SPIE Optics + Photonics, San Diego, US, August 2015.
82. *Star-test polarimetry at low-light levels* (given by coauthor), Laser Science, San José, US, October 2015.
83. *Entanglement constraints in multi-qubit systems* (given by coauthor), Frontiers in Optics, San José, US, October 2015.
84. *Simultaneous Determination of 3D Orientation and 3D Localization in Single Emitter Microscopy Imaging*, Frontiers in Optics, Rochester, US, October 2016.

85. *Center-Of-Mass Interpretation for Bi-Partite Purity Analysis of N-Party Entanglement*, Frontiers in Optics, Rochester, US, October 2016.
86. *Is the Maxwell-Shafer fish eye lens able to form super-resolved images?*, Frontiers in Optics, Rochester, US, October 2016.
87. *Single-Shot Polarimetry Imaging of Multicore Fibers*, Frontiers in Optics, Rochester, US, October 2016.
88. *Polarization-sensitive Off-null Measurements Applied to Process Monitoring Using Focused Beam Scatterometry* (given by student), Frontiers in Optics, Rochester, US, October 2016.
89. *Entanglement Constraints with Quantum Background Parties* (poster presented by co-author), Frontiers in Optics, Rochester, US, October 2016.
90. *Lensless Measurements of Optical Field Correlations* (poster presented by student), Frontiers in Optics, Rochester, US, October 2016.
91. *MTF as the Fourier transform of a pupil difference probability density* (talk presented by student), Imaging and Applied Optics (MATH), San Francisco CA, US, June 2017.
92. *MTF as the Fourier transform of a pupil difference probability density* (talk presented by student), Optical Design and Fabrication (Freeform), Denver CO, US, July 2017.
93. *Optimal Birefringent Masks for Producing Bottle Fields*, 4<sup>th</sup> International Conference on Optical Angular Momentum (ICOAM), Anacapri, September 2017.
94. *Caustics in Nondiffracting Bessel Lattice Beams and Beyond* (poster presented by co-author), 4<sup>th</sup> International Conference on Optical Angular Momentum (ICOAM), Anacapri, September 2017.
95. *Confined Bases, from Paraxial to Electromagnetic* (poster presented by student), 4<sup>th</sup> International Conference on Optical Angular Momentum (ICOAM), Anacapri, September 2017.
96. *Optimal Birefringent Masks for Producing Bottle Fields* (poster presented by student), Frontiers in Optics, Washington D.C., September 2017.
97. *Confined Bases, from Paraxial to Electromagnetic* (poster presented by student), Frontiers in Optics, Washington D.C., September 2017.
98. *Using the Pupil Difference Probability Density to Understand OTF* (talk given by student) Computational Optics 2018, SPIE Optical Systems Design, Frankfurt, May 2018.
99. *Tailored shearing interferometers based on spin-orbit coupling* (poster given by student), 2<sup>nd</sup> Joensuu Conference on Coherence and Random Polarization, Joensuu, June 2018.
100. *Lorenz-Mie scattering in terms of complex focus fields* (poster given by student), 2<sup>nd</sup> Joensuu Conference on Coherence and Random Polarization, Joensuu, June 2018.
101. *Using the Pupil-Difference Probability Density to understand OTF* (talk given by student), OSA Imaging and Applied Optics Congress, Orlando, June 2018.

102. *Focused beam scatterometry experiment for simultaneous measurement of multiple parameters of a subwavelength structure*, Optique Toulouse 2018, Toulouse, July 2018.
103. *Théorie de Lorenz-Mie en terms de champs au point focale complexe* (poster given by student), Optique Toulouse 2018, Toulouse, July 2018.
104. *Measuring geometric phase without interferometry* (talk presented by student), Frontiers in Optics, Washington D.C., September 2018.
105. *Lorenz-Mie scattering in terms of complex focus fields* (poster presented by student), Frontiers in Optics, Washington D.C., September 2018.
106. *Sub-Rayleigh limit localization with a spatial mode analyzer* (poster presented by collaborator), Frontiers in Optics, Washington D.C., September 2018.
107. *Simultaneous detection of 3D orientation and 3D spatial localization of single emitters for super resolution structural imaging*, QBI 2019 Conference, Rennes, France, Jan. 2019.
108. *Non-interferometric calibration of the phase transmission matrix in lensless endoscopy* (talk presented by co-author), Photonics West, San Francisco, Feb. 2019.
109. *Simultaneous detection of 3D orientation and 3D spatial localization of single emitters for nanoscale structural imaging* (talk presented by co-author), Photonics West, San Francisco, Feb. 2019.
110. *Telescope windows examined by Wigner function* (talk presented by coauthor), Imaging and Applied Optics Congress, Munich, June 2019.
111. *Simultaneous Detection of 3D Orientation and 3D Spatial Localization of Single Fluorescent Emitters* (talk presented by coauthor), Progress in Electromagnetic Research Symposium (PIERS), Rome, June 2019.
112. *The Validity of the Perturbation Model for the Propagation of MSF Structures*, OSA Optical Design and Fabrication Congress, Washington DC, US, Juin 2019.
113. *Tailored Shearing Interferometry Using Geometric Phase*, OSA Optical Design and Fabrication Congress, Washington DC, US, Juin 2019.
114. *Conformal Mappings for Reflector Construction and Assessment*, OSA Optical Design and Fabrication Congress, Washington DC, US, Juin 2019.
115. *Majorana Representation of Structured-Gaussian Beams* (poster), International Conference on Optical Angular Momentum (ICOAM), Ottawa, Canada, Juin 2019.
116. *Shearing Interferometry Using Spin-Orbit Coupling Devices* (poster), International Conference on Optical Angular Momentum (ICOAM), Ottawa, Canada, Juin 2019.
117. *Maximum differential group delay achievable by a space-time wave-packet in free space* (talk presented by coauthor), Frontiers in Optics, Washington DC, Sept. 2019.
118. *Superresolution using parity sorting with partially coherent light* (talk presented by coauthor), Frontiers in Optics, Washington DC, Sept. 2019.

119. *Analytic model for micromanipulation in terms of complex-focus fields* (poster), Conference on Nanophotonics: Foundations and Applications, Monte Verità, Suisse, Sept 2019.
120. *Tailored Shearing Interferometry Using Geometric Phase* (poster), 11emes Journées Scientifiques de Porquerolles, Porquerolles, France, Sept 2019.
121. *Coordinate and Height superresolution Imaging with Dithering and Orientation (CHIDO) for Single Molecules*, 11emes Journées Scientifiques de Porquerolles, Porquerolles, France, Sept 2019.
122. *Birefringent Fourier filtering for single molecule coordinate and height superresolution imaging with dithering and orientation (CHIDO)*, 4<sup>th</sup> Centuri Scientific day – Imaging, Turing Centre for Living Systems, Marseille, France, Nov 2019.
123. *Tailored shearing interferometry using geometric phase objects* (talk presented by student), 4<sup>th</sup> Centuri Scientific day – Imaging, Turing Centre for Living Systems, Marseille, France, Nov 2019.
124. *Customizing caustics in propagation-invariant beams* (talk presented by co-author), Advanced Photonics Congress 2020, virtual meeting, July 2020.
125. *Reflector Design and Study via Conformal Mappings* (talk presented by student), Nonimaging Optics: Efficient Design for Illumination and Solar Concentration XVII, SPIE Optics + Photonics, virtual meeting, August 2020.
126. *Coordinate and Height superresolution Imaging with Dithering and Orientation (CHIDO) for Single Molecules* (virtual poster presented by student), Biophotonics and Imaging Graduate Summer School, Galway, Ireland, August 2020.
127. *Single Molecule Coordinate and Height superresolution Imaging with Dithering and Orientation (CHIDO)*, (talk presented by student), Frontiers in Optics, virtual meeting, September 2020.
128. *Quantum Bounds on Localization for Partially Coherent Emitters* (virtual poster presented by student), Frontiers in Optics, virtual meeting, September 2020.
129. *Majorana Representations and Hidden Symmetries of Structured Gaussian Beams*, (talk presented by student), Frontiers in Optics, virtual meeting, September 2020.
130. *Ince-Gauss Modes of Aberrated Cavities as Emulators of Many-Body Topological Transitions* (talk presented by postdoc), Frontiers in Optics, virtual meeting, September 2020.
131. *Simultaneous estimation of 3D localization, 3D orientation and wobble for single emitters microscopy* (talk presented by student), OPTIQUE Dijon 2021, Dijon, France, July 2021.
132. *Superresolution Imaging with simultaneous 3D spatial localization and 3D orientation behavior characterization for single emitters* (talk presented by student), OSA Imaging and Applied Optics Congress, virtual meeting, July 2021.
133. *Measuring the phase and polarization of structured vector beams with quadriwave lateral shearing interferometry* (poster presented by student),

International Conference on Optical Angular Momentum (ICOAM), Tampere, Finland, June 2022.

134. *Role of supercritical angle fluorescence in CHIDO microscopy* (poster presented by student), International Conference on Optical Angular Momentum (ICOAM), Tampere, Finland, June 2022.
135. *Nonparaxial optical fields containing all possible polarization ellipses in a 4D physical space-time* (poster presented by postdoc), International Conference on Optical Angular Momentum (ICOAM), Tampere, Finland, June 2022.
136. *Demonstration of propagation-invariant 3D space-time wave packets* (talk presented by coauthor), European Optical Society Annual Meeting, Porto, Portugal, September 2022.
137. *Conformal mapping for reflector design and assessment*, 25<sup>th</sup> Congress of the International Commission for Optics, Dresden, Germany, September 2022.
138. *Coordinate and Height super-resolution Imaging with Dithering and Orientation (CHIDO) for single molecules*, 25<sup>th</sup> Congress of the International Commission for Optics, Dresden, Germany, September 2022.
139. *Can a bead emulate a single fluorescent molecule?*, (poster presented by PhD student) Frontiers in Optics, Rochester NY, USA, October 2022.

#### **TEACHING: Curriculum courses**

- Ecole Centrale Marseille, France  
2021: *Tutorials: Polarization* (Europhotonics Master Program, in English, ~7 students/class).  
2018, 2019, 2020, 2021: *Optique* (as part of “approfondissement” course on Mechanics and Physics, in French, ~130 students/class).  
2020, 2021, 2022: *Waves* (undergraduate mandatory course, in French, 2 times/year, ~150 students/class).  
2020: *Tutorials: The connection between the ray and wave models of light* (Europhotonics Master Program, in English, ~7 students/class).  
2019, 2020, 2021: *Advanced Electromagnetic theory* (Europhotonics Master Program, co-taught, in English, ~7 students/class).
- The Institute of Optics and Physics Department, University of Rochester, US  
2022: *Polarization* (co-taught online with Prof. T.G. Brown, graduate course, 10 students).  
2017: *Theory of optical coherence* (advanced graduate course, ~40 students/class).  
2003-2016: *Mathematical methods of optics and physics* (graduate course, ~45 students/class).  
2005-2017: *Mathematical methods in optics and physics* (undergraduate course, ~50 students per class).  
2004, 2006: *Wave propagation* (graduate reading course).  
2008, 2014: *Introduction to coherence and polarization* (graduate reading course).

- Universidad Autónoma del Estado de Morelos, Cuernavaca, Mexico  
2001-2002: *Optica* (undergraduate course, 3 times, ~4 students/class).

**TEACHING: Short courses at international workshops and educational events**

- Preparatory School to the Winter College in Optics, Abdus Salam International Centre for Theoretical Physics, Trieste, Italy  
2020: *Fourier Theory; Coherence and Statistical Optics; The Angular momentum of light; Linear and nonlinear responses of matter to light; Mathematica Simulation Workshop* (3 sessions).  
2019: *Fourier Theory; Imaging; Optical Coherence; OCT; Mathematica Simulation Workshop* (3 sessions).  
2018: *Fourier Theory I and II; Wave Propagation in Optical Media; Introduction to Nonlinear Optics I and II; Mathematica Simulation Workshop* (3 sessions).  
2017: *Fourier Theory; Physical Optics: Interference and Diffraction; Physical Optics: Fourier Optics and Resolution; Ray and Wave Theory of Image Formation: Aberrations; Coherence Theory; Mathematica Simulation Workshop* (3 sessions).  
2016: *Introduction to Fourier Theory; Signal Analysis: Wiener-Khintchine, noise, SNR, averaging; Pulse propagation in materials and waveguides; Introduction to Nonlinear Optics; Mathematica Simulation Workshop*.  
2015: *Fourier analysis; Waves; Polarization; Geometrical optics; Mathematica Simulation Workshop*.  
2014: *Fourier analysis; Introduction to waveguides and fibres; Fundamentals of signal theory; Introduction to nonlinear optics; Mathematica Simulation Workshop*.  
2013: *Brief review of Fourier transforms; Paraxial and far-field approximations; Resonators and Gaussian optics; Propagation in dielectrics, absorption, dispersion and causality; Nonlinear optics*.  
2011: *Fourier transforms, main theorems, examples and exercises; Optical interference, scalar diffraction and polarization; Tutorial on computational modeling of wave propagation*.  
2010: *Radiometry and Photometry; Geometric optics and aberrations; Image formation; Basic elements of group theory; Relation between Maxwell's equations, coherence and radiometry*.  
2009: *Basics of statistics and coherence theory; Fourier transforms; Main functions in diffraction theory*.  
2008: *Diffraction, coherence, and ray optics I and II; Introduction to optical imaging modalities*.  
2007: *Propagation velocities in dispersive media; Second order differential operators and their eigenfunctions; Introductory fibre optics*.  
2006: *Asymptotic Methods in Optics*.
- Europhotonics Masters Program  
2018 (Marseille, France): *The Mathematics and Geometry of Wave Propagation*.

- 2018 (Barcelona, Spain): *The Mathematics and Geometry of Wave Propagation.*
- International Workshop on Optics and Photonics I (Morocco) and II (Pakistan)  
2017 (Islamabad, Pakistan): *Introduction to Geometrical Optics.*  
2010 (Marrakesh, Morocco): *Coherence Theory; Theory of Image Formation.*
- Latin American Optics and Photonics (LAOP) Workshop  
2017 (Guadalajara, Mexico): *Separability in linear algebra; Coherence, Polarization and Entanglement; Two Sides of the Poincaré Sphere.*  
2014 (Cancún, Mexico): *Uncertainty relations in optics; Wigner functions; Focused beams and polarization.*
- Escuela de Óptica Moderna, Instituto Nacional de Astronomía, Óptica y Electrónica, Tonantzintla, Mexico  
2015: *Propagando ondas usando rayos; Coherencia espacial y espacio fase; Haces autosimilares: un estudio con rayos.*  
2013: *Relaciones de incertidumbre en óptica; Conexión entre rayos y ondas I: Métodos lineales; Conexión entre rayos y ondas II: Funciones de Wigner; Haces con polarizaciones inhomogeneas.*
- OSA Traveling Lecturer, Universidad de Guadalajara, Mexico  
2016: *Conexión entre rayos y ondas.*
- Workshop de Optica, Universidad Nacional de Colombia, Bogotá, Colombia  
2016: *Conexión entre rayos y ondas; Funciones de Wigner; Coherencia parcial.*
- Escuela de Optica y Fotónica SPIE-UNAM, Mexico City, Mexico  
2015: *Propagación de campos de onda usando rayos.*
- Contemporary Physical Optics, Dept. of Applied Physics, Aalto University, Finland  
2010: *Wave optics and coherence; Asymptotic methods; Propagation velocities in dispersive media.*
- Summer School in Physics, Cuernavaca, Mexico  
2001: *Relaciones de incertidumbre y estados de mínima incertidumbre.*
- Telecomunicaciones vía Fibras Ópticas, Teoría y Aplicaciones (continuing education course), UNAM, Mexico City, Mexico  
1992: *Amplificadores ópticos.*  
1991: *Acopladores ópticos.*

### **ADVISING/THESIS COMMITTEES**

Advisor of 8 graduated and 3 current Ph.D. students, 3 postdocs, 2 graduated Thesis M.S. students, 3 graduated Thesis B.Sc. students, 3 visiting Ph.D. students, 5 research internship M.S. students, and 6 research internship undergraduate students. Thesis committee member for 95 Ph.D. students, 10 M.S. students, and one French “HDR”.

## **PERSONAL INFORMATION**

Place and date of birth: Mexico City, 29 September 1966.

Nationality: Mexican, Spanish.

Marital status: Married to Kristel Thornell.

## **LANGUAGES**

Spanish (native), English, Italian, French.

Last update: Dec 10, 2022