Alexander Cerjan, PhD

CINT Scientist, Sandia National Laboratories

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EDUCATION

PhD, **Physics**, Yale University, New Haven, CT 2015

BS, **Physics**, **Philosophy**, Brown University, Providence, RI 2009

RESEARCH FUNDING (total funding: $14.5M, total funding as PI: $6.7M)

Laboratory Directed Research and Development (LDRD), Sandia National Labs

PI, "Structured light from superstructured photonics," $1,332k 2025-2027

PI, "Mesoscopic modelling of nonlinear materials in structured optical systems," $610k 2025-2026

PI, "From geometry to interface states without a band structure: Developing a real-space approach to material topology," $1,802k 2024-2026

Senior Investigator, "Elucidating a novel mechanism of lasing in indirect bandgap transition metal dichalcogenide (TMD) slab and its survivability against aging under lasing condition," $1,395k 2024-2026

PI, "Identifying and classifying localized states in gapless systems using pseudospectral methods," $1,493k 2023-2025

- Includes START HBCU University Partnership award, $258k

Senior Investigator, "Integrated on-chip quantum non-demolition measurement device for uncooled photon-number resolving detection and quantum interconnect applications," $1,892k 2022-2024

PI, "Novel transport states in phonon-polariton systems," $284k 2022

PI, "Enhancing photonic systems using topology and non-Hermiticity," $1,185k 2021-2023

Department of Energy, Office of Science, Basic Energy Sciences (DOE BES)

Co-PI, "Light-matter interaction phenomena using subwavelength engineering of material properties," $4,500k 2024-2026

PROFESSIONAL EXPERIENCE

Principal Member of the Technical Staff 2024-Present
Sandia National Laboratories, Albuquerque, NM
Scientist at the Center for Integrated Nanotechnologies (CINT)

Senior Member of the Technical Staff 2021-2024
Sandia National Laboratories, Albuquerque, NM
Scientist at the Center for Integrated Nanotechnologies (CINT)

Research Professor (via Letter of Academic Title) 2021-Present
University of New Mexico, Albuquerque, NM

Department of Mathematics and Statistics

Postdoctoral Scholar 2017-2021
Pennsylvania State University, University Park, PA
Advisor: Mikael C. Rechtsman

Postdoctoral Scholar 2015-2017
Stanford University, Stanford, CA
Advisor: Shanhui Fan

HONORS & AWARDS

APS Outstanding Referee	2023
Light: Science & Applications Outstanding Reviewer	2021
Best Talk Award, U.S./Middle East Conference on Photonics, New York City	2019
Prize Teaching Fellowship Award, Yale University	2014
Prize Teaching Fellowship Award, Yale University	2012
Karen T. Romer Undergraduate Teaching and Research Award, Brown Univ.	2008
Eagle Scout Award	2004

TEACHING & MENTORING

Postdoctoral Advisees

- Dr. Hyosim Yang, Sandia National Labs, 2025-present
- Dr. Ki Young Lee, Sandia National Labs, 2024-present
- Dr. Stephan Manua Wong, Sandia National Labs, 2022-present
- Dr. Kahlil Yusef Dixon-Whyte, Sandia National Labs, 2021-2023

Graduate Students Mentored

- José Garcia, University of New Mexico, 2022-present
- Chris Bairnsfather, Purdue University, 2024-present
- Xingwei Gao, University of Southern California, 2024-present
- Hao He, University of Southern California, 2024-present

Undergraduates Mentored

- Louis Shogo Hight, University of New Mexico, 2023-present
- Ajani Roberts, Florida A&M University, 2023-present
- Dominic Cordova, University of New Mexico, 2023
- Kanchita Klangboonkrong, Pennsylvania State University, 2019
- Lauren Bittner, Pennsylvania State University, 2018
- Jingjing Pan, Pennsylvania State University, 2017-2018
- Jason Frost, Stanford University, 2016
- Kevin Lai, Yale University, 2012-2013

Teaching

"Band theory and Nanophotonics for Mathematicians" 2022
(500-level, Mathematics and Statistics), University of New Mexico

Teaching Assistant

“Ordinary and Partial Differential Equations with Applications” 2015
(100-level, Applied Physics), Yale University

“Thermodynamics and Statistical Mechanics” 2011-2014
(400-level, Physics), Yale University

“Electromagnetic Fields and Optics” 2014
(400-level, Physics), Yale University

“Solid State Physics II” 2013
(500-level, Physics), Yale University

“General Physics Laboratory” 2009,2010,2012
(100-level, Physics), Yale University

“Electromagnetic Theory I” 2011
(500-level, Physics), Yale University

“Classical Mechanics (Intensive)” 2010
(400-level, Physics), Yale University

PROFESSIONAL ACTIVITIES & AFFILIATIONS

Society Affiliations

Member, American Physical Society 2011-Present
Member, Optica (formerly the Optical Society of America) 2015-Present
Member, Materials Research Society 2022-Present
Member, SPIE 2023-Present
Member, IEEE 2023-Present
Member, American Mathematical Society 2024-Present

Editorial Service

Editorial Board Member, *Physical Review A* 2023-2025

Conference Organization

Subcommittee Member, FS 5: Nonlinear Optics and Novel Phenomena, CLEO 2023-2025

Subcommittee Member, 4: Nonlinear Optics, Optica Latin America Optics and Photonics (LAOP) 2024

Organizer, “Nanophotonics Enabled Advances in Energy and Environmental Sustainability Applications,” CINT Annual User Meeting 2022

Journals Reviewed

APS Journals: *Physical Review Letters*, *Physical Review X*, *Physical Review A*, *Physical Review B*, *Physical Review Research*, *Physical Review Applied*, *Physical Review Materials*

Nature Journals: *Nature*, *Nature Physics*, *Nature Photonics*, *Nature Materials*, *Nature Nanotechnology*, *Nature Communications*, *Communications Physics*, *Scientific Reports*

AAAS Journals: *Science*, *Science Advances*

OSA Journals: *Optica*, *Optics Letters*, *Optics Express*, *Applied Optics*

CIOMP Journals: *Light: Science & Applications*, *eLight*

AIP Journals: *Applied Physics Letters*

Wiley Journals: *Laser & Photonics Reviews*, *Advanced Optical Materials*

Granting Organizations Reviewed

Laboratory Directed Research and Development (LDRD), Sandia National Laboratories, USA
European Research Council (ERC), European Union
Deutsche Forschungsgemeinschaft (DFG), Germany
National Research and Development Agency (ANID), Chile

COLLABORATORS

- Terry A. Loring, Univ. New Mexico
- Wladimir A. Benalcazar, Emory Univ.
- Camelia Prodan, Fordham Univ.
- Vasile Lauric, Florida A&M Univ.
- Wei Pan, Sandia National Labs
- Ralph Kaufmann, Purdue Univ.
- Justin Cole, UC Colorado Springs
- Igal Brener, Sandia National Labs
- Hermann Schulz-Baldes, FAU Erlangen
- Mikael C. Rechtsman, Penn State Univ.
- Shoufeng Lan, Texas A&M Univ.
- Sven Höfling, JMU Würzburg
- Chloe Doiron, Sandia National Labs

TECHNICAL EXPERTISE

MEEP Contributor

Led the effort to complete and validate the saturable multi-level atomic susceptibility feature and validated the gyrotropic media feature in the open-source photonics simulation software package MEEP. (A detailed technical note for the first feature is available in arXiv:2007.09329)

Computer Languages

- Python
- Matlab
- C++
- Perl
- Scheme
- Mathematica
- Bash

PUBLICATIONS (total publications: 56, h-index: 25, total citations ~3100, Google Scholar Link, ORCID 0000-0002-4362-7300)

Peer-Reviewed Journal Articles

(Articles marked with a † follow the mathematics convention of listing authors alphabetically.)

[56] S. Wong, A. Cerjan, K. G. Makris, M. Khajavikhan, D. Christodoulides, and S. S. Oh, "Nonlinear topological photonics: capturing nonlinear dynamics and optical thermodynamics." (in press at *ACS Photonics*)

[55] C. D. Spataru, W. Pan, and A. Cerjan, "Topological Phenomena in Artificial Quantum Materials Revealed by Local Chern Markers." *Physical Review Letters* **134**, 126601 (2025).
APS Editors' Suggestion

[54] A. R. Kim, C. F. Doiron, F. J. Vega, J. Yu, A. M. Boehm, J. P. Klesko, I. Brener, R. Sarma, A. Cerjan, and T. Ohta, "Imaging Photonic Resonances within an All-Dielectric

Metasurface via Photoelectron Emission Microscopy." (in press at *Advanced Photonics Research*)

[53] S. Malek, C. Doiron, I. Brener, and A. Cerjan, "Advanced Symmetry Design for Robust Multi-Resonant Nonlocal Metasurfaces," *Nanophotonics* **14**, 449 (2025).
- ❖ Featured on the Journal's Cover

[52]† A. Cerjan, V. Lauric, and T. A. Loring, "Multivariable pseudospectrum in C* algebras," *Journal of Mathematical Analysis and Applications* **547**, 129241 (2025).

[51] A. Cerjan and T. A. Loring, "Classifying photonic topology using the spectral localizer and numerical *K*-theory," *APL Photonics* **9**, 111102 (2024).
- Selected as a Featured Article

[50] C. Doiron, I. Brener, and A. Cerjan, "Dual-Band Polarization Control with Pairwise Positioning of Polarization Singularities in Metasurfaces," *Physical Review Letters* **133**, 213802 (2024).

[49] X. Gao, H. He, S. Sobolewski, A. Cerjan, and C. W. Hsu, "Dynamic gain and frequency comb formation in exceptional-point lasers," *Nature Communications* **15**, 8618 (2024).

[48] S. Wong, T. A. Loring, and A. Cerjan, "Classifying topology in photonic crystal slabs with radiative environments," *npj Nanophotonics* **1**, 19 (2024).

[47] A. Cerjan, T. A. Loring, and H. Schulz-Baldes, "Local Markers for Crystalline Topology," *Physical Review Letters* **132**, 073803 (2024).

[46] A. Farhi, A. Cerjan, and A. D. Stone, "Generating and processing optical waveforms using spectral singularities," *Physical Review A* **109**, 013512 (2024).

[45]† A. Cerjan and T. A. Loring, "Even spheres as joint spectra of matrix models," *Journal of Mathematical Analysis and Applications* **531**, 127892 (2024).

[44] K. Y. Dixon, T. A. Loring, and A. Cerjan, "Classifying Topology in Photonic Heterostructures with Gapless Environments," *Physical Review Letters* **131**, 213801 (2023).

[43] S. Wong, T. A. Loring, and A. Cerjan, "Probing topology in nonlinear topological materials using numerical K-theory," *Physical Review B* **108**, 195142 (2023).

[42]† A. Cerjan, L. Koekenbier, and H. Schulz-Baldes, "Spectral localizer for line-gapped non-Hermitian systems," *Journal of Mathematical Physics* **64**, 082102 (2023).

[41] W. Cheng*, A. Cerjan*, S.-Y. Chen, E. Prodan, T. A. Loring, and C. Prodan, "Revealing topology in metals using experimental protocols inspired by K-theory," *Nature Communications* **14**, 3071 (2023).
- ❖ Highlighted through a News & Views in Nature Physics

[40]† A. Cerjan, T. A. Loring, and F. Vides, "Quadratic pseudospectrum for identifying localized states," *Journal of Mathematical Physics* **64**, 023501 (2023).

[39] C. F. Doiron, I. Brener, and A. Cerjan, "Realizing symmetry-guaranteed pairs of bound states in the continuum in metasurfaces," *Nature Communications* **13**, 7534 (2022).

[38] A. Cerjan and T. A. Loring, "An operator-based approach to topological photonics," *Nanophotonics* **11**, 4765 (2022).

[37] A. Cerjan and T. A. Loring, "Local invariants identify topology in metals and gapless systems," *Physical Review B* **106**, 064109 (2022).

[36] J. Murray, A. Cerjan, and B. Redding, "Massively distributed fiber strain sensing using Brillouin lasing," *Optics Express* **30**, 25765 (2022).

[35] W. A. Benalcazar and A. Cerjan, "Chiral-Symmetric Higher-Order Topological Phases of Matter," *Physical Review Letters* **128**, 127601 (2022).

[34] J. Murray, A. Cerjan, and B. Redding, "Distributed Brillouin fiber laser sensor," *Optica* **9**, 80 (2022).
- ❖ Featured in Optics and Photonics News Year in Review

[33] C. Jörg*, S. Vaidya*, J. Noh, A. Cerjan, S. Augustine, G. von Freymann, and M. C. Rechtsman, "Observation of Quadratic (Charge-2) Weyl Point Splitting in Near-Infrared Photonic Crystals," *Laser & Photonics Reviews* **16**, 2100452 (2022).
- ❖ Featured on the Journal's Cover

[32] A. Cerjan*, C. Jörg*, S. Vaidya, S. Augustine, W. A. Benalcazar, C. W. Hsu, G. von Freymann, and M. C. Rechtsman, "Observation of bound states in the continuum embedded in symmetry bandgaps," *Science Advances* **7**, eabk1117 (2021).

[31] S. Vaidya, W. A. Benalcazar, A. Cerjan, and M. C. Rechtsman, "Point-defect-localized bound states in the continuum in photonic crystals and structured fibers," *Physical Review Letters* **127**, 023605 (2021).

[30] S. Vaidya, J. Noh, A. Cerjan, C. Jörg, G. von Freymann, and M. C. Rechtsman, "Observation of a charge-2 photonic Weyl point in the infrared," *Physical Review Letters* **125**, 253902 (2020).
- APS Editors' Suggestion

[29] A. Cerjan, M. Jürgensen, W. A. Benalcazar, S. Mukherjee, and M. C. Rechtsman, "Observation of a higher-order topological bound state in the continuum," *Physical Review Letters* **125**, 213901 (2020).
- APS Editors' Suggestion

[28] A. Cerjan, M. Wang, S. Huang, K. P. Chen, and M. C. Rechtsman, "Thouless pumping in disordered photonic systems," *Light: Science & Applications* **9**, 178 (2020).

[27] M. Benzaouia, A. Cerjan, and S. G. Johnson, "Is single-mode lasing possible in an infinite periodic system?" *Applied Physics Letters* **117**, 051102 (2020).
- ❖ Editor's Pick

[26] W. A. Benalcazar and A. Cerjan, "Bound states in the continuum of higher-order topological insulators," *Physical Review B* **101**, 161116(R) (2020).

[25] A. Cerjan, S. Bittner, M. Constantin, M. Guy, Y. Zeng, Q. J. Wang, H. Cao, and A. D. Stone, "Multimode lasing in wave-chaotic semiconductor microlasers," *Physical Review A* **100**, 063814 (2019).

[24] A. Cerjan, C. W. Hsu, and M. C. Rechtsman, "Bound states in the continuum through environmental design," *Physical Review Letters* **123**, 023902 (2019).

[23] A. Cerjan, S. Huang, M. Wang, K. P. Chen, Y. D. Chong, and M. C. Rechtsman, "Experimental realization of a Weyl exceptional ring," *Nature Photonics* **13**, 623 (2019).
🏆 "Highly Cited Paper," in the top 1% of all papers in physics (Web of Science)

[22] A. Pick, A. Cerjan, and S. G. Johnson, "Ab initio theory of quantum fluctuations and relaxation oscillations in multimode lasers," *Journal of the Optical Society of America B* **36**, C22 (2019).

[21] A. Cerjan, M. Xiao, L. Yuan, and S. Fan, "Effects of non-Hermitian perturbations on Weyl Hamiltonians with arbitrary topological charges," *Physical Review B* **97**, 075128 (2018).

[20] A. Cerjan and S. Fan, "Complete photonic bandgaps in supercell photonic crystals," *Physical Review A* **96**, 051802(R) (2017).

[19] A. Cerjan and S. Fan, "Achieving arbitrary control over pairs of polarization states using complex birefringent metamaterials," *Physical Review Letters* **118**, 253902 (2017).

[18] Y. Shi, A. Cerjan, S. Fan, "Acousto-optic finite-difference frequency-domain algorithm for first-principles simulations of on-chip acousto-optic devices," *APL Photonics* **2**, 020801 (2017).

[17] A. Cerjan and S. Fan, "Effects of non-uniform distributions of gain and loss in photonic crystals," *New Journal of Physics* **18**, 125007 (2016).

[16] A. Cerjan, B. Redding, L. Ge, S. F. Liew, H. Cao, A. D. Stone, "Controlling mode competition by tailoring the spatial pump distribution in a laser: a resonance-based approach," *Optics Express* **24**, 26006 (2016).

[15] A. Cerjan and S. Fan, "Eigenvalue dynamics in the presence of non-uniform gain and loss," *Physical Review A* **94**, 033857 (2016).

[14] Y. Shen, G. Fang, A. Cerjan, Z. Chi, S. Fan, and C. Jin, "Slanted gold mushroom array: a switchable bi/tridirectional surface plasmon polariton splitter," *Nanoscale* **8**, 15505 (2016).

[13] A. Cerjan, A. Raman, and S. Fan, "Exceptional contours and band structure design in parity-time symmetric photonic crystals," *Physical Review Letters* **116**, 203902 (2016).

[12] L. Ge, D. Liu, A. Cerjan, S. Rotter, H. Cao, S. G. Johnson, H. E. Türeci, and A. D. Stone, "Interaction-induced mode switching in steady-state microlasers," *Optics Express* **24**, 41 (2016).

[11] A. Cerjan and A. D. Stone, "Why the laser linewidth is so narrow: A modern perspective," *Physica Scripta* **91**, 013003 (2016).

[10] A. Cerjan, A. Pick, Y. D. Chong, S. G. Johnson, and A. D. Stone, "Quantitative test of general theories of the intrinsic laser linewidth," *Optics Express* **23**, 28316 (2015).

[9] A. Pick, A. Cerjan, D. Liu, A. W. Rodriguez, A. D. Stone, Y. D. Chong, and S. G. Johnson, "Ab-initio multimode linewidth theory for arbitrary inhomogeneous laser cavities," *Physical Review A* **91**, 063806 (2015).

❦ APS Editors' Suggestion

[8] A. Cerjan, Y. D. Chong, and A. D. Stone, "Steady-state *ab initio* laser theory for complex gain media," *Optics Express* **23**, 6455 (2015).

[7] B. Redding, A. Cerjan, X. Huang, M. L. Lee, A. D. Stone, M. A. Choma, and H. Cao, "Low-spatial coherence electrically-pumped semiconductor laser for speckle-free full-field imaging," *Proceedings of the National Academy of Sciences USA* **112**, 1304 (2015).
- ❖ Featured in Optics and Photonics News
- ❖ Selected for a Microscopy Today Innovation Award

[6] S. Esterhazy, D. Liu, M. Liertzer, A. Cerjan, L. Ge, K. G. Makris, A. D. Stone, J. M. Melenk, S. G. Johnson, and S. Rotter, "Scalable numerical approach for the steady state *ab initio* laser theory," *Physical Review A* **90**, 023816 (2014).

[5] A. Cerjan, and A. D. Stone, "Steady-state *ab initio* theory of lasers with injected signals," *Physical Review A* **90**, 013840 (2014).

[4] M. Liertzer, L. Ge, A. Cerjan, A. D. Stone, H. E. Türeci, and S. Rotter, "Pump-induced exceptional points in lasers," *Physical Review Letters* **108**, 173901 (2012).

[3] A. Cerjan, Y. D. Chong, L. Ge, and A. D. Stone, "Steady-state ab-initio laser theory for N-level lasers," *Optics Express* **20**, 474 (2012).

[2] A. Cerjan and C. Cerjan, "Orbital angular momentum of Laguerre-Gaussian beams beyond the paraxial approximation," *Journal of the Optical Society of America A* **28**, 2253 (2011).

[1] A. Cerjan and C. Cerjan, "Analytic solution of flat-top Gaussian and Laguerre-Gaussian laser field components," *Optics Letters* **35**, 3465 (2010).

Perspectives

[1] A. Cerjan, "A whole surface of exceptional points," *Physics* **12**, 138 (2019).

Technical Notes

[1] A. Cerjan, A. Oskooi, S.-L. Chua, S. G. Johnson "Modeling lasers and saturable absorbers via multilevel atomic media in the Meep FDTD software: Theory and implementation," arXiv: 2007.09329.

Conference Proceedings

[1] B. H. Hokr, A. Cerjan, J. V. Thompson, L. Yuan, S. F. Liew, J. N. Bixler, G. D. Noojin, R. J. Thomas, H. Cao, A. D. Stone, B. A. Rockwell, M. O. Scully, and V. V. Yakovlev, "Evidence of Anderson localization effects in random Raman lasing," *Proceedings of SPIE* **9731**, 973110 (2016).

Work-in-Progress (manuscripts available upon request)

[8] C. H. Moore, W. W. Chow, A. S. Fierro, and A. Cerjan, "Integrated laser-material interaction and PIC-DSMC simulation of laser-triggered high-voltage switches." (in submission)

[7] X. Gao, H. He, W. W. Chow, A. Cerjan, and C. W. Hsu, "Bi-stability and period-doubling cascade of frequency combs in exceptional-point lasers," arXiv:2501.14223 (in submission)

[6] K. Y. Lee, S. Wong, S. Vaidya, T. A. Loring, and A. Cerjan, "Classification of Fragile Topology enabled by Matrix Homotopy," arXiv:2503.03948. (in submission)

[5] H. He, X. Gao, A. Cerjan, and C. W. Hsu, "Quasinormal coupled-mode analysis of dynamic gain in exceptional-point lasers," arXiv:2412.12066. (in submission)

[4] B. Zhu, K. Hean, Y. Wang, S. Wong, R. Banerjee, H. Xue, Q. Wang, A. Cerjan, Q. J. Wang, W. Chang, and Y. D. Chong, "Topological photonic crystal fibre," arXiv: 2501.15107. (in submission)

[3] S. Wong, A. Cerjan, and J. T. Cole, "Quantitative measure of topological protection in Floquet systems through the spectral localizer," arXiv:2410.24176. (in submission)

[2] J. J. Garcia, A. Cerjan, and T. A. Loring, "Clifford and quadratic composite operators with applications to non-Hermitian physics," arXiv:2410.03880. (in submission)

[1] S. Wong, S. Betzold, S. Höfling, and A. Cerjan, "Dynamically reconfigurable topological routing in nonlinear photonic systems." (in submission)

PROFESSIONAL PRESENTATIONS (51 total presentations + 5 upcoming)

Invited

(Presentations marked with a ‡ are for accepted invitations at upcoming venues.)

[36]‡ "Classifying topology in open and nonlinear photonic systems," SPIE Optics and Photonics, San Diego, CA. August 3-8, 2025.

[35]‡ "Classifying Fragile Topology Using Matrix Homotopy," META 2025, Malaga, Spain. July 22-25, 2025.

[34]‡ "Local topological classification of open and nonlinear photonic systems," TopoPhoto 2025, Donostia-San Sebastian, Spain. June 30-July 2, 2025.

[33]‡ "An operator-based approach to classifying topology in open and nonlinear systems," ETOPIM 13 (the International Conference on Elastic, Electrical, Transport and Optical Properties of Inhomogeneous Media), CUNY, New York, NY. June 16-20, 2025.

[32]‡ "Classifying material topology using matrix homotopy," Topology and Geometry beyond Crystals, Nordita, Stockholm, Sweden, May 26-30, 2025.

[31] "Classifying topology in open and nonlinear photonic systems," Waves 2025, Athens, GA. April 15th, 2025.

[30] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," Julius-Maximilians-Universität Würzburg, Würzburg, Germany. February 26th, 2025.

[29] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," IFW Dresden, Dresden, Germany. February 25th, 2025.

[28] "Local topological classification of open and nonlinear materials," AMS Special Session on Mathematics of Topological Insulators, JMM 2025, Seattle, WA. January 10th, 2025.

[27] "Understanding defects, unfolding bands, and classifying topology using multi-operator pseudospectra," Sandia National Laboratories, Albuquerque, NM. January 8th, 2025.

[26] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," Duke Advanced Multifunctional Metamaterials (AMM) Workshop, Durham, NC. November 18th, 2024.

[25] "Classifying Topology in Open and Nonlinear Photonic Systems," 21st International Workshop on Pseudo-Hermitian Hamiltonians in Quantum Physics (PHHQP-XXI), Chania, Greece. September 24th, 2024.

[24] "Creating Controllable Sets of Bound States in the Continuum," SPIE Optics and Photonics, San Diego, CA. August 22nd, 2024.

[23] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," Physics of Excitons and Polaritons in Semiconductors 2024, Reykjavík, Iceland. August 9th, 2024.

[22] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," CUNY, New York, NY. July 25th, 2024. (Virtual)

[21] "Classifying Topology in Open Photonic Systems," META 2024, Toyama, Japan. July 18th, 2024.

[20] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," International workshop on Quantum Materials and Structured Light 2024, Ettore Majorana Foundation, Erice, Italy. July 9th, 2024.

- ❖ *Invited Tutorial*

[19] "An operator-based approach to topological physics, and creating controllable sets of bound states in the continuum," Laboratory for Ultrafast Materials and Optical Science (LUMOS), Los Alamos National Laboratory, Los Alamos, NM. November 2nd, 2023.

[18] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," Max Planck Institute for the Science of Light, Erlangen, Germany. October 27th, 2023.

[17] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," RPTU Kaiserslautern-Landau, Kaiserslautern, Germany. October 23rd, 2023.

[16] "An operator-based approach to topological photonics: Band structures and Bloch eigenstates not required," International Workshop on Polaritons in Emerging Materials, IBS: PCS, Daejeon, South Korea. September 14th, 2023.

[15] "Identifying topology directly from Maxwell's equations: Band structures and Bloch eigenstates not required," META 2023, Paris, France. July 18th, 2023.

[14] "An operator-based approach to topological physics: Band structures and Bloch eigenstates not required," Emory University, Atlanta, GA. April 13th, 2023.

[13] "Identifying topology directly from Maxwell's equations: Band structures and Bloch eigenstates not required," Florida A&M University, Tallahassee, FL. February 27th, 2023.

[12] "Creating Controllable Sets of Bound States in the Continuum," PQE 2023, Snowbird, UT. January 10th, 2023.

[11] "Creating Bound States in the Continuum Using Superstructure Photonics," MRS Fall Meeting, Boston, MA. November 28th, 2022.

[10] "Identifying topology directly from Maxwell's equations: Band structures and Bloch eigenstates not required," International Conference of Quantum, Nonlinear and Nanophotonics, Jena, Germany. September 7th, 2022.

[9] "Using symmetry and topology to confine and control light," University of New Mexico, Albuquerque, NM. September 2nd, 2021.

[8] "Topological photonic systems: from structure to function," Sandia National Laboratories, Albuquerque, NM. September 1st, 2020.

[7] "Topological photonic systems: from structure to function," Rice University, Houston, TX. February 18th, 2020.

[6] "Advances in non-Hermitian and topological photonics," Institute for Basic Science: Center for Theoretical Physics of Complex Systems, Daejeon, South Korea. October 22nd, 2019.

[5] "Weyl points and Weyl exceptional rings in helical waveguide arrays," International Institute of Physics: Weyl Fermions in Condensed Matter, Natal, Brazil. August 7th, 2019.

[4] "Exceptional contours formed in non-Hermitian topological photonic systems," Banff International Research Station Workshop on Photonic Topological Insulators, Banff, Canada. September 14th, 2017.

[3] "Photonic systems with patterned gain and loss," Northrop Grumman Next Workshop on the Physics of Light Matter Interactions and Excited State Dynamics, Redondo Beach, CA. October 27th, 2016.

[2] "Exceptional contours and eigenvalue dynamics in systems with non-uniform gain and loss," Yale University: Applied Physics Seminar, New Haven, CT. August 24th, 2016.

[1] "Quantitative test of general theories of the intrinsic laser linewidth," Texas A&M Physics of Quantum Electronics Follow-on Workshop, College Station, TX. January 12th, 2015.

Invited Guest Lectures

[2] "Introduction to the steady-state ab initio laser theory," Yale University, New Haven, CT. April 21st, 2015.

[1] “Exploring the nature of genius in science and mathematics,” Yale University, New Haven, CT. February 3rd, 2015.

Contributed

[18] A. Cerjan and T. A. Loring, “An Operator-Based Approach to Topological Photonics,” CLEO, San Jose, CA. May 11th, 2023.

[17] A. Cerjan and T. A. Loring, “Local markers identify topology in metals and gapless systems,” APS March Meeting, Las Vegas, NV. March 8th, 2023.

[16] W. A. Benalcazar and A. Cerjan, “Chiral-Symmetric Higher-Order Topological Phases Protected by Multipole Chiral Number Invariants,” CLEO, San Jose, CA. May 20th, 2022.

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