

GARRETT D. COLE

Thorlabs Crystalline Solutions
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GRADUATE EDUCATION

University of California, Santa Barbara

July 2001–October 2005

Ph.D., Materials Science and Engineering
Major Area: Electronic and Photonic Materials
Advisors: Profs. N. C. MacDonald and J. E. Bowers
GPA: 4.00/4.00

Dissertation: MEMS-Tunable Vertical-Cavity Semiconductor Optical Amplifiers

My dissertation focused on the development of the first wavelength tunable vertical-cavity semiconductor optical amplifiers (VCSOAs). To achieve dynamic spectral tunability, these devices incorporated a micromachined electrostatic tuning element. This research generated 10 peer-reviewed publications and proceedings, a patent (which was licensed by Aeries Photonics), and was featured in *MIT Technology Review*, *Compound Semiconductor Magazine*, and *FibreSystems Europe*. Experimental investigations covered fiber-optic testing of the tunable amplifier, as well as laser-vibrometer-based characterization of the MEMS actuator. In addition to experimental measurements, a comprehensive analytical model was developed to describe the properties of the tunable VCSOA.

UNDERGRADUATE EDUCATION

California Polytechnic State University, San Luis Obispo

September 1997–June 2001

B.S., Materials Engineering (Magna Cum Laude)
Senior Thesis Advisor: Prof. Lanny Griffin
Major GPA: 3.97/4.00

Undergraduate Thesis: Design and Testing of a Thick Film Piezoelectric Strain Transducer

For my senior thesis I developed a novel thick film strain sensor based on a PZT/polymer composite. This material was essentially a “piezoelectric paint” in which the pigment had been replaced with a ferroelectric powder ($\text{Pb}[\text{Zr}_x\text{Ti}_{1-x}]\text{O}_3$). The resulting composite was coated on aluminum substrates and, after curing, an aluminum top contact was evaporated and patterned via shadow masking. The experimental focus of this project was to investigate different polymer matrix materials, as well as the effects of the volume percentage of the piezoelectric powder on the dynamic output of the device.

PROFESSIONAL AND ACADEMIC EXPERIENCE

Advanced Engineering Manager, Thorlabs Crystalline Solutions

December 2019–Present

Following the acquisition by Thorlabs Inc., Crystalline Mirror Solutions was rebranded as Thorlabs Crystalline Solutions, a sub-group of the Optics Business Unit (now Thorlabs Advanced Photonics) in Newton, New Jersey. My team continues to operate out of our Santa Barbara, CA office and lab space, producing high-performance xtal stable mirrors for narrow-linewidth reference-cavity-stabilized lasers, low-loss xtal mir optics for high-resolution spectroscopy and trace gas detection systems, high-thermal-conductivity xtal therm mirrors and gain chips for advanced solid-state lasers, as well as a variety of xtal custom components that leverage our expertise in microfabrication techniques enhanced by the direct bonding of various semiconductors, glasses, and other relevant optical and electronic materials for photonic and optoelectronic devices.

Co-Founder and CEO/CTO, Crystalline Mirror Solutions GmbH and LLC

January 2013–December 2019

Born of fundamental quantum optics research at the University of Vienna, Crystalline Mirror Solutions (CMS) was founded to commercialize a ground-breaking optical coating technology that I developed, which employs a proprietary direct-bonding-based manufacturing process. This technique enables the transfer of epitaxial semiconductor heterostructures onto arbitrary—including curved—optical surfaces. The excellent optomechanical properties of these monocrystalline interference coatings minimize Brownian noise, enabling unprecedented improvements in ultrastable interferometers for a variety of precision optical metrology applications. Additional advantages of this novel coating and manufacturing technique include the ability to produce high-performance optics for inertial navigation systems, low-loss mirrors for the mid-infrared spectral region, as well as active and passive high-thermal-conductivity coatings for high-power and ultrafast lasers. Incorporated in 2013 as a GmbH in Vienna, Austria and as an LLC operating out of Santa Barbara, CA I grew the business from two co-founders to a headcount of 16 with a global annual revenue of approximately \$2M. In December 2019 CMS was successfully acquired by Thorlabs Inc.

University Assistant, Faculty of Physics, University of Vienna
Marie Curie Fellow, IQOQI Austrian Academy of Sciences

March 2011–January 2014
October 2008–March 2011

My work in Vienna with Markus Aspelmeyer, first at the Institut für Quantenoptik und Quanteninformation (headed by Anton Zeilinger, Physics Nobel Laureate 2022), then at Universität Wien, focused on advancing the field of cavity optomechanics. These efforts led to publications in top-tier journals, with select papers in *Nature*, *Nature Physics*, *Nature Photonics*, *Nature Nanotechnology*, and *Nature Communications*. Key accomplishments included the demonstration of high-performance epitaxial GaAs-based microresonators, the construction of a scanning cryogenic optical fiber interferometer (featured as an application note in the 2010 attocube product catalog), the creation of a finite-element-enabled solver for quantifying phonon-tunneling dissipation in micro- and nanomechanical devices (in collaboration with Dr. Ignacio Wilson-Rae, then at TU Munich), and the development of a novel gas-phase epitaxial liftoff process for AlGaAs heterostructures (with Prof. Eugene Fitzgerald, MIT).

Postdoctoral Researcher, LLNL Center for Micro- and Nanotechnologies

August 2006–August 2008

The central theme of my research at Lawrence Livermore National Laboratory (LLNL) was novel optical sensor technologies. Focusing on physical sensors, I was responsible for a fiber-based load sensor that was successfully delivered to partners at the Atomic Weapons Establishment. In the area of optical gas sensors, I produced the first MEMS-tunable VCSELs with operation near the oxygen A-band (760-780 nm), the results of which were featured in *Nature Photonics*. Additionally, I initiated an international collaboration with Markus Aspelmeyer of the Austrian Academy of Sciences for the development of monocrystalline optomechanical resonators. In the course of my position, I was granted a Department of Energy Q clearance.

Consultant and Expert Witness, Advanced Optical Microsystems

October 2005–Present

Since the completion of my Ph.D., I have offered consulting and expert witness services to commercial clients in photonics, specializing in state-of-the-art optical and micromechanical devices, covering device design, materials analysis, and micro/nanofabrication process-flow development and troubleshooting. To highlight one prominent example, together with partner Praevium Research, we demonstrated MEMS-tunable VCSELs exhibiting a continuous single-mode tuning range of 150 nm around 1310 nm, as well as 100 nm of tuning near 1060 nm. With an integrated electrostatic actuator, this wavelength span was covered at sweep rates approaching 1 MHz. These devices are now implemented at the heart of a commercial optical coherence tomography imaging system offered by Thorlabs Inc., a leading manufacturer of photonics equipment.

Research Scientist, Aerius Photonics, LLC

October 2005–August 2006

At Aerius Photonics, I was the first employee and lead scientist on the fabrication of high-power short-pulse GaAs-based VCSELs. In this role I was responsible for all aspects of device production including mask design, processing, packaging, and characterization of single emitters, as well as linear and 2-dimensional laser arrays. I also spearheaded the commercialization of the MEMS-tunable VCSEA technology developed during the course of my dissertation research at UCSB. Further responsibilities included writing proposals and white papers, as well as traveling to meet with commercial customers and federal funding agencies. As a co-investigator, I was successful in securing numerous phase I and II SBIR grants.

Research Assistant, UCSB MEMS Lab & Ultrafast Optoelectronics Group

July 2001–October 2005

As a research assistant co-advised by Noel MacDonald and John Bowers, I headed the development of wavelength-agile optical amplifiers for the DARPA CHIPS program at UCSB. This effort culminated in the demonstration of the first MEMS-tunable VCSEA and resulted in numerous technical publications, conference presentations, and a patent. I served as the webmaster for the MEMS Research Group and as a teaching assistant for introductory materials science and graduate-level quantum mechanics. Three summers were spent as a mentor for students in NSF-sponsored undergraduate research programs.

Engineering Intern, NASA Ames Research Center, SimLabs

June 2000–September 2000

As an engineering intern I designed and tested components for the hydraulic feedback system of the center's premiere flight simulation system, the vertical motion simulator (VMS). The VMS was essential in training astronauts for space shuttle landings in addition to serving as a test bed for experimental flight controls for both military and civilian aircraft. Additionally, I assisted in implementing a software transition from AutoCAD to Solidworks. The final deliverable of this effort was the design and fabrication of a revised position adjustment mechanism for dynamic seat applications in the simulator.

PUBLICATIONS AND PRESENTATIONS

Book Chapters

1. V. Jayaraman, J. Jiang, B. Potsaid, M. Robertson, P. J. S. Heim, C. Burgner, D. John, **G. D. Cole**, I. Grulkowski, J. G. Fujimoto, A. M. Davis, A. E. Cable, "VCSEL Swept Light Sources for OCT." In *Optical Coherence Tomography: Technology and Applications, 2nd Edition*, ISBN 978-3319064185, edited by W. Drexler, J. G. Fujimoto, pp. 659–686. Springer, 2015
2. **G. D. Cole** and M. Aspelmeyer, "Quantum Optomechanics." In *Optical Coatings and Thermal Noise in Precision Measurement*, ISBN 978-1107003385, edited by G. M. Harry, T. P. Bodiya, R. DeSalvo, pp. 259–279. Cambridge University Press, 2012

Contributed Press and Reviews

3. L. Chang, **G. D. Cole**, G. Moody, J. E. Bowers, “CSOI: Beyond Silicon-on-Insulator Photonics,” *Optics & Photonics News*, vol. 33, no. 1, pp. 24-31, January 2022 **COVER ARTICLE**
4. **G. Cole**, M. White, M. Aspelmeyer, C. Pawlu, “Semiconductor Supermirrors: Advancing Precision Laser Optics with Substrate-Transferred Epitaxial Films,” *Compound Semiconductor Magazine*, vol. 23, no. 3, pp. 26-33, April/May 2017 **COVER ARTICLE**
5. **G. D. Cole** and M. Aspelmeyer, “News and Views: Cavity Optomechanics: Mechanical memory sees the light,” *Nature Nanotechnology*, vol. 6, no. 11, pp. 690-691, November 2011

Journal Articles

6. M. Zhang, N. Giannini-Hutchin, A. R. Albrecht, G.-W. Truong, C. Nguyen, D. Follman, **G. D. Cole**, M. Sheik-Bahae, “High-power single-mode membrane semiconductor disk laser stabilized to the sodium D_{2a} transition,” manuscript in preparation
7. M. Prinz, M. Bober, D. Charczun, P. Morzynski, M. Naroznik, L. W. Perner, G.-W. Truong, **G. D. Cole**, O. H. Heckl, P. Masłowski, “Broadband characterization of an ultrastable optical cavity with crystalline mirrors using an optical frequency comb,” manuscript in preparation
8. A. M. Gretarsson, G. Cagnoli, E. Capote, **G. D. Cole**, E. M. Gretarsson, G. M. Harry, M. M. Kinley-Hanlon, S. Tait, S. D. Penn, “Mechanical loss and thermal noise in large-area AlGaAs coatings,” manuscript in preparation
9. N. A. Didio, S. Tanioka, E. M. Capote, S. D. Penn, S. W. Ballmer, **G. D. Cole**, S. C. Tait, “Cryogenic mechanical loss studies of large-area substrate-transferred GaAs/AlGaAs crystalline coatings,” manuscript in preparation
10. **G. D. Cole**, R. Suetterlin, G. P. Barwood, C. Deutsch, P. Gaynor, M. Ghulinyan, P. Gill, C. Greve, R. Hendricks, I. Hill, S. Koller, S. Kundermann, R. Le Goff, S. Lecomte, C. Meier, G. Pepponi, S. Schilt, C. Stenzel, K. Voss, A. Zhukov, “Towards space-deployable laser stabilization systems based on vibration-insensitive cubic cavities with crystalline coatings,” manuscript submitted
11. T. Cullen, R. Pagano, J. Cripe, S. Sharifi, M. Lollie, S. Aronson, H. Cain, P. Heu, D. Follman, N. Aggarwal, **G. D. Cole**, T. Corbitt, “Surpassing the standard quantum limit using an optical spring,” preprint arXiv:2210.12222
12. G.-W. Truong, L. W. Perner, D. M. Bailey, G. Winkler, S. B. Cataño-Lopez, V. J. Wittwer, T. Südmeyer, C. Nguyen, D. Follman, A. J. Fleisher, O. H. Heckl, **G. D. Cole**, “Mid-infrared supermirrors with finesse exceeding 400 000,” preprint arXiv:2307.08937, accepted for publication in *Nature Communications*
13. L. W. Perner, G.-W. Truong, D. Follman, M. Prinz, G. Winkler, S. Puchegger, **G. D. Cole**, O. H. Heckl, “Simultaneous measurement of mid-infrared refractive indices in thin-film heterostructures: Methodology and results for GaAs/AlGaAs,” *Physical Review Research*, vol. 5, no. 3, 033048, July–September 2023
Featured: Data included in the online refractive index database at refractiveindex.info for GaAs and AlGaAs
14. **G. D. Cole**, S. Ballmer, G. Billingsley, S. B. Cataño-Lopez, M. Fejer, P. Fritschel, A. M. Gretarsson, G. M. Harry, D. Kedar, T. Legero, C. Makarem, S. D. Penn, D. Reitze, J. Steinlechner, U. Sterr, S. Tanioka, G.-W. Truong, J. Ye, J. Yu, “Substrate-transferred GaAs/AlGaAs crystalline coatings for gravitational-wave detectors,” *Applied Physics Letters*, vol. 122, no. 11, 110502, 13 March 2023, **Invited Perspectives Article | Special Topic on Gravitational Wave Detectors**
Featured: “Ultralow-noise coatings for gravitational-wave detectors,” *Optics & Photonics News*, Year in Optics Issue December 2023
15. S. Tanioka, D. Vander-Hyde, **G. D. Cole**, S. D. Penn, S. W. Ballmer, “Study on electro-optic noise in crystalline coatings toward future gravitational wave detectors,” *Physical Review D*, vol. 107, no. 2, 022003, 15 January 2023
16. R. Kaltenbaek, M. Arndt, M. Aspelmeyer, P. F. Barker, A. Bassi, J. Bateman, A. Belenchia, J. Bergé, C. Braxmaier, S. Bose, B. Christophe, **G. D. Cole**, C. Curceanu, A. Datta, M. Debiossac, U. Delić, L. Diósi, A. A. Geraci, S. Gerlich, C. Guerlin, G. Hechenblaikner, A. Heidmann, S. Herrmann, K. Hornberger, U. Johann, N. Kiesel, C. Lämmerzahl, T. W. LeBrun, G. J. Milburn, J. Millen, M. Mohageg, D. C. Moore, G. W. Morley, S. Nimmrichter, L. Novotny, D. K. L. Oi, M. Paternostro, C. J. Riedel, M. Rodrigues, L. Rondin, A. Roura, W. P. Schleich, T. Schuldt, B. A. Stickler, H. Ulbricht, C. Vogt, L. Wörner, “Research campaign: Macroscopic quantum resonators (MAQRO),” *Quantum Science and Technology*, vol. 8, no. 1, 014006, January 2023, **Special Issue Article | Focus on Cold Atoms in Space**

17. M. Zhang, A. R. Albrecht, C. Nguyen, D. Follman, **G. D. Cole**, M. Sheik-Bahae, “A hybrid membrane-external-cavity surface-emitting laser,” *Optics Express*, vol. 30, no. 23, pp. 42470-42479, 7 November 2022
18. E. M. Gretarsson, A. M. Gretarsson, **G. D. Cole**, G. M. Harry, M. M. Kinley-Hanlon, R. J. Jones, S. D. Penn, “Measured limits on amplitude dependence of mechanical loss in substrate-transferred GaAs/Al_{0.92}Ga_{0.08}As coatings,” *Physical Review D*, vol. 106, no. 4, 042001, 15 August 2022
19. T. Cullen, S. Aronson, R. Pagano, M. T. Nery, H. Cain, J. Cripe, **G. D. Cole**, S. Sharifi, N. Aggarwal, B. Willke, T. Corbitt, “Passive laser power stabilization via an optical spring,” *Optics Letters*, vol. 47, no. 11, pp. 2746-2749, 1 June 2022
20. D. Priante, M. Zhang, A. R. Albrecht, R. Bek, M. Zimmer, C. Nguyen, D. Follman, **G. D. Cole**, M. Sheik-Bahae, “In-well pumping of a membrane external-cavity surface-emitting laser,” *IEEE Journal of Selected Topics in Quantum Electronics*, vol. 28, no. 1, pp. 1-7, January/February 2022, Special Issue on Semiconductor Lasers
21. G. Winkler, L. W. Perner, G.-W. Truong, G. Zhao, D. Bachmann, A. S. Mayer, J. Fellingner, D. Follman, P. Heu, C. Deutsch, D. M. Bailey, H. Peelaers, S. Puchegger, A. J. Fleisher, **G. D. Cole**, O. H. Heckl, “Mid-infrared interference coatings with excess optical loss below 10 ppm,” *Optica*, vol. 8, no. 5, pp. 686-696, May 2021
Select Feature Articles: (English) *Analytica World*, *Electro Optics Magazine*, *EurekaAlert!*, *Optics.org*, *Photonics Spectra Magazine*, *physicsworld*, *PhysOrg*; (German) *Der Standard*, *Forschung und Wissen*
22. M. T. Nery, J. R. Venneberg, N. Aggarwal, **G. D. Cole**, T. Corbitt, J. Cripe, R. Lanza, B. Willke, “Laser power stabilization via radiation pressure,” *Optics Letters*, vol. 46, no. 8, pp. 1946-1949, 15 April 2021 **EDITOR'S PICK**
23. D. Priante, M. Zhang, A. R. Albrecht, R. Bek, M. Zimmer, C. Nguyen, D. Follman, **G. D. Cole**, M. Sheik-Bahae, “Demonstration of a 20 W membrane-external-cavity surface-emitting laser for sodium guidestar applications,” *Electronics Letters*, vol. 57, no. 8, pp. 337-338, April 2021
24. J. Cripe, T. J. Cullen, Y. Chen, P. Heu, D. Follman, **G. D. Cole**, T. Corbitt, “Quantum backaction cancellation in the audio band,” *Physical Review X*, vol. 10, no. 3, 031065, July–September 2020
Featured: “Physicists develop a method to improve gravitational wave detector sensitivity,” *PhysOrg*, 25 September 2020
Featured: “Physicists quiet the quantum whisper to improve gravitational wave detector sensitivity,” *Scitech Daily*, 25 September 2020
25. N. Aggarwal, T. J. Cullen, J. Cripe, **G. D. Cole**, R. Lanza, A. Libson, D. Follman, P. Heu, T. Corbitt, N. Mavalvala, “Room-temperature optomechanical squeezing,” *Nature Physics*, vol. 16, no. 7, pp. 784-788, July 2020
Featured: “News and Views: Squeezing hots up,” by André Xuereb, *Ibid.*, pp. 710-711
Featured: “‘Light squeezer’ reduces quantum noise in lasers, could enhance quantum computing and gravitational-wave detection,” by Jennifer Chu, *PhysOrg*, 7 July 2020
Featured: “Quantum squeezing is achieved at room temperature,” by Sam Jarman, *physicsworld*, 20 July 2020
Featured: “Mirror specifications and energy-efficient design support increasingly portable system for laser precision at room temperature,” by Jake Saltzman, *Photonics.com*, 30 July 2020
26. M. J. Yap, J. Cripe, G. L. Mansell, T. G. McRae, R. L. Ward, B. J. J. Slagmolen, P. Heu, D. Follman, **G. D. Cole**, T. Corbitt, D. E. McClelland, “Broadband reduction of quantum radiation pressure noise via squeezed light injection,” *Nature Photonics*, vol. 14, no. 1, pp. 19-23, January 2020
Featured: “News and Views: Bright squeezed light reduces back-action,” by Thomas Purdy, *Ibid.*, pp. 1-2
Featured: “Squeeze leads to stellar-mass black hole collision precision,” by Jessica Fagan, *PhysOrg*, 31 October 2019
27. P. Koch, **G. D. Cole**, C. Deutsch, D. Follman, P. Heu, M. Kinley-Hanlon, R. Kirchhoff, S. Leavey, J. Lehmann, P. Oppermann, A. K. Rai, Z. Tornasi, J. Wöhler, D. S. Wu, T. Zederbauer, H. Lück, “Thickness uniformity measurements and damage threshold tests of large-area GaAs/AlGaAs crystalline coatings for precision interferometry,” *Optics Express*, vol. 27, no. 25, pp. 36731-36740, 9 December 2019
28. G.-W. Truong, G. Winkler, T. Zederbauer, D. Bachmann, P. Heu, D. Follman, M. E. White, O. H. Heckl, **G. D. Cole**, “Near-infrared scanning cavity ringdown for optical loss characterization of supermirrors,” *Optics Express*, vol. 27, no. 14, pp. 19141-19149, 8 July 2019
29. J. Cripe, N. Aggarwal, R. Lanza, A. Libson, R. Singh, P. Heu, D. Follman, **G. D. Cole**, N. Mavalvala, T. Corbitt, “Measurement of quantum back action in the audio band at room temperature,” *Nature*, vol. 568, no. 7752, pp. 364-367, 18 April 2019
Select Feature Articles: (English) *Compound Semiconductor*, *Cosmos Magazine*, *EurekaAlert!*, *Laser Focus World*, *Nanowerk*, *Photonics.com*, *PhysOrg*, *R&D Magazine*, *Science Daily*, *Science Alert*; (German) *Der Standard*, *ORF*

30. S. D. Penn, M. M. Kinley-Hanlon, I. A. O. MacMillan, P. Heu, D. Follman, C. Deutsch, **G. D. Cole**, G. M. Harry, "Mechanical ringdown studies of large-area substrate-transferred GaAs/AlGaAs crystalline coatings," *Journal of the Optical Society of America B (JOSA B)*, vol. 36, no. 4, C15-C21, 1 April 2019, **Feature Issue on Fluctuation-Induced Phenomena in Photonic Systems**
31. C. L. Anyi, R. J. Thirkettle, D. Zou, D. Follman, **G. D. Cole**, K. U. Schreiber, J.-P. R. Wells, "The Macek and Davis experiment revisited: A large ring laser interferometer operating on the $2s^2 \rightarrow 2p^4$ transition of neon," *Applied Optics*, vol. 58, no. 2, pp. 302-307, 10 January 2019
32. M. Bückle, V. C. Hauber, **G. D. Cole**, C. Gärtner, U. Zeimer, J. Grenzer, E. M. Weig, "Stress control of tensile-strained $\text{In}_{1-x}\text{Ga}_x\text{P}$ nanomechanical string resonators," *Applied Physics Letters*, vol. 113, no. 20, 201903, 14 November 2018
33. V. J. Kitsmiller, M. Dummer, K. Johnson, **G. D. Cole**, T. D. O'Sullivan, "Frequency domain diffuse optical spectroscopy with a near-infrared tunable vertical cavity surface emitting laser," *Optics Express*, vol. 26, no. 16, pp. 21033-21043, 6 August 2018
34. J. Pohl, **G. D. Cole**, U. Zeimer, M. Aspelmeyer, M. Weyers, "Reduction of absorption losses in MOVPE-grown AlGaAs Bragg mirrors," *Optics Letters*, vol. 43, no. 15, pp. 3522-3525, 1 August 2018
35. J. Cripe, B. Danz, B. Lane, M.-C. Lorio, J. Falcone, **G. D. Cole**, T. Corbitt, "Observation of an optical spring with a beamsplitter," *Optics Letters*, vol. 43, no. 9, pp. 2193-2196, 1 May 2018
36. Z. Yang, D. Follman, A. R. Albrecht, P. Heu, N. Giannini, **G. D. Cole**, M. Sheik-Bahae, "16 W DBR-free membrane semiconductor disk laser with dual-SiC-heatspreader," *Electronics Letters*, vol. 54, no. 7, pp. 430-432, April 2018
37. M. Marchiò, R. Flaminio, L. Pinard, D. Forest, C. Deutsch, P. Heu, D. Follman, **G. D. Cole**, "Optical performance of large-area crystalline coatings," *Optics Express*, vol. 26, no. 5, pp. 6114-6125, 5 March 2018
38. J. Cripe, N. Aggarwal, R. Singh, R. Lanza, A. Libson, M.-J. Yap, **G. D. Cole**, D. E. McClelland, N. Mavalvala, T. Corbitt, "Radiation-pressure-mediated control of an optomechanical cavity," *Physical Review A*, vol. 97, 013827, 18 January 2018
39. R. Singh, **G. D. Cole**, J. Cripe, T. Corbitt, "Stable optical trap from a single optical field utilizing birefringence," *Physical Review Letters*, vol. 117, 213604, 18 November 2016
40. B. J. Bjork, T. Q. Bui, O. H. Heckl, P. B. Changala, B. Spaun, P. Heu, D. Follman, C. Deutsch, **G. D. Cole**, M. Aspelmeyer, M. Okumura, J. Ye, "Direct frequency comb measurement of $\text{OD} + \text{CO} \rightarrow \text{DOCO}$ kinetics," *Science*, vol. 354, no. 6311, pp. 444-448, 28 October 2016
Select Feature Articles: (English) *Chemical & Engineering News*, *EurekAlert!*, *Forbes*, *Laser Focus World*, *PhysOrg*, *Science Daily*, *Space Daily*; (German) *Der Standard*
41. **G. D. Cole**, W. Zhang, B. J. Bjork, D. Follman, P. Heu, C. Deutsch, L. Sonderhouse, J. Robinson, C. Franz, A. Alexandrovski, M. Notcutt, O. H. Heckl, J. Ye, M. Aspelmeyer, "High-performance near- and mid-infrared crystalline coatings," *Optica*, vol. 3, no. 6, pp. 647-656, June 2016
42. A. Diebold, T. Zengerle, C. Alfieri, C. Schriber, F. Emaury, M. Mangold, M. Hoffmann, C.J. Saraceno, M. Golling, D. Follman, **G. D. Cole**, M. Aspelmeyer, T. Südmeier, U. Keller, "Optimized SESAMs for kilowatt-level ultrafast lasers," *Optics Express*, vol. 24, no. 10, pp. 10512-10526, 16 May 2016
43. T. Chalermongsak, F. Seifert, E. D. Hall, K. Arai, D. Follman, **G. D. Cole**, M. Aspelmeyer, E. K. Gustafson, R. X. Adhikari, "Coherent cancellation of thermo-optic noise in $\text{GaAs}/\text{Al}_{0.92}\text{Ga}_{0.08}\text{As}$ Bragg mirrors," *Metrologia*, vol. 53, no. 2, pp. 860-868, April 2016
44. V. P. Mitrofanov, S. Chao, H.-W. Pan, L.-C. Kuo, **G. Cole**, J. Degallaix, B. Willke, "Technology for the next gravitational wave detectors," *Science China-Physics, Mechanics & Astronomy*, vol. 58, no. 12, 120404, December 2015 **INVITED REVIEW, Special Topic: The Next Detectors for Gravitational Wave Astronomy**
45. S. Gröblacher, A. Trubarov, N. Prigge, **G. D. Cole**, M. Aspelmeyer, J. Eisert, "Observation of non-Markovian micromechanical Brownian motion," *Nature Communications*, vol. 6, article 7606, 28 July 2015
46. J. Steinlechner, I. W. Martin, A. Bell, **G. Cole**, J. Hough, S. Penn, S. Rowan, S. Steinlechner, "Mapping the optical absorption of a substrate-transferred crystalline AlGaAs coating at $1.5 \mu\text{m}$," *Classical and Quantum Gravity*, vol. 32, no. 10, 105008, 21 May 2015

47. K. U. Schreiber, R. J. Thirkettle, R. B. Hurst, D. Follman, **G. D. Cole**, M. Aspelmeyer, J.-P. R. Wells, "Sensing earth's rotation with a helium-neon ring laser operating at 1.15 μm ," *Optics Letters*, vol. 40, no. 8, pp. 1705-1708, 15 April 2015
48. G. Barreto Lemos, V. Borish, **G. D. Cole**, S. Ramelow, R. Lapkiewicz, A. Zeilinger, "Quantum imaging with undetected photons," *Nature*, vol. 512, no. 7515, pp. 409-412, 28 August 2014
Select Feature Articles: (English) *Ars Technica*, *Discover Magazine* [Ranked #10 of "Top 100 Stories of 2014"], *EurekAlert!*, *Gizmodo*, *IEEE Spectrum*, *National Geographic*, *Nature Photonics*, *Nature Physics*, *NBC News*, *New Scientist*, *PhysOrg*, *Science*, *Scientific American*, *Smithsonian Magazine*; (German) *Die Presse*, *Der Spiegel*, *Der Standard*, *Frankfurter Allgemeine*, *Kurier*, *ORF*, *Spektrum der Wissenschaft*, *Wiener Zeitung*
49. **G. D. Cole**, P.-L. Yu, C. Gärtner, K. Siquans, R. Moghadas Nia, J. Schmöle, J. Hoelscher-Obermaier, T. P. Purdy, W. Wieczorek, C. A. Regal, M. Aspelmeyer, "Tensile strained $\text{In}_x\text{Ga}_{1-x}\text{P}$ membranes for cavity optomechanics," *Applied Physics Letters*, vol. 104, no. 20, 201908, 19 May 2014
50. W. Zhang, M. J. Martin, C. Benko, J. L. Hall, J. Ye, C. Hagemann, T. Legero, U. Sterr, F. Riehle, **G. D. Cole**, M. Aspelmeyer, "Reduction of residual amplitude modulation to 1×10^{-6} for frequency-modulation and laser stabilization," *Optics Letters*, vol. 39, no. 7, pp. 1980-1983, April 2014
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135. L. W. Perner, G.-W. Truong, D. Follman, M. Prinz, G. Winkler, S. Puchegger, **G. D. Cole**, O. H. Heckl, “High-accuracy measurement of refractive indices in GaAs/AlGaAs thin-film heterostructures,” *CLEO Europe-EQEC 2023*, Munich, Germany, 26–30 June 2023, CE-6.1
136. M. Bober, D. Charczun, P. Morzyński, M. Narożnik, P. Masłowski, M. Prinz, O. Heckl, **G. D. Cole**, G.-W. Truong, “Broadband characterization of an ultrastable optical cavity with crystalline mirrors using an optical frequency comb,” *Joint IEEE International Frequency Control Symposium and European Frequency and Time Forum (IFCS/EFTF)*, Toyama, Japan, 15–19 May 2023
137. S. Tsaoussis, R. Gibson, J. Rollag, C. Nguyen, D. Follman, **G. Cole**, S. Addamane, J. Moloney, R. J. Jones, “Hybrid SESAM Mode-Locked VECSEL,” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 7–12 May 2023
138. G.-W. Truong, L. W. Perner, G. Winkler, S. B. Cataño-Lopez, C. Nguyen, D. Follman, O. H. Heckl, **G. D. Cole**, “Mid-infrared crystalline supermirrors for optical cavities with 231 000 finesse,” *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 7–12 May 2023

139. L. W. Perner, G.-W. Truong, D. Follman, M. Prinz, G. Winkler, S. Puchegger, **G. D. Cole**, O. H. Heckl, "High-accuracy measurement of mid-IR refractive indices in GaAs/AlGaAs thin-film heterostructures," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 7–12 May 2023
140. G.-W. Truong, L. W. Perner, G. Winkler, S. B. Cataño-Lopez, C. Nguyen, D. Follman, O. H. Heckl, **G. D. Cole**, "A 99.9986% reflectance crystalline coating at 4.45 μm for mid-infrared cavity-enhanced sensing," *SPIE Defense + Commercial Sensing, Next-Generation Spectroscopic Technologies XV*, Orlando, FL, USA, 30 April–4 May 2023 [12516-33]
141. R. D. Gibson, S. P. Tsaoussis, J. Rollag, C. Nguyen, D. Follman, **G. D. Cole**, S. J. Addamane, J. V. Moloney, R. J. Jones, "Hybrid SESAMs for high-repetition rate mode-locked VECSELs," *SPIE Photonics West, Vertical External Cavity Surface Emitting Lasers (VECSELs) XII*, San Francisco, CA, USA, 31 January 2023 [12404-15]
142. M. Zhang, A. R. Albrecht, G.-W. Truong, **G. D. Cole**, M. Sheik-Bahae, "A single-mode high-power in-well pumped hybrid-MECSEL at 589 nm," *SPIE Photonics West, Vertical External Cavity Surface Emitting Lasers (VECSELs) XII*, San Francisco, CA, USA, 31 January 2023 [12404-9]
143. L. W. Perner, G.-W. Truong, G. Winkler, G. Zhao, D. Follman, D. M. Bailey, C. Nguyen, M. Prinz, A. J. Fleisher, **G. D. Cole**, O. H. Heckl, "Progress towards a 100 000 finesse optical cavity in the mid-infrared," *Field Laser Applications in Industry and Research (FLAIR)*, Aix-les-Bains, France, 12–16 September 2022
144. G.-W. Truong, L. Perner, G. Winkler, G. Zhao, D. Bachmann, A. S. Mayer, J. Fellingner, D. Follman, P. Heu, C. Deutsch, D. M. Bailey, S. Puchegger, A. J. Fleisher, O. H. Heckl, **G. D. Cole**, "Progress towards a > 100,000 finesse optical cavity at 4.5 μm ," *Optical Interference Coatings (OIC)*, OSA Topical Meeting and Exhibit, Whistler, British Columbia, Canada, 19–24 June 2022 **INVITED**
145. G. Harry, G.-L. Billingsley, **G. Cole (presenter)**, A. Gretarsson, E. Gretarsson, S. Penn, "Development of aluminum gallium arsenide (AlGaAs) as an optical coating material for interferometric gravitational wave detectors," *Optical Interference Coatings (OIC)*, OSA Topical Meeting and Exhibit, Whistler, British Columbia, Canada, 19–24 June 2022
146. L. W. Perner, G. Winkler, G.-W. Truong, D. Follman, J. Fellingner, M. Prinz, S. Puchegger, **G. D. Cole**, O. H. Heckl, "High-accuracy measurement of mid-IR refractive indices of GaAs/AlGaAs in thin-film multilayers," *Optical Interference Coatings (OIC)*, OSA Topical Meeting and Exhibit, Whistler, British Columbia, Canada, 19–24 June 2022
147. M. Brekenfeld, B. Rauf, S. Saint-Jalm, **G. D. Cole**, G.-W. Truong, M. Lessing, A. Fricke, M. Fischer, M. Giunta, R. Holzwarth, "Rack-mounted ultrastable laser system for Sr lattice clock operation," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 15–20 May 2022
148. M. Zhang, A. R. Albrecht, **G. D. Cole**, C. Nguyen, D. Follman, M. Sheik-Bahae, "Multipass in-well pumped semiconductor disk laser for sodium guide stars," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 15–20 May 2022
149. M. Brekenfeld, B. Rauf, S. Saint-Jalm, M. Lessing, A. Fricke, B. Sprenger, M. Fischer, M. Giunta, R. Holzwarth, G.-W. Truong, S. B. Cataño-Lopez, **G. D. Cole**, "Ultrastable laser system for Sr lattice clocks," *Joint IEEE International Frequency Control Symposium and European Frequency and Time Forum (IFCS/EFTF)*, Paris, France, 24–28 April 2022
150. M. Zhang, A. R. Albrecht, D. Priante, **G. D. Cole**, M. Sheik-Bahae, "High power in-well pumped MECSEL emitting at 1178 nm for sodium guide star applications," *SPIE Photonics West, Vertical External Cavity Surface Emitting Lasers (VECSELs) XI*, San Francisco, CA, USA, 25–26 January 2022 [11984-5]
151. R. Sütterlin, G. Barwood, **G. Cole**, C. Deutsch, P. Gaynor, D. Gerardi, M. Ghulinyan, P. Gill, C. Greve, R. Hendricks, I. Hill, S. Koller, S. Kundermann, R. Le Goff, S. Lecomte, C. Meier, S. Schilt, C. Stenzel, K. Voss, A. Zhukov, "Towards space deployable laser stabilisation systems based on 5-cm vibration insensitive cubic cavities," *Joint IEEE International Frequency Control Symposium and European Frequency and Time Forum (IFCS/EFTF)*, Virtual Event, 7–17 July 2021
152. D. Priante, M. Zhang, A. Albrecht, C. Nguyen, D. Follman, **G. Cole**, M. Sheik-Bahae, "High-power DBR-free VECSELs emitting at 1178 nm for sodium guide star applications," *SPIE Photonics West, Vertical-Cavity Surface-Emitting Lasers XXV*, Digital Forum, 6–11 March 2021 [11704-13]
153. D. Priante, A. Albrecht, **G. D. Cole**, M. Sheik-Bahae, "New platforms for high-power optically-pumped semiconductor disk lasers," *39th International Congress on Applications of Lasers & Electro-Optics (ICALEO)*, Chicago, IL, USA 19–22 October 2020 **INVITED**

154. D. Priante, A. R. Albrecht, M. Zhang, C. Nguyen, D. Follman, **G. D. Cole**, M. Sheik-Bahae, "1178 nm membrane external-cavity surface-emitting lasers for sodium guide-star applications," *Advanced Solid State Lasers Conference (ASSL)*, OSA Virtual Event, 13–16 October 2020, AW2A.6
155. G. Harry, S. Penn, **G. Cole**, I. MacMillan, N. Demos, S. Gras, M. Evans, M. Fejer, "Use of aluminum gallium arsenide interference coatings in low-thermal-noise precision optical experiments," *OSA Frontiers in Optics + Laser Science APS/DLS (FiO + LS)*, Washington, DC, USA, 14–17 September 2020, FM5E.4
156. S. Sharifi, T. Cullen, N. Aggarwal, R. Lanza, P. Heu, D. Follman, **G. D. Cole**, J. Cripe, N. Mavalvala, G. Veronis, T. Corbitt, "Improving the measurement of squeezed states using noise subtraction techniques," *51st Annual Meeting of the APS Division of Atomic, Molecular, and Optical Physics (DAMOP 2020)*, Portland, OR, USA, 1–5 June 2020, Q01.00059
157. O. H. Heckl, G. Winkler, L. Perner, G.-W. Truong, A. S. Mayer, **G. Cole**, "Mid-infrared frequency combs and crystalline mirrors," *SPIE Photonics West, Nonlinear Frequency Generation and Conversion: Materials and Devices XIX*, San Francisco, CA, USA, 3–5 February 2020 [11264-1] **INVITED**
158. G. Winkler, L. Perner, G.-W. Truong, D. Bachmann, A. Mayer, J. Fellingner, T. Zederbauer, D. Follman, C. Deutsch, G. Zhao, D. Bailey, A. Fleisher, **G. Cole**, O. Heckl, "High-performance mid-infrared crystalline Bragg mirrors at 4.5 μm ," *OSA Laser Congress and Exhibition*, Vienna, Austria, 29 September–3 October 2019, ATu4A.7
159. D. Lidsky, Z. Yang, A. R. Albrecht, **G. D. Cole**, M. Sheik-Bahae, "Active meta-mirrors," *Nonlinear Optics*, OSA Topical Meeting and Exhibit, Waikoloa Beach, HI, USA, 15–19 July 2019, NTh3A.1 **POSTDEADLINE PRESENTATION**
160. G. Winkler, L. Perner, G.-W. Truong, D. Bachmann, A. S. Mayer, J. Fellingner, T. Zederbauer, D. Follman, C. Deutsch, **G. D. Cole**, O. H. Heckl, "High-performance mid-infrared crystalline Bragg mirrors at 4.5 μm ," *CLEO Europe-EQEC 2019*, Munich, Germany, 23–27 June 2019, CE-8.1
161. L. Deyra, R. B. Doua, M. J. Milla, J. Bouillet, P. Heu, D. Follman, **G. D. Cole**, A. Saci, J.-G. Brisset, A. Courjaud, "180 W single-mode laser operation of an Yb:YAG thin disk using a robust direct-bonding process," *CLEO Europe-EQEC 2019*, Munich, Germany, 23–27 June 2019, CA-5.6
162. G. Winkler, L. Perner, G.-W. Truong, D. Bachmann, A. S. Mayer, J. Fellingner, T. Zederbauer, D. Follman, C. Deutsch, **G. D. Cole**, O. H. Heckl, "High-performance mid-infrared crystalline Bragg mirrors at 4.5 μm " *13th International User Meeting on Cavity Enhanced Spectroscopy (CES2019)*, Madison, WI, USA, 11–14 June 2019
163. K. A. Wyman, A. R. Albrecht, **G. D. Cole**, M. Sheik-Bahae, "Development of semiconductor disk lasers for sodium guidestar applications," *Adaptive Optics for Extremely Large Telescopes (AO4ELT6)*, Québec City, Québec, Canada, 9–14 June 2019
164. G.-W. Truong, K. Numata, C. Nguyen, **G. D. Cole**, "Gamma radiation exposure of crystalline coatings for space applications," *Optical Interference Coatings (OIC)*, OSA Topical Meeting and Exhibit, Santa Ana Pueblo, NM, USA, 2–7 June 2019, FA.4/FAB.6
165. S. D. Penn, M. M. Kinley-Hanlon, G. M. Harry, I. A. O. MacMillan, P. Heu, D. Follman, **G. D. Cole**, C. Deutsch, "Assessing substrate-transferred GaAs/AlGaAs coatings for gravitational-wave detectors," *Optical Interference Coatings (OIC)*, OSA Topical Meeting and Exhibit, Santa Ana Pueblo, NM, USA, 2–7 June 2019, FA.3/FAB.9
166. J. Cripe, T. Cullen, Y. Chen, P. Heu, D. Follman, **G. Cole**, T. Corbitt, "Quantum back action cancellation in the audio band," *50th Annual Meeting of the APS Division of Atomic, Molecular, and Optical Physics (DAMOP 2019)*, Milwaukee, WI, USA, 27–31 May 2019, K08.00003
167. G.-W. Truong, T. Zederbauer, D. Bachmann, P. Heu, D. Follman, M. White, **G. Cole**, "Optical loss uniformity characterization using scanning cavity ringdown measurements," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 5–10 May 2019
168. G. Winkler, L. Perner, G.-W. Truong, D. Bachmann, A. S. Mayer, J. Fellingner, T. Zederbauer, D. Follman, C. Deutsch, **G. D. Cole**, O. H. Heckl, "High-performance mid-infrared crystalline Bragg mirrors at 4.5 μm ," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 5–10 May 2019
169. W.-K. Lee, C. Y. Park, M.-S. Heo, H. Kim, D.-H. Yu, G.-W. Truong **G. D. Cole**, "Ultrastable laser system using a room-temperature optical cavity with 4.8×10^{-17} thermal noise limit," *Joint IEEE International Frequency Control Symposium and European Frequency and Time Forum (IFCS/EFTF)*, Orlando, Florida, USA, 14–18 April 2019

170. N. Aggarwal, J. Cripe, R. Lanza, A. Libson, R. Singh, P. Heu, D. Follman, **G. D. Cole**, N. Mavalvala, T. Corbitt, "Measurement of quantum back action in the audio band at room temperature," *APS April Meeting 2019*, Denver, CO, USA, 13–16 April 2019, K01.00056
171. U. Sezer, D. Bachmann, C. Deutsch, T. Zederbauer, D. Follman, P. Heu, **G. D. Cole**, "Crystalline mirrors and direct bonding technology for high-power lasers," *SPIE Optics + Optoelectronics*, High-Power, High-Energy, and High-Intensity Laser Technology, Prague, Czech Republic, 3–4 April 2019 [11033-39]
172. S. L. Rothwell, M. M. Dummer, **G. D. Cole**, K. Johnson, "Tunable vertical-cavity surface-emitting lasers as a light source for diffuse optical spectroscopy," *SPIE Photonics West*, Vertical-Cavity Surface-Emitting Lasers XXIII, San Francisco, CA, USA, 6–7 February 2019 [10938-15]
173. Z. Yang, D. Follman, D. Bachmann, P. Heu, A. R. Albrecht, **G. D. Cole**, M. Sheik-Bahae, "16 W DBR-free semiconductor disk laser using dual-SiC-heatspreader," *SPIE Photonics West*, Vertical External Cavity Surface Emitting Lasers (VECSELs) IX, San Francisco, CA, USA, 5–6 February 2019 [10901-11]
174. R. Bello, L. Deyra, M. Milla-Rodrigo, J. Boulet, P. Heu, D. Follman, **G. Cole**, A. Saci, J.-G. Brisset, A. Courjaud, "180 W single mode laser operation of an Yb:YAG thin disk using a robust direct-bonding process," *SPIE Photonics West*, Solid State Lasers XXVIII: Technology and Devices, San Francisco, CA, USA, 5–7 February 2019 [10896-67]
175. C. Deutsch, **G. D. Cole**, D. Follman, P. Heu, C. Franz, A. Alexandrovski, "Crystalline mirrors for mid-IR applications," *Photonic Days Berlin Brandenburg 2018*, Berlin, Germany, 17–18 October 2018
176. D. Bachmann, U. Sezer, D. Follman, P. Heu, **G. D. Cole**, "Crystalline mirrors and direct bonding technology for high-power lasers," *22nd Symposium on High Power Laser Systems and Applications (HPLS&A)*, Villa Mondragone, Frascati, Italy, 9–12 October 2018
177. L. Deyra, R. Bello, M.-J. Milla, P. Heu, D. Follman, **G. D. Cole**, A. Saci, J.-G. Brisset, A. Courjaud, "180 W single-mode laser operation of an Yb:YAG thin disk using a robust direct-bonding process," *22nd Symposium on High Power Laser Systems and Applications (HPLS&A)*, Villa Mondragone, Frascati, Italy, 9–12 October 2018
178. A. L. Alexandrovski, **G. D. Cole**, C. Deutsch, D. Follman, P. Heu, "Absorption calibration of coatings with a proxy pump," *SPIE Laser Damage, Materials and Measurements II*, Boulder, CO, USA, 23–26 September 2018 [10805-8]
179. G. Harry, S. Penn, **G. Cole**, G.-L. Billingsley, M. Evans, G. Lovelace, "Aluminum gallium arsenide as a high-reflectivity coating material for interferometric gravitational-wave detectors," *OSA Frontiers in Optics + Laser Science APS/DLS (FiO + LS)*, Washington, DC, USA, 16–20 September 2018, JW4A.77
180. C. Deutsch, **G. D. Cole**, D. Follman, P. Heu, D. Bachmann, P. Koch, H. Lück, A. von Finck, S. Schröder, A. Rai, T. Zederbauer, "Fabrication and characterization of large-area crystalline coatings for next-generation gravitational wave detectors," *SPIE Optical Systems Design*, Optical Fabrication, Testing, and Metrology VI, Frankfurt, Germany, 14–17 May 2018 [10692-28]
181. Z. Yang, D. Follman, A. Albrecht, P. Heu, **G. D. Cole**, M. Sheik-Bahae, "High-power DBR-free membrane semiconductor disk lasers," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 13–18 May 2018 JTU2A.14
182. T. Legero, D. G. Matei, R. Weyrich, S. Häfner, F. Riehle, L. Sonderhouse, J. M. Robinson, E. Oelker, W. Zhang, J. Ye, P. Heu, D. Follman, C. Deutsch, **G. D. Cole**, U. Sterr, "Towards a cryogenic silicon resonator with low thermal noise crystalline mirrors" *32nd European Frequency and Time Forum (EFTF)*, Torino, Italy, 10–12 April 2018
183. R. Glaser, L. Maczewsky, M. Mäusezahl, R. Nawrodt, J. Dickmann, S. Kroker, T. Knupfer, **G. D. Cole**, "Thermal noise in complex systems," *Gravitational Waves Science & Technology Symposium (GRASS 2018)*, Padova, Italy, 1–2 March 2018
184. M. Bückle, V. C. Hauber, C. Gärtner, **G. D. Cole**, U. Zeimer, J. Grenzer, E. Weig, "Stress control of tensile-strained $\text{In}_{1-x}\text{Ga}_x\text{P}$ string resonators," *6th Gordon Research Conference on Mechanical Systems in the Quantum Regime*, Ventura, CA, USA, 25 February–2 March 2018
185. V. Jayaraman, S. Segal, K. Lascola, C. Burgner, F. Towner, A. Cazabat, **G. Cole**, D. Follman, P. Heu, C. Deutsch, "Room-temperature continuous-wave mid-infrared VCSEL operating at 3.35 μm ," *SPIE Photonics West*, Vertical-Cavity Surface-Emitting Lasers XXII, San Francisco, CA, USA, 31 January–1 February 2018 [10552-10]

186. T. Legero, D. Matei, R. Weyrich, S. Häfner, C. Grebing, W. Zhang, J. Robinson, L. Sonderhouse, P. Heu, D. Follman, C. Deutsch, **G. D. Cole**, M. Aspelmeyer, F. Riehle, J. Ye, U. Sterr, "Ultrastable lasers based on low thermal noise optical resonators," *CLEO Europe-EQEC 2017*, Munich, Germany, 25–29 June 2017
187. I. J. Graumann, A. Diebold, F. Emaury, B. Deppe, C. R. Phillips, M. Golling, D. Bauer, P. Heu, D. Follman, **G. D. Cole**, M. Aspelmeyer, D. Sutter, C. Kränkel, C. J. Saraceno, U. Keller, "Peak-power scaling of femtosecond SESAM-modelocked Yb:Lu₂O₃ thin-disk lasers," *CLEO Europe-EQEC 2017*, Munich, Germany, 25–29 June 2017
188. C. Deutsch, **G. D. Cole (presenter)**, D. Follman, P. Heu, B. J. Bjork, C. Franz, A. Alexandrovski, O. H. Heckl, J. Ye, M. Aspelmeyer, "Mid-infrared crystalline mirrors with ultralow optical losses," *CLEO Europe-EQEC 2017*, Munich, Germany, 25–29 June 2017
189. U. Sterr, D.-G. Matei, T. Legero, S. Häfner, R. Weyrich, W. Zhang, J. Robinson, L. Sonderhouse, P. Heu, D. Follman, C. Deutsch, **G. D. Cole**, M. Aspelmeyer, F. Riehle, J. Ye, "Thermal noise in ultrastable cavity-referenced lasers," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 14–19 May 2017 **INVITED**
190. C. Deutsch, **G. D. Cole**, D. Follman, P. Heu, B. J. Bjork, C. Franz, A. Alexandrovski, O. H. Heckl, J. Ye, M. Aspelmeyer, "Mid-infrared crystalline mirror coatings with ultralow optical absorption," *43rd Freiburg Infrared Colloquium*, Freiburg, Germany, 14–15 March 2017
191. J. Cripe, R. Singh, M.-J. Yap, **G. Cole**, T. Corbitt, "Cavity optomechanics with micromirrors: Measuring and reducing radiation pressure noise with bright squeezed light," *APS March Meeting*, New Orleans, LA, USA, 13–17 March 2017, R35.00006
192. C. Deutsch, **G. D. Cole**, D. Follman, P. Heu, B. J. Bjork, C. Franz, A. Alexandrovski, O. H. Heckl, J. Ye, M. Aspelmeyer, "Mid-infrared crystalline supermirrors with ultralow optical absorption," *SPIE Photonics West, Laser Resonators, Microresonators, and Beam Control XIX*, San Francisco, CA, USA, 28 January–2 February 2017 [10090-9]
193. A. Rai, T. Zederbauer, **G. D. Cole**, C. Deutsch, D. Follman, P. Heu, C. Franz, A. Alexandrovski, M. Aspelmeyer, "Crystalline interference coatings grown by molecular beam epitaxy," *German MBE Workshop 2016*, Munich, Germany, 13–14 October 2016
194. T. Corbitt, R. Singh, J. Cripe, **G. Cole**, "Optomechanics and quantum noise with AlGaAs microstructures," *International Conference on Coherence and Nonlinear Optics (ICONO 2016)*, Minsk, Belarus 26–30 September 2016, IThB2 **INVITED**
195. B. J. Bjork, T. Q. Bui, O. H. Heckl, P. B. Changala, B. Spaun, A. J. Fleisher, K. C. Cossel, **G. Cole**, M. Okumura, J. Ye, "Studies of *trans*-DOCO by mid-IR time-resolved frequency comb spectroscopy," *24th International Symposium on Gas Kinetics and Related Phenomena*, York, England, UK, 17–21 July 2016, P072
196. W. Zhang, L. Sonderhouse, J. Robinson, T. Legero, D. Matei, U. Sterr, F. Riehle, **G. D. Cole**, D. Follman, P. Heu, C. Deutsch, M. Aspelmeyer, J. Ye, "Towards 10⁻¹⁷ stability with a cryogenic silicon cavity," *IEEE International Frequency Control Symposium (IFCS)*, New Orleans, LA, USA, 9–12 May 2016
197. M. Bückle, V. C. Hauber, C. Gärtner, **G. D. Cole**, E. Weig, "High-stress crystalline string resonators," *5th Gordon Research Conference on Mechanical Systems in the Quantum Regime*, Ventura, CA, USA, 6–11 March 2016
198. A. P. Singh, **G. Cole**, R. Schnabel, "Optical absorption in substrate-transferred crystalline coatings at 1064 nm and 1550 nm for gravitational wave detectors," *Spring Meeting of the German Physical Society (DPG)*, Hamburg, Germany, 29 February–4 March 2016, GR 16.6 / VMP6 HS A
199. G. Barreto Lemos, S. Ramelow, A. Zeilinger, **G. Cole**, R. Lapkiewicz, V. Borish, "Quantum imaging with undetected photons," *Joint Annual Meeting of the Austrian and Swiss Physical Societies*, Vienna, Austria, 1–4 September 2015, Pres. 573
200. T. Zengerle, A. Diebold, M. Mangold, C. Schriber, C. Alfieri, F. Emaury, M. Hoffmann, C. J. Saraceno, M. Golling, D. Follman, **G. D. Cole**, M. Aspelmeyer, T. Südmeyer, U. Keller, "Novel optimized SESAMs for kilowatt ultrafast lasers," *CLEO Europe-EQEC 2015*, Munich, Germany, 21–25 June 2015
201. R. Singh, J. Cripe, A. Libson, **G. Cole**, N. Mavalvala, T. Corbitt, "Towards radiation pressure measurement using a microresonator test mass," *46th Annual Meeting of the APS Division of Atomic, Molecular, and Optical Physics (DAMOP 2015)*, Columbus, Ohio, USA, 8–12 June 2015, Q1.00065

202. A. Diebold, T. Zengerle, M. Mangold, C. Schriber, F. Emaury, M. Hoffmann, C.J. Saraceno, M. Golling, D. Follman, **G. D. Cole**, M. Aspelmeyer, T. Südmeyer, U. Keller, "Optimized SESAMs for kilowatt ultrafast lasers," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 10–15 May 2015, STu1O.5
203. J. Cripe, R. Singh, W. Johnson, **G. Cole**, T. Corbitt, "Progress towards the measurement of quantum radiation pressure noise," *APS April Meeting 2015*, Baltimore, Maryland, USA, 11–14 April 2015, J13.00006
204. W. Zhang, M. J. Martin, C. Benko, **G. D. Cole**, C. Hagemann, T. Legero, U. Sterr, F. Riehle, M. Aspelmeyer, J. L. Hall, J. Ye, "Reduction of residual amplitude modulation to 1×10^{-6} for frequency-modulation and laser stabilization," *28th European Frequency and Time Forum (EFTF)*, Neuchâtel, Switzerland, 23–26 June 2014
205. R. Singh, **G. Cole**, T. Corbitt, "Microresonator based optomechanical cavity: calibration of quantum noises for LIGO," *45th Annual Meeting of the APS Division of Atomic, Molecular, and Optical Physics (DAMOP 2014)*, Madison, WI, USA, 2–6 June 2014, N4.00001
206. J. D. Cripe, R. Singh, **G. Cole**, W. Johnson, T. Corbitt, "Noise measurements for an optomechanical cavity with micro-mirrors," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Takayama, Japan, 25–30 May 2014
207. G. Barreto Lemos, V. Borish, **G. D. Cole**, S. Ramelow, R. Lapkiewicz, A. Zeilinger, "Imaging via quantum indistinguishability of undetected photons," *Quantum Information and Measurement (QIM)*, Berlin, Germany, 18–20 March 2014, QTu1A.1
208. A. Libson, N. Aggarwal, E. Oelker, A. Buikema, S. Sankar, C. Wipf, T. Bodiya, J. Lee, T. Corbitt, A. Muller, **G. Cole**, N. Mavalvala, "Optomechanics on multiple mass scales," *4th Gordon Research Conference on Mechanical Systems in the Quantum Regime*, Ventura, CA, USA, 9–14 March 2014
209. S. G. Hofer, J. Hoelscher-Obermaier, W. Wiczorek, K. Siquans, R. Riedinger, **G. D. Cole**, K. Hammerer, M. Aspelmeyer, "Optimal state reconstruction for cavity-optomechanical systems via Kalman filtering," *Joint Annual Meeting of the Austrian and Swiss Physical Societies*, Linz, Austria, 3–6 September 2013, Pres. 526
210. W. Zhang, **G. D. Cole**, M. J. Martin, J. Ye, M. Aspelmeyer, "Crystalline coatings for thermal noise reduction in optical interferometers," *American Control Conference (ACC 2013)*, Washington, DC, USA, 17–19 June 2013, MoB20.2
211. P.-L. Yu, T. P. Purdy, **G. D. Cole**, C. A. Regal, "New directions in high-Q optomechanical membrane resonators," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 9–14 June 2013, CW3F
212. R. Singh, J. Bowers, G. May, **G. D. Cole**, T. Corbitt, "Quantum back-action limited optomechanical cavity using microresonators: towards calibration of quantum noise for LIGO," *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 9–14 June 2013, QF1B
213. V. Jayaraman, B. Potsaid, J. Y. Jiang, **G. D. Cole**, M. Robertson, C. Burgner, D. John, I. Grulkowski, S. T. Sanders, J. G. Fujimoto, A. E. Cable, "High-speed ultra-broad tuning range MEMS-VCSELs for imaging and spectroscopy," *SPIE Microtechnologies, Smart Sensors, Actuators, and MEMS VI*, Grenoble, France, 24–26 April 2013 [8763-13] **INVITED**
214. J. Hoelscher-Obermaier, S. G. Hofer, W. Wiczorek, K. Siquans, R. Riedinger, **G. D. Cole**, K. Hammerer, M. Aspelmeyer, "Optomechanical state reconstruction using Kalman filtering," *Spring Meeting of the German Physical Society (DPG)*, Hannover, Germany, 18–22 March 2013, Q 35.88
215. M. Brandstetter, C. Deutsch, A. Benz, **G. Cole**, H. Detz, A. M. Andrews, W. Schrenk, G. Strasser, K. Unterrainer, "THz quantum cascade lasers with wafer bonded active regions," *International Quantum Cascade Lasers School & Workshop (IQCLSW 2012)*, Baden, Austria, 2–6 September 2012
216. S. Sankar, **G. D. Cole**, T. Corbitt, E. Oelker, M. Aspelmeyer, N. Mavalvala, "Route to quantum-noise-limited motion of a cryogenic cavity-coupled low-frequency mechanical oscillator," *3rd Gordon Research Conference on Mechanical Systems in the Quantum Regime*, Galveston, TX, USA, 4–9 March 2012
217. V. Jayaraman, J. Jiang, B. Potsaid, **G. Cole**, J. Fujimoto, A. Cable, "Design and performance of broadly tunable, narrow linewidth, high repetition rate 1310 nm VCSELs for swept source OCT," *SPIE Photonics West, Vertical-Cavity Surface-Emitting Lasers XVI*, San Francisco, CA, USA, 25–26 January 2012 [8276-12] **INVITED**
218. M. Nagel, K. Möhle, K. Döringshoff, E. V. Kovalchuk, **G. D. Cole**, J. Pohl, M. Weyers, M. Aspelmeyer, A. Peters, "Ultra-stable cryogenic optical resonators: towards a thermal noise limited frequency stability $< 3 \times 10^{-17}$," *4th ESA International Workshop on Optical Atomic Frequency Standards & Clocks*, Trani, Italy, 24–27 October 2011

- 219.S. Kalchmair, R. Gansch, **G. D. Cole**, H. Detz, A. M. Andrews, P. Klang, W. Schrenk, G. Strasser, "Photonic crystal slabs for resonant photodetection in quantum wells," *Metamaterials 2011*, Barcelona, Spain, 10–15 October 2011
- 220.S. Kalchmair, R. Gansch, **G. D. Cole**, H. Detz, A. M. Andrews, P. Klang, W. Schrenk, G. Strasser, "Temperature effects in photonic crystal slab quantum well photodetectors," *11th International Conference on Intersubband Transitions in Quantum Wells*, Badesi, Italy, 11–17 September 2011
- 221.V. Jayaraman, J. Jiang, H. Li, P. J. S. Heim, **G. D. Cole**, B. Potsaid, J. G. Fujimoto, A. Cable, "OCT imaging up to 760 kHz axial scan rate using single-mode 1310 nm MEMS-tunable VCSELs with >100 nm tuning range," *Conference on Lasers and Electro-Optics (CLEO)*, Baltimore, MD, USA, 1–6 May 2011, PDPB2 **POSTDEADLINE PRESENTATION**
Featured: "760 kHz OCT scanning possible with MEMS-tunable VCSEL," by Gail Overton, *Laser Focus World*, vol. 47, no. 7, p. 15, July 2011
- 222.M. R. Vanner, I. Pikovski, **G. D. Cole**, M.-S. Kim, Č. Brukner, K. Hammerer, G. J. Milburn, M. Aspelmeyer, "Pulsed quantum optomechanics," *March Meeting of the American Physical Society*, Dallas, TX, USA, 21–25 March 2011, V29.00010
- 223.D. Demir, **G. D. Cole**, M. Aspelmeyer, "A table-top demonstration of radiation pressure," *Spring Meeting of the German Physical Society (DPG)*, Dresden, Germany, 13–18 March 2011, Q 15.35 P1
- 224.S. Kalchmair, H. Detz, **G. Cole**, A. M. Andrews, M. Nobile, P. Klang, W. Schrenk, G. Strasser, "Quantum well photodetector in a free-standing photonic crystal slab," *36th International Conference on Micro & Nano Engineering (MNE)*, Genoa, Italy, 19–22 September 2010
- 225.M. Boozarjmehr, **G. D. Cole**, G. Weihs, "Electrically tunable air gap microcavities for entangled photon pair generation," *European Science Foundation (ESF) Conference on Quantum Engineering of States and Devices: Theory and Experiments*, Obergurgl, Austria, 5–10 June 2010
- 226.S. Gröblacher, J. B. Hertzberg, M. R. Vanner, **G. D. Cole**, S. Gigan, K. C. Schwab, M. Aspelmeyer, "Demonstration of an ultracold micro-optomechanical oscillator in a cryogenic cavity," *WE-Heraeus Workshop on Quantum Optics of Nano- and Micromechanical Systems*, Bad Honnef, Germany, 19–22 July 2009
- 227.C. Gierl, **G. D. Cole**, B. Kögel, S. Jatta, K. Zogal, H. Davani, P. Meissner, "Mechanical properties of a movable micro-mirror membrane for electrostatically tunable optical filters and vertical-cavity surface-emitting lasers," *European Conference on Lasers and Electro-Optics and XIth European Quantum Electronics Conference (CLEO/EQEC)*, Munich, Germany, 14–19 June 2009, CB.P.5 TUE
- 228.S. Gröblacher, M. R. Vanner, A. Trubarov, **G. D. Cole**, N. Kiesel, M. Aspelmeyer, "Quantum optical control of micro-mechanical resonators," *European Conference on Lasers and Electro-Optics and XIth European Quantum Electronics Conference (CLEO/EQEC)*, Munich, Germany, 14–19 June 2009, PDB.6 THU **POSTDEADLINE PRESENTATION**
- 229.J. Benterou, C. V. Bennett, **G. Cole**, D. E. Hare, C. May, E. Udd, S. J. Mihailov, P. Lu, "Embedded fiber optic Bragg grating detonation velocity sensor," *SPIE Defense, Security, and Sensing, Fiber Optic Sensors and Applications VI*, Orlando, FL, USA, 13–17 April 2009 [7316-13]
- 230.V. Hongpinyo, Y. H. Ding, C. E. Dimas, Y. Wang, B. S. Ooi, W. Qiu, L. L. Goddard, E. M. Behymer, **G. D. Cole**, T. C. Bond, "Intermixing of InGaAs/GaAs quantum wells using multiple cycle annealing of Cu-doped SiO₂," *IEEE Photonics Global Conference*, Singapore, 8–11 December 2008, A2-2-01
- 231.B. W. Kögel, K. Zogal, S. Jatta, G. Grasse, M.-C. Amann, **G. D. Cole**, M. Lackner, M. Schwarzott, F. Winter, P. Meissner, "Micromachined tunable vertical-cavity surface-emitting lasers with narrow linewidth for near infrared gas detection," *SPIE International Symposium on Optomechatronic Technologies (ISOT)*, Optomechatronic Sensors and Instrumentation IV, San Diego, CA, USA, 17–19 November 2008 [7266B-204]
- 232.L. Goddard, K.-Y. Wong, A. Garg, E. Behymer, **G. Cole**, T. Bond, "Measurements of the complex refractive index of Pd and Pt films in air and upon adsorption of H₂ gas," *IEEE LEOS 2008*, Newport Beach, CA, USA, 9–13 November 2008, W52
- 233.L. L. Goddard, T. C. Bond, **G. D. Cole**, E. M. Behymer, "Functionalized lateral surface coated lasers for chem-bio detection" *IEEE Sensors 2007*, Atlanta, GA, USA 28–31 October 2007, C2L-C4
- 234.T. C. Bond, **G. D. Cole (presenter)**, L. L. Goddard, E. M. Behymer, "Photonic MEMS for NIR in-situ gas detection and identification," *IEEE Sensors 2007*, Atlanta, GA, USA, 28–31 October 2007, C4L-C5

235. J. Geske, M. MacDougal, **G. Cole**, D. Snyder, "High-power VCSELs for smart munitions," *SPIE Optics & Photonics 2006*, Optical Technologies for Arming, Safing, Fuzing, and Firing II, San Diego, CA, USA, 13–17 August 2006 [6287-03]
236. T. Kimura, S. Björlin, **G. Cole**, H.-F. Chou, J. Bowers, "1550-nm vertical-cavity SOAs for optically preamplified high bit rate receivers," *30th European Conference on Optical Communication*, Stockholm, Sweden, 5–9 September 2004 We4.P.070
237. E. S. Björlin, **G. D. Cole**, T. Kimura, J. E. Bowers, "Vertical-cavity semiconductor optical amplifiers: recent progress and emerging applications," *Optical Amplifiers and their Applications (OAA)*, OSA Topical Meeting and Exhibit, San Francisco, CA, USA, 27–29 June 2004, OMBI **INVITED**

Invited Lectures, Seminars, Workshops, and Popular Presentations

238. "Semiconductor supermirrors for precision spectroscopy in the near- and mid-IR," National Institute of Metrology, China (NIM), Changping Campus, Beijing, China, 26 October 2023
239. "Semiconductor supermirrors for precision spectroscopy in the near- and mid-IR," MOE Key Laboratory of Fundamental Physical Quantities Measurements & Hubei Key Laboratory of Gravitation and Quantum Physics, Huazhong University of Science and Technology (HUST), Wuhan, China, 20 October 2023
240. "Semiconductor supermirrors for precision spectroscopy in the near- and mid-IR," State Key Laboratory of Magnetic Resonance and Atomic and Molecular Physics, Wuhan Institute of Physics and Mathematics, APM, Chinese Academy of Sciences, Wuhan, China, 20 October 2023
241. "Semiconductor supermirrors for precision spectroscopy in the near- and mid-IR," Max-Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut, AEI), Leibniz Universität Hannover, Hannover, Germany, 29 July 2023
242. "Compound-semiconductor-on-insulator (CSOI) technology for high-performance photonics," *NASA Fundamental Physics Workshop*, Santa Barbara, CA, USA, 23–25 May 2023
243. "Hardware needs for advancing quantum optical technologies," Organizer and moderator of a panel exploring the advancements necessary to bring quantum computing and sensing technologies to the commercial market, Market Focus Event, *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 9 May 2023
244. "Compound-semiconductor-on-insulator (CSOI) technology for high-performance photonics," *Coherent Engineering Seminar*, Virtual Event, 28 April 2023
245. "Semiconductor supermirrors for quantum optical metrology," *Quantum Industry Showcase*, University of California, Santa Barbara, Santa Barbara, CA, USA, 20 April 2023
246. "Crystalline coatings for ultrastable interferometry and high-performance mid-infrared optics," NASA Jet Propulsion Laboratory (JPL), Pasadena, CA, USA, 2 February 2023
247. "Semiconductor Supermirrors: commercializing fundamental optomechanics research," *Vienna Center for Quantum Science and Technology (VCQ) Summer School*, University of Vienna, Vienna, Austria, 30 August 2022
248. "Development of large-diameter substrate-transferred crystalline coatings for GW interferometers," *Workshop on Aluminum Gallium Arsenide in Gravitational Wave Astronomy*, American University, Washington, DC, USA, 15–17 August 2022
249. "Substrate-transferred crystalline coatings for high-performance infrared optics," Invited lecture for ECE 594, graduate level special topics in optoelectronics, Department of Electrical and Computer Engineering, University of California, Santa Barbara, Santa Barbara, CA, USA, 11 May 2022
250. "Semiconductor supermirrors: an enabling quantum technology," Panelist–Forum on Enabling Technologies for Quantum Solutions, *LASER World of PHOTONICS 2022*, World of QUANTUM, Munich, Germany, 28 April 2022
251. *Rainforest Forum*, Panelist–Corporate Engagement, University of New Mexico, Albuquerque, NM, USA, 14 April 2022
252. "Crystalline Mirror Solutions: commercializing fundamental research," *UNM Optical Society Seminar*, University of New Mexico, Albuquerque, NM, USA, 9 February 2022

253. "Substrate-transferred crystalline coatings for high-performance infrared optics," Special seminar for Optical Sciences and Engineering (OSE) Advanced Lecture Series course (PHYS500), University of New Mexico, Albuquerque, NM, USA, 8 February 2022
254. "Crystalline mirrors for precision measurement and astronomy," Seminar on micro/nanofabrication processes as part of the machining and manufacturing program at Allan Hancock College, hosted by Prof. John Gerrity, 27 October 2021
255. "From angels to acquisition: sowing the seeds of investment," Organizer and moderator of a panel on external investment and partnership opportunities in photonics, *Applied Industrial Optics (AIO)*, OSA Virtual Event, 26 July 2021
256. "Semiconductor supermirrors," *New Frontiers in Optical Coatings & Fabrication*, Online Workshop, Rafael Advanced Defense Systems Ltd., Haifa, Israel, 15 June 2021
257. "Redefining precision laser optics with substrate-transferred crystalline coatings," Optical Society of Southern California (OSSC) Online Webinar, 20 May 2021
258. *Quantum Industry Showcase*, Panelist–Fireside Chat, Hosted by UC Santa Barbara NSF Quantum Foundry, 22 April 2021
259. "Crystalline mirror coatings for laser applications," *Photonics Hub Online Meeting of the Optence Working Group Lasertechnology*, 23 March 2021
260. *All Things Photonics Podcast*, Discussion on premium optics technologies with Jake Saltzman, 17 November 2020
261. *First Cosmic Explorer Meeting*, Panelist–Mirrors and Coatings Session, Hosted by Pennsylvania State University Institute for Gravitation and the Cosmos, 26 October 2020
262. "Single-crystal interference coatings for precision metrology," Invited lecture for ECE 594, graduate level special topics in optoelectronics, Department of Electrical and Computer Engineering, University of California, Santa Barbara, Santa Barbara, CA, USA, 27 May 2020
263. "High-performance single-crystal optical interference coatings," General Atomics, San Diego, CA, USA, 13 January 2020
264. "Single-crystal interference coatings for laser-based metrology and manufacturing systems," OSA Thin Films Technical Group Webinar, 5 November 2019
265. "Substrate-transferred crystalline coatings," Thorlabs, Newton, NJ, USA, 28 October 2019
266. "Semiconductor supermirrors," *UCSB Nanotech TECH Talks seminar series*, University of California, Santa Barbara, Santa Barbara, CA, USA, 5 September 2019
267. "Small business, big optics," Organizer and moderator of a panel on SBIR, STTR, and related small-business-focused grants, *Applied Industrial Optics (AIO)*, OSA Topical Meeting and Exhibit, OSA Headquarters, Washington, DC, USA, 8 July 2019
268. "Substrate-transferred crystalline coatings: an unexpected spin-off of fundamental research," Cal Poly Center for Innovation and Entrepreneurship Small Business Development Center, San Luis Obispo, CA, USA, 15 May 2019
269. "Recent progress in and the next steps for substrate-transferred crystalline coatings," *LSC-Virgo-KAGRA Collaboration (LVC) Meeting Coatings Workshop*, Lake Geneva, WI, USA, 22 March 2019
270. "Ultrastable optical resonators with low-noise crystalline coatings," *SYRTE Time / Frequency Seminar*, Observatoire de Paris, Paris, France, 21 February 2019
271. "Recent advancements in substrate-transferred crystalline coatings," *1st KAGRA-Virgo-3G Detectors Workshop*, Perugia, Italy, 16 February 2019
272. "Ultrastable optics with low-noise crystalline coatings," NASA Goddard Space Flight Center, Greenbelt, MD, USA, 10 December 2018
273. "Substrate-transferred crystalline coatings," VIAVI Solutions, Santa Rosa, CA, USA, 19 October 2018
274. "Substrate-transferred crystalline coatings," College of Optical Sciences, University of Arizona, Tucson, AZ, USA, 11 October 2018

275. "Current status and outlook for substrate-transferred crystalline coatings," *AlGaAs Coatings Workshop*, American University, Washington, DC, USA, 27 June 2018
276. "Mid-IR substrate-transferred crystalline coatings," Panelist–Industry Focus Panel: Commercial Applications for Mid-IR and Terahertz Optics and Photonics, *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 16 May 2018
277. "Outlook on size-scaling of substrate-transferred crystalline coatings," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Girdwood, AK, USA, 15 May 2018
278. "Substrate-transferred crystalline coatings: an unexpected spin-off of fundamental research in cavity optomechanics," University of Dayton, Dayton, OH, USA, 25 April 2018
279. "Semiconductor supermirrors," HRL Laboratories, Malibu, CA, USA, 16 April 2018
280. "Semiconductor supermirrors," NASA Jet Propulsion Laboratory (JPL), Pasadena, CA, USA, 29 March 2018
281. "Current status of large-area crystalline coatings," *LSC-Virgo Collaboration (LVC) Meeting Coatings Workshop*, Sonoma State University, Rohnert Park, CA, USA, 23 March 2018
282. "Substrate-transferred crystalline coatings: an unexpected spin-off of fundamental research," *UCSB Photonics Society Seminar*, University of California, Santa Barbara, Santa Barbara, CA, USA, 7 February 2018
283. "Semiconductor supermirrors," NG Next, Northrop Grumman, Manhattan Beach, CA, USA, 4 October 2017
284. "Semiconductor supermirrors," Lockheed Martin, Louisville, CO, USA, 15 August 2017
285. "Semiconductor supermirrors via substrate transfer and direct bonding," Lawrence Livermore National Laboratory, Livermore, CA, USA, 31 July 2017
286. "Semiconductor supermirrors," Invited lecture for ECE 594, graduate level special topics in optoelectronics, Department of Electrical and Computer Engineering, University of California, Santa Barbara, Santa Barbara, CA, USA, 30 May 2017
287. "Latest results on crystalline coating characterization," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Hamilton Island, Queensland, Australia, 10 May 2017
288. "Semiconductor supermirrors for precision interferometry," *2017 Light Science Workshop*, UCSB Photonics Society, University of California, Santa Barbara, Santa Barbara, CA, USA, 10 May 2017
289. "Crystalline coatings for 3rd generation gravitational-wave detectors," *Astroparticle Physics European Consortium (APPEC) Technology Forum*, Hannover, Germany, 3 May 2017
290. "Semiconductor supermirrors," Coherent Inc., Santa Clara, CA, USA, 17 March 2017
291. "Semiconductor supermirrors," NIST, Gaithersburg, MD, USA, 25 January 2017
292. "Substrate-transferred crystalline coatings," Teledyne Scientific & Imaging, Thousand Oaks, CA, USA, 16 September 2016
293. "Recent advancements in substrate-transferred crystalline coatings," Physikalisch-Technische Bundesanstalt (PTB), Braunschweig, Germany, 29 July 2016
294. "Minimizing test mass thermal noise with crystalline coatings," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Elba, Italy, 27 May 2016
295. "Crystalline coatings for gravitational-wave test masses," *LIGO Seminar*, California Institute of Technology, Pasadena, CA, USA, 26 April 2016
296. "Crystalline coatings: an unexpected spin-off of fundamental research in cavity optomechanics," *Stanford Optical Society Seminar*, Stanford University, Stanford, CA, USA, 24 March 2016
297. "Transitioning technology from the laboratory to the commercial market," Universitat Politècnica de Catalunya, Barcelona, Spain, 4 March 2016

298. "Crystalline coatings: technology and product offerings," IBM Zurich Research Laboratory, Rüschlikon, Switzerland, 13 October 2015
299. "Crystalline coatings: a new paradigm in optical coating technology," Google Quantum Artificial Intelligence Lab, Goleta, CA, USA, 15 September 2015
300. "Crystalline coatings: a new paradigm in optical coating technology," *Photonics4All Business Bootcamp*, Wirtschaftsuniversität Wien, Vienna, Austria, 10 September 2015
301. "Crystalline coatings: an unexpected spin-off of cavity optomechanics," *Future Atomic Clocks (FACT) Workshop*, Observatoire de Paris, Paris, France, 9 September 2015
302. "Thermal noise in optical cavities," *Future Atomic Clocks (FACT) Workshop*, Observatoire de Paris, Paris, France, 9 September 2015
303. "Crystalline Supermirrors: from concept to reality," International Year of Light (IYL) invited blog post, published by SPIE in *Celebrating Light and Inspired by Light: Reflections from the International Year of Light 2015* 19 August 2015
304. "Crystalline coatings: a new paradigm in optical coating technology," *Raytheon Fellows Seminar Series*, Raytheon Space and Airborne Systems, El Segundo, CA, USA, 23 July 2015
305. "Crystalline coatings: minimizing Brownian noise in precision interferometry," Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences, State Key Laboratory of Magnetic Resonance and Atomic and Molecular Physics, Wuhan, China, 27 April 2015
306. "Crystalline coatings: minimizing Brownian noise in precision interferometry," Huazhong University of Science and Technology (HUST), Wuhan, China, 27 April 2015
307. *The Next Detectors for Gravitational Wave Astronomy*, Kavli Institute for Theoretical Physics China / Institute for Theoretical Physics, Chinese Academy of Sciences (KITPC/ITP-CAS), Beijing, China, 20–24 April 2015
308. "Crystalline coatings: from cavity optomechanics to ultrastable interferometers," University of California, Riverside, Riverside, CA, USA, 14 November 2014
309. "Substrate-transferred crystalline coatings," Tongji University, Shanghai, China, 15 October 2014
310. "Substrate-transferred crystalline coatings," *LSC-Virgo Collaboration (LVC) Meeting Coatings Workshop*, Stanford University, Stanford, CA, USA, 29 August 2014
311. "Crystalline coatings," University of California, Santa Barbara, Santa Barbara, CA, USA, 2 April 2014
312. "Cavity optomechanics: minimizing thermal noise in precision measurement," Colloquium for RTG 1729 *Fundamentals and applications of ultra-cold matter*, Leibniz Universität Hannover, Hannover, Germany, 9 January 2014
313. "Substrate-transferred crystalline multilayers: a new paradigm in optical coating technology," Panelist–Technology Transfer Program, *Conference on Lasers and Electro-Optics (CLEO)*, San Jose, CA, USA, 13 June 2013
314. "AlGaAs crystalline coatings: recent progress and future prospects," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Elba, Italy, 22 May 2013
315. "Minimizing thermal noise with monocrystalline mirrors," Max-Planck-Institut für Gravitationsphysik (Albert-Einstein-Institut, AEI), Leibniz Universität Hannover, Hannover, Germany, 5 April 2013
316. "Ultra-widely tunable VCSELs," Walter Schottky Institut, Technische Universität München, Munich, Germany, 27 September 2012
317. "Cavity optomechanics with crystalline mirrors," LIGO Observatory, Livingston, LA, USA, 5 July 2012
318. "Quantum optomechanics outside the GW community," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Waikoloa Beach, HI, USA, 16 May 2012

319. "Recent progress in substrate transferred crystalline mirrors," *Gravitational Wave Advanced Detector Workshop (GWADW)*, Waikoloa Beach, HI, USA, 14 May 2012
320. "Cavity optomechanics with crystalline mirrors," JILA, Boulder, CO, USA, 1 March 2012
321. "Low-thermal-noise monocrystalline mirrors," Laser Interferometer Gravitational-Wave Observatory (LIGO), California Institute of Technology, Pasadena, CA, USA, 6 December 2011
322. "Alleviating coating thermal noise with monocrystalline mirrors," *4th ESA International Workshop on Optical Atomic Frequency Standards & Clocks*, Trani, Italy, 24–27 October 2011
323. "Optomechanical performance of epitaxial Bragg mirrors," Friedrich-Schiller-Universität Jena, Jena, Germany, 18 October 2011
324. *Gravitational Wave Advanced Detector Workshop (GWADW)*, Elba, Italy, 26 May 2011
325. "Optomechanical resonators in epitaxial AlGaAs alloys," Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA, USA, 6 December 2010
326. "Optomechanics with epitaxial distributed Bragg reflectors," Laser Interferometer Gravitational-Wave Observatory (LIGO), Massachusetts Institute of Technology, Cambridge, MA, USA, 2 July 2010
327. "Phonon-tunneling losses in micromechanical resonators," *7th SFB-FoQuS Meeting*, Universität Innsbruck, Innsbruck, Austria, 7 May 2010
328. "Tunable optical microcavities for sensing and communication," *Infrared Optical Nanostructures (IR-ON) Seminar Series*, Technische Universität Wien, Vienna, Austria, 31 March 2009
329. "Tunable VCSELs with emission wavelengths below 800 nm," *Tunable Integrated Components in Microwave Technology and Optics (TICMO) research colloquium*, Technische Universität Darmstadt, Klingenberg, Germany, 4 December 2008
330. "Optical microsystems in compound semiconductors," Invited lecture for *Advanced Engineering Materials* course, Department of Materials Engineering, California Polytechnic State University, San Luis Obispo, CA, 16 November 2007
331. "Microfabricated optical compressive load sensors," *Engineering Relations with Academia (ERA) Seminar Series*, Lawrence Livermore National Laboratory, Livermore, CA, 13 April 2007

PATENTS

Issued

1. "Substrate-transferred stacked optical coatings," U.S. Patent 11,365,492 / E.U. Patent 3219834A1
2. "Direct-bonded optical coatings," E.U. Patent 3219832A1
3. "Laser active medium and process of manufacturing the same," U.S. Patent 10,559,936 / E.U. Patent 2996211A1
4. "Substrate transferred monocrystalline Bragg mirrors," U.S. Patent 9,945,996 / E.U. Patent 2607935A1
5. "Resonant optical transducers for in-situ gas detection," U.S. Patent 9,880,096
6. "Resonant optical transducers for in-situ gas detection," U.S. Patent 9,377,399
7. "Method and apparatus including movable-mirror MEMS-tuned surface-emitting lasers," U.S. Patent 8,989,230
8. "Tunable photonic cavities for in-situ spectroscopic trace gas detection," U.S. Patent 8,309,929
9. "Low loss, high and low index contrast waveguides in semiconductors," U.S. Patent 7,995,892
10. "MEMS-tunable vertical-cavity semiconductor optical amplifier," U.S. Patent 7,457,033

Applications

11. Continuation of "Substrate-transferred stacked optical coatings," U.S. App. # 17/683,776, E.U., Canada, and China
12. "Hybrid semiconductor saturable absorber mirror (SESAM) output coupler," U.S. App. # 63/519,498

RECOGNITION AND PROFESSIONAL ACTIVITIES

Honors and Awards

- Elected Fellow of the Optical Society of America (now Optica), October 2023
- Selected as a member of the 2024 cohort of the Photonics100 by Europa Science, October 2023
- Inaugural Thorlabs Global Technical Excellence Award, Best Research Effort category, September 15, 2023
- Trust Science Champion, UNESCO International Day of Light, May 16, 2021
- LASER World of Photonics Startup Challenge, 3rd Prize, June 2017

Winner, SPIE / Photonics Media Prism Award, Materials and Coatings category, February 2017
European Photonics Start-up Challenge, Second Prize, October 2016
Berthold Leibinger Innovationspreis, Second Prize, September 2016
LIGHT2015 Young Photonics Entrepreneur Award, June 2015
Born Global Champion, Vienna Chamber of Commerce, June 2015
Vienna Startup Award winner, “Innovative Product and Service” category, June 2015
Young Enterprise Award, AMA Association for Sensors and Measurements, May 2015
First Prize in the “Hightech” category of the GEWINN Young Entrepreneur Competition, November 2014
Finalist, Mercur Innovation Award, Vienna Chamber of Commerce, November 2014
Finalist, Houska Prize, Austria's largest private research award, April 2014
Semi-Finalist, SPIE Startup Challenge, Photonics West, February 2014
Technology Transfer Showcase, CLEO June 2013
Marie Curie Incoming International Fellowship, March 2009–March 2011
Lancaster Dissertation Award nominee, June 2006
National Science Foundation (NSF) IGERT Fellowship Fall 2002–Fall 2004

Service To Profession

Advisory Board Member, NEXTLASERS/European Metrology Programme for Innovation and Research (EMPIR), 2022-Present
Industrial Advisory Board Member, NSF-sponsored Quantum Foundry at UC Santa Barbara, 2020-Present
Judge, SPIE Startup Challenge Finals, January 2023
Award presenter, SPIE / Photonics Media Prism Award, February 2020

Ph.D. Thesis Committees Served

Michael Choquer, PI Prof. Galan Moody, University of California, Santa Barbara (graduating in 2024)
Mingyang Zhang, PI Prof. Mansoor Sheik-Bahae, University of New Mexico (graduating in 2024)

Conference Organization

CLEO A&T5, Quantum Technology in Transition, Technical Program Committee Chair, 2022-Present
CLEO Joint Council on Applications (JCA), Member, 2022-Present
Optica Quantum 2.0, Technical Program Committee Member, 2022-Present
Optica Optical Interference Coatings (OIC), Technical Program Committee Member, 2022-Present
Optica Applied Industrial Optics (AIO), Technical Program Committee Member, 2017-Present
Workshop on Aluminum Gallium Arsenide in Gravitational Wave Astronomy, Organizer, August 2022
CLEO Special Symposium on Thermal Noise in Precision Interferometry, Lead Organizer, 2017
Frontiers of Optical Coatings (FOC), member of the International Program Committee, 2023-Present
SPIE Advances in Optical Thin Films, member of the International Program Committee, 2023-Present
SPIE / Chinese Optical Society (COS) Photonics Asia, Technical Program Committee Member, 2015-Present

Society Memberships

Optica / OSA
SPIE (Society of Photo-Optical Instrumentation Engineers)
Tau Beta Pi, Engineering Honor Society
Alpha Sigma Mu, Materials Science and Engineering Honor Society
Society of Automotive Engineers (Collegiate Formula Racing Series 1999-2001)

Referee

Nature Nanotechnology and Nature Communications
OSA/Optica Applied Optics, Optics Letters, and Optics Express
Applied Physics Letters
IEEE Journal of Quantum Electronics, Photonics Journal, and Photonics Technology Letters
IEEE/OSA Journal of Lightwave Technology
ECS Journal of Solid State Science and Technology
MRS Proceedings

Claims to Fame

“Price is Right” television game show contestant, 16 November 1999
– won a bowling ball set, cappuccino maker, washer/dryer, and gun safe
Hosted by Jeff Bezos at the invitation-only MARS (machine learning, automation, robotics, and space) Conference, Palm Springs, CA, March 2018 & 2019