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**Margaret Mary Murnane**

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**Education**

Ph.D. in Physics, University of California at Berkeley (1989)  
M.Sc. in Physics, University College Cork, Ireland (1983)  
B.Sc. Honors in Physics, University College Cork, Ireland (1981)

**Professional Experience**

Professor of Physics and Distinguished Professor, University of Colorado, Boulder, CO (August 1999–present)  
Associate Professor, EECS and Physics, University of Michigan, Ann Arbor, MI (1996–1999)  
Associate Professor of Physics, Washington State University, Pullman, WA (1995)  
Assistant Professor of Physics, Washington State University, Pullman, WA (1990–1995)  
Presidential Postdoctoral Fellow, University of California at Berkeley (1989–1990)

**Honors**

2021 Franklin Medal in Physics (shared with Henry Kapteyn)  
2020 Fellow National Academy of Inventors Society (shared with Henry Kapteyn)  
2019 R&D 100 Award for Quantum Microscope (KMLabs – JILA team)  
2018 Colorado Governor's Award for High Impact Research (shared with Henry Kapteyn)  
2018 Presidential Distinguished Service Award for the Irish Abroad (Science, Technology, and Innovation)  
2018 Science Foundation Ireland St. Patrick's Day Science Medal for Academia  
2018 Honorary Degree of Doctor of Science, University of Notre Dame  
2017 Frederic Ives Medal/Jarus W. Quinn Prize of the Optical Society of America (highest award from OSA)  
2017 Alumnus Award for Achievement, UC Berkeley  
2016 Honorary Degree of Doctor of Science, Uppsala University, Sweden  
2015 Honorary Degree of Doctor of Science, National University of Ireland  
2015 Elected to Member, American Philosophical Society  
2015 Honorary Degree of Doctor of Science, University College Dublin  
2015 Honorary Degree of Doctor of Science, Trinity College Dublin  
2014 Moore Foundation Experimental Investigator Award  
2014 CU Boulder Inventor of the Year (shared with Henry Kapteyn)  
2013 Honorary Member, Royal Irish Academy  
2012 Willis Lamb Award for Laser Science and Quantum Optics (shared with Henry Kapteyn)  
2012 Chair, President's Committee for the US National Medal of Science (2012–2014)  
2011 Boyle Medal of the Royal Dublin Society (highest award to Irish scientist)  
2010 Appointed to the President's Committee for the US National Medal of Science  
2010 R.W. Wood Prize of the Optical Society of America (shared with Henry Kapteyn)  
2010 Arthur L Schawlow Prize in Laser Science of the American Physical Society (shared with Henry Kapteyn)  
2009 Ahmed Zewail Award of the American Chemical Society (shared with Henry Kapteyn)  
2008 National Security Science and Engineering Faculty Fellowship  
2008 Distinguished Professor, University of Colorado  
2007 Fellow of the Association for Women in Science  
2006 Fellow of the American Academy of Arts and Sciences  
2005 Distinguished Alumnus Award, University College Cork (Ireland)  
2004 Elected to Member, National Academy of Sciences (USA)  
2003 Fellow of the American Association for the Advancement of Science  
2003 Richtmyer Memorial Lecturer of the American Association of Physics Teachers  
2001 Fellow of the American Physical Society  
2001 Loeb Lecturer, Harvard University  
2000 John D. and Catherine T. MacArthur Fellow  
1998 Fellow of the Optical Society of America

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1997 Maria Goeppert-Mayer Award of the American Physical Society  
1993 Presidential Faculty Fellowship of the National Science Foundation  
1992 Sloan Foundation Fellowship  
1991 Presidential Young Investigator Award of the National Science Foundation  
1990 Simon Ramo Award of the American Physical Society  
1989 University of California President's Postdoctoral Fellowship  
1984 Regents Fellowship, University of California at Berkeley  
1983 University Fellowship, University of California at Berkeley  
1983 Pfizer Postgraduate Scholarship, Pfizer Chemical, Ireland  
1977 College Scholarship, University College Cork, Ireland

### **Professional Affiliations**

American Physical Society (APS); Optical Society of America (OSA); Institute of Electrical and Electronic Engineers (IEEE); American Association for the Advancement of Science (AAAS); National Academy of Sciences (US); Association for Women in Science (AWIS); American Chemical Society (ACS)

### **Professional Activities**

Reviewer for the NSF, DOE, Keck, NRC, OSA, IEEE, APS, Science, Nature.  
President and Founding member, AWIS Palouse, 1993–1995.  
Program Subcommittee Chair of Physics of Laser Sources, APS DLS Meeting, Portland, OR 1995.  
Program Subcommittee Chair of Ultrafast Phenomena, IQEC Meeting, Sydney, Australia 1996.  
Conference Chair: OSA Conference on Short Wavelength Sources (Santa Fe, NM, March 1997).  
Member, R.W. Wood Prize Committee of the Optical Society of America (1995 and 1997).  
Member, Schawlow Prize Committee of the American Physical Society (1996 and 1997).  
Member, Max Born Prize Committee of the Optical Society of America (1999).  
Topical Editor for Optics Letters in Ultrafast Phenomena (Optical Society of America) (1996–2004)  
Editorial Board of Review of Scientific Instruments (American Institute of Physics) (1995–1998)  
Optical Society of America Representative on the Joint Council on Quantum Electronics (1997–1999)  
Faculty Advisor, Society of Women Engineers (SWE), University of Michigan (1996–1998)  
Faculty Advisor, OSA Student Chapter, CU Boulder (2000–2001)  
Member, APS Site Visit Team to Improve the Climate for Women in Physics (1996–2003)  
Chair, National Research Council Committee on Atomic, Molecular & Optical Science (1999–2002)  
Conference co-Chair, Gordon Conference on Nonlinear Optics (1999 and 2001)  
Centennial Speaker, American Physical Society (1998–1999)  
Executive Committee Member, American Physical Society Division of Laser Science (1997–1999)  
Conference Chair, APS Division of Laser Science Annual Meeting (1999)  
Conference Co-Chair, OSA International Conference on Ultrafast Phenomena (2000 and 2002)  
Board of Directors of the Optical Society of America (2000–2002)  
Executive Committee Member, APS Division of AMO Physics (2001–2003)  
NRC Committee Member for Report on “Atoms, Molecules, and Light” (2000–2002)  
Council Member, American Physical Society (2000–2003)  
Committee on Committees Member, American Physical Society (2002)  
Member, Review of Accelerator & Fusion Division, Lawrence Berkeley Labs (2002)  
Member, American Physical Society Committee on the Status of Women in Physics (2001–2002)  
Chair, American Physical Society Committee on the Status of Women in Physics (2003–2004)  
Coordinator, American Physical Society Committee on the Status of Women in Physics Site Visit Program to Improve the Climate for Women in Physics (2004–2005)  
Executive Board Member, American Physical Society (2002–2003)  
Member of External Review Committee, Trinity College Dublin, Physics Dept. (2003)  
Vice-Chair and Chair, Will Allis Prize, American Physical Society (2005–2007)  
Associate Chair for Graduate Studies, Physics, CU Boulder (2002–2004)  
Member, DOE-Basic Energy Sciences Council on Chemical Sciences (2004–2009)  
Member at Large, Section on Physics of the AAAS (2003–2007)  
Scientific Advisory Committee, LCLS, Stanford University (2004–2009)  
Chair, Lillienfield Prize Committee of the American Physical Society (2005)  
Member, NRC Decadal Report on AMO Physics (2005–2006)

Board of Directors, Tyndall National Institute, Cork Ireland (2004–2009)  
 Board of Directors, Kavli Institute for Theoretical Physics, UC Santa Barbara (2007–2009)  
 Vice-Chair and Chair, Nominating Committee, American Physical Society (2006–2007)  
 Member, American Physical Society Development Advisory Committee (2007– )  
 Member, Advisory Committee for Education and Centers, NSF Division of Engineering (2006– 2007)  
 Member NAS Class Membership Committee (2006, 2007, 2009, 2010)  
 Member, NSF Division of Engineering External Advisory Committee (2006–2010)  
 Chair, NSF Directorate for Engineering External Advisory Committee (2008–2009)  
 Member, Reforming Graduate Education Workshop Committee, APS (2008)  
 Advisory Committee, Princeton University Physics Department (2011– )  
 Review Committee for AMO, Keck Foundation (2010– )  
 Member, National Ignition Campaign (LLNL) Committee (2010– )  
 Nominating Committee, Optical Society of America (2010– )  
 Nominating Committee, National Academy of Sciences (2011– )  
 Committee of Visitors, National Science Foundation, ECS and DMR (2011)  
 National Medal of Science Presidential Committee (2010, 2011), Chair (2012–2014)  
 Materials Council, Office of Basic Energy Sciences, Department of Energy (2011– )  
 American Physical Society, Physics Policy Committee (2013–2015)  
 Chair, NAS Temporary Group for all Physical Sciences (Chemistry, Physics, Astro, Geo, Math)  
 Chair AMO section, National Academy of Sciences (2010–2012)  
 Editorial Board, Physical Review X (2012–2014)  
 Editorial Advisory Board, “*Structural Dynamics*” (American Institute of Physics and Crystallographic Assoc.)  
 Panel chair on the Committee of Visitors (COV) for the Materials Sciences and Engineering (MSE) Division in the Department of Energy’s (DOE) Office of Basic Energy Sciences (BES).  
 Member, Committee of Visitors to Argonne for Improving the Climate for Women in Physics (2012)  
 Member, Committee of Visitors to review DOE Materials Science at SLAC (2012)  
 Member, Former Chair, Board of Directors, Kapteyn-Murnane Labs. Inc. ([www.kmlabs.com](http://www.kmlabs.com))  
 Member, NSF MPSAC Synchrotron Subcommittee (2014)  
 Member of Council, US National Academy of Sciences (2014–2017)  
 Governing Board, National Research Council (2015–2017)  
 Associate Editor, Science Advances (new online AAAS journal (2015–2017, 2020– )  
 Foundation Selection Committee (2014–2017)  
 Committee Member, DOE Science Grand Challenges Report (2013)  
 Committee Member, DOE Quantum Materials Report (2016)

## Funding

Past and current funding from, NSF, DOE, DoD, Sloan, MacArthur and Moore Foundations.

## PUBLICATION SUMMARY

>250 publications in peer reviewed journals; >33,511 cites (Google Scholar); Hirsch index 96 (96 papers with >96 cites)



## TALKS SUMMARY

> 500 Invited, Plenary, Keynote and Colloquia talks from group

## Margaret M. Murnane

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### Example Group Alumni

Robert Karl (Lockheed Martin)  
Kevin Dorney (Postdoc, IMEC, Belgium)  
Begoña Abad Mayor (Postdoc, University of Bern, Switzerland)  
Daniel Hickstein (KMLabs Inc.)  
Daniel Adams (Assistant Professor, Colorado School of Mines)  
Christina Porter (ASML)  
Maithreyi Gopalakrishnan (Graduate Student, Stanford)  
Travis Fraser (Postdoc, Argonne National Lab)  
Giulia Fulvia Mancini (Staff Scientists, Paul Scherrer Institute, Switzerland)  
Phoebe Tengdin (Postdoc, EPFL Switzerland)  
Kathy Hoogeboom-Pot (Intel)  
Franklin Dollar (Assistant Professor, Dept. of Physics, UC Irvine)  
Tenio Popmintehev (Assistant Professor, Dept. of Physics, UC San Diego)  
Adra (Tory) Carr (Los Alamos National Lab)  
Damiano Nardi (Intel)  
Sterling Backus (Chief Science Officer, KMLabs.)  
Alon Bahabad (Senior Lecturer (tenured), Dept. of Physical Electronics, Tel-Aviv University)  
Randy Bartels (Professor, Colorado State University)  
Michael Bauer (Professor, University of Kiel)  
Zenghu Chang (Professor, University of Central Florida)  
Ming-Chang Chen (Associate Professor, National Tsing-Hua University, Taiwan)  
Scott Christensen (IPG Photonics)  
Oren Cohen (Professor, Dept. of Physics, Technion)  
Chengyuan Ding (ASML Cymer)  
Charles Durfee (Professor, Colorado School of Mines)  
Alison Ferris (Graduate student, Stanford University)  
Etienne Gagnon (Associate Professor, Franklin and Marshall College)  
David Gaudiosi (L-3 Communications Inc.)  
Ben Galloway (Sandia National Labs)  
Dominique Gaudyn (Amazon)  
Erez Gershgoren (MST Israel)  
Emily Gibson (Associate Professor - Bioengineering, University of Colorado Denver)  
Craig Hogle (Sandia National Laboratories)  
Donna Howland (Northrop Grumman Space Technology)  
Chung-Po Huang (Google)  
Ellen Keister (Education Director, STROBE STC, Univ. Colorado.)  
Chan La-o-Vorakiat (Assistant Professor, King Mongkut's University of Technology Thonburi)  
Tim Lei (Associate Professor of Electrical Engineering, University of Denver)  
Qing Li (KLA Inc.)  
Wen Li (Professor, Wayne State University)  
Ariel Libertun (Medtronic)  
Robynne Lock (Assistant Professor, Texas A&M Commerce)  
Amy Lytle (Associate Professor of Physics, Franklin & Marshall College)  
Leigh Martin (Graduate student, UC Berkeley)  
Stefan Mathias (Professor, University of Goettingen, Germany)  
Piotr Matyba (Assistant Professor, Umea University, Dept of Physics)  
Luis Miaja-Avila (NIST Boulder)  
Lino Misoguti (Professor, Institute of Physics of Sao Carlos, Brazil)  
Ariel Paul (Director of Development at PhET Interactive Simulations, Dept of Physics, U of Colorado)  
Justin Peatross (Professor, Brigham Young University)  
Dimitar Popmintehev (UCSD)  
Predrag Ranitovic (Lawrence Berkeley National Laboratory)  
Daisy Raymondson (KMLabs Inc.)  
Kendall Read  
Andrew Rundquist (Chair, Physics Department, Hamline University)  
Guido Saathoff (Elenion Technologies)

## **Margaret M. Murnane**

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Richard Sandberg (Associate Professor, Brigham Young University)  
Arvinder Sandhu (Professor, University of Arizona)  
Miranda Schatten Silvious (US Army Night Vision Labs)  
Matt Seaberg (Associate Staff Scientist, SLAC)  
Vandana Sharma (Assistant Professor at Indian Institute of Technology, Hyderabad)  
Robert Shelton (FLIR Inc.)  
Mark Siemens (Associate Professor in the Dept. of Physics, University of Denver)  
Greg Taft (Visiting Associate Professor at College of Saint Benedict and Saint John's University)  
Carson Teale (Graduate student, MIT)  
Isabell Thomann (Assistant Professor, Rice University)  
Sarah Thomson (CTI Laser Inc. Lockheed)  
Ra'anan Tobey (Honeywell Inc.)  
Emrah Turgut (Assistant Professor, Oklahoma State University)  
Adrienne Van Allen (Undergraduate, Stanford University)  
Nicholas Wagner (CIRES, University of Colorado and NOAA)  
Professor Thomas Weinacht (Professor, Stony Brook University Department of Physics and Astronomy)  
Stefan Witte (Vrije University Amsterdam and Advanced Research Center for Nanolithography (ARCNL))  
Andrea Wuest (Sensirion)  
Wei Xiong (Assistant Prof, University of California, San Diego)  
Bosheng Zhang (KLA Inc.)  
Xiaoshi Zhang (KMLabs Inc.)  
Xibin Zhou (Apple, Inc.)

**List of Patents (reverse chronological order)**

1. S. Backus, H. C. Kapteyn, and M. M. Murnane, "Laser amplifier and method," U.S. Patent #5,644,424, July 1, 1997.
2. C. G. Durfee, III, A. R. Rundquist, H. C. Kapteyn, and M. M. Murnane, "Guided wave methods and apparatus for nonlinear frequency generation," U.S. Patent #6,151,155, November 21, 2000
3. S. J. Backus, H. C. Kapteyn, and M. M. Murnane, "Ultrashort pulse amplification in cryogenically cooled amplifiers," U.S. Patent #6,804,287, October 12, 2004.
4. H. C. Kapteyn, J. L. Hall, and M. M. Murnane. J. Ye, "Multistage synchronization of pulsed radiation sources," US Patent #6,831,935, December 14, 2004.
5. Oren Cohen, Henry C. Kapteyn, Margaret M. Murnane, "Phase matching of high order harmonic generation using dynamic phase modulation caused by a non-collinear modulation pulse," US Patent #7,664,147, February 16, 2010.
6. Jorge Rocca, Henry Kapteyn, Margaret Murnane, David Gaudiosi, Mike Grisham, Tenio Popmintchev, Brandon Reagan "High-Order Harmonic Generation in a Capillary Discharge," US Patent #7,729,403, June 1, 2010.
7. Zhang, A. L. Lytle, O. Cohen, H. C. Kapteyn, and M. M. Murnane, " Quasi-phase matching and quantum control of high harmonic generation in waveguides using counterpropagating beams," US Patent #7,830,928, November 9, 2010.
8. Tenio Popmintchev, Ming-Chang Chen, Alon Bahabad, Margaret Murnane, Henry Kapteyn, "Phase-Matched Generation of Coherent Soft and Hard X-rays using IR Lasers," US Patent #8,462,824, June 11, 2013.
9. T. Popmintchev, D. Popmintchev, M. M. Murnane, and H. Kapteyn, "Generation of VUV, EUV, and x-ray light using VUV-UV-VIS lasers," US Patent 9,627,844, April 18, 2017.
10. B. Zhang, M. D. Seaberg, D. E. Adams, H. C. Kapteyn, M. M. Murnane, "Coherent Diffractive Imaging With Arbitrary Angle Of Incidence," US Patent 9,891,584, February 13, 2018. Also EP3186616A1, KR20170082505A, PCT WO2016033541A1.
11. R. M. Karl, D. E. Adams, R. S. Bevis, H. C. Kapteyn, M. M. Murnane, "Coherent Diffractive Imaging With Spaced-Apart Beams," US Patent 9,911,207, March 6, 2018.
12. T. Popmintchev, D. Popmintchev, M. M. Murnane, and H. Kapteyn, "Generation of VUV, EUV, and x-ray light using VUV-UV-VIS lasers," US Patent 10,128,631, November 13, 2018.
13. T.V. Popmintchev, D.V. Popmintchev, M. M. Murnane, and H.C. Kapteyn, "Generation of VUV, EUV, and x-ray light using VUV-UV-VIS lasers," US Patent Application US 2019/0372300 A1, 16/189933.
14. Christina Porter, Daniel E. Adams, Michael Tanksalvala, Elizabeth Shanblatt, Margaret M. Murnane, and Henry C. Kapteyn, "Complex Spatially-Resolved Reflectometry/Refractometry," US Patent Application US 2019/0302010 A1 Priority Date May 19,2016. Also PCT/US17/33404.
15. Michael Tanksalvala, Daniel E. Adams, Dennis Gardner, Christina L. Porter, Giulia F. Mancini, Margaret M. Murnane, and Henry C. Kapteyn, "Modulus Enforced Probe," PCT/US17/33397 priority date May 19, 2016.
16. Henry C. Kapteyn, Margaret M. Murnane, Chen-Ting Liao, Bin Wang, "Quantum-Limited Extended Ultraviolet / X-Ray Coherent Diffraction," Application PCT US20/14140, priority date January 17, 2019.

### Peer Reviewed Publications (reverse chronological order)

1. M. Murnane, X. Shi, H. Kapteyn, “Probing and manipulating magnetic and 2D quantum materials using ultrafast laser and high harmonic sources,” *Journal of Physics: Condensed Matter*, in press (2021).
2. D. Couch, Q. Nguyen, A. Liu, D. Hickstein, H. Kapteyn, M. Murnane, N. Labbe, “Detection of the keto-enol tautomerization in acetaldehyde, acetone, cyclohexanone, and methyl vinyl ketone with a novel VUV light source,” *Proc. Combustion Institute*, in press (2021). DOI: 10.1016/j.proci.2020.06.139
3. G. Gui, A. Adak, M. Dandapat, D. Carlson, D. Morrill, A. Guggenmos, H. Kapteyn, M. Murnane, V. Pervak, C.-T. Liao, “Measurement and control of optical nonlinearities in dispersive dielectric multilayers,” *Optics Express* **29**(4), 4947 (2021). DOI: 10.1364/OE.409216
4. B. Wang, M. Tanksalvala, Z. Zhang, Y. Esashi, N. Jenkins, M. Murnane, H. Kapteyn, C.-T. Liao, “Coherent Fourier scatterometry using orbital angular momentum beams for detection,” *Optics Express* **29**, 3342 (2021). DOI: 10.1364/OE.414584
5. M. Tanksalvala, C. L. Porter, Y. Esashi, B. Wang, N. W. Jenkins, Z. Zhang, G. P. Miley, J. L. Knobloch, B. McBennett, N. Horiguchi, S. Yazdi, J. Zhou, M. W. Jacobs, C. S. Bevis, R. M. Karl, P. Johnsen, D. Ren, L. Waller, D. E. Adams, S. L. Cousin, C.-T. Liao, J. Miao, M. Gerrity, H. C. Kapteyn, M. M. Murnane, “Nondestructive, high-resolution, chemically specific 3D nanostructure characterization using phase-sensitive EUV imaging reflectometry,” *Science Advances*, **7**(5) eabd9667 (2021). DOI: 10.1126/sciadv.abd9667
6. Y. Lo, J. Zhou, A. Rana, D. Morrill, C. Gentry, B. Enders, Y.-S. Yu, C.-Y. Sun, D. A. Shapiro, R. W. Falcone, H. C. Kapteyn, M. M. Murnane, P. U. P. A. Gilbert, and J. Miao, “X-ray linear dichroic ptychography,” *Proceedings of the National Academy of Sciences*, **118** (3) e2019068118 (2021). DOI: 10.1073/pnas.2019068118
7. D.E. Couch, M. M. Murnane, D. D. Hickstein, and H. C. Kapteyn, “High-Flux MHz Vacuum Ultraviolet Light Source,” *Optics and Photonics News* **31**(12), 34–34 (2020). DOI: 10.1364/OPN.31.12.000034
8. X. Shi, C.-T. Liao, Z. S. Tao, E. Cating-Subramanian, M.M. Murnane, C. Hernandez-Garcia, and H. C. Kapteyn, “Attosecond light science and its application for probing quantum materials,” invited paper, *Journal of Physics B: Atomic, Molecular and Optical Physics*, **53**, 184008 (2020). Joint Focus Issue on Attosecond Technology(ies) and Science. DOI: 10.1088/1361-6455/aba2fb
9. T. Frazer, J. L. Knobloch, J. N. Hernandez-Charpak, K.M. Hoozeboom-Pot, D. Nardi, S. Yazdi, W. Chao, E. H. Anderson, M. K. Tripp, S. W. King, H. C. Kapteyn, M. M. Murnane, B. Abad, “Full characterization of ultrathin 5-nm low-k dielectric bilayers: Influence of dopants and surfaces on the mechanical properties,” *Physical Review Materials* **4**, 073603 (2020). DOI: 10.1103/PhysRevMaterials.4.073603
10. D. E. Couch, D. D. Hickstein, D. G. Winters, S. J. Backus, M.S. Kirchner, S. R. Domingue, J. J. Ramirez, C. G. Durfee, M. M. Murnane, and H. C. Kapteyn, “Ultrafast 1 MHz vacuum ultraviolet source via highly cascaded harmonic generation in negative-curvature hollow-core fibers,” *Optica* **7**, 832 (2020). DOI: 10.1364/OPTICA.395688
11. Y. C. Zhang, X. Shi, W. J. You, Z. S. Tao, Y. G. Zhong, F. C. Kabeer, P. Maldonado, P. M. Oppeneer, M. Bauer, K. Rossnagel, H. Kapteyn, and M. Murnane, “Coherent modulation of the electron temperature and electron-phonon couplings in a 2D material,” *Proceedings of the National Academy of Sciences*, **117**(16), 8788 (2020). DOI: 10.1073/pnas.1917341117
12. B. Abad, J. L. Knobloch, T. Frazer, J. N. Hernandez-Charpak, H. Y. Cheng, A. J. Grede, N. C. Giebink, T. E. Mallouk, P. Mahale, N. N. Nova, A. Tomaschke, V. L. Ferguson, V. H. Crespi, V. Gopalan, H. C. Kapteyn, J. V. Badding, M. M. Murnane, “Nondestructive measurements of the mechanical and structural properties of nanostructured metalattices,” *Nano Letters* **20**, 3306 (2020). DOI: 10.1021/acs.nanolett.0c00167
13. P. Tengdin, C. Gentry, A. Blonsky, D. Zusin, M. Gerrity, L. Hellbrück, J. Shaw, Y. Kvashnin, E. K. Delczeg-Czirjak, M. Arora, H. Nembach, T. J. Silva, S. Mathias, M. Aeschlimann, H. C. Kapteyn, D. Thonig, K. Koumpouras, O. Eriksson, M. Murnane, “Direct light-induced spin transfer between different elements in a spintronic Heusler material via femtosecond laser excitation,” *Science Advances* **6**, eaaz1100, DOI: 10.1126/sciadv.aaz1100 (2020). DOI: 10.1126/sciadv.aaz1100
14. M. Hofherr, S. Häuser, J. K. Dewhurst, P. Tengdin, S. Sakshath, H. T. Nembach, S. T. Weber, J. M. Shaw, T. J. Silva, H. C. Kapteyn, M. Cinchetti, B. Rethfeld, M. M. Murnane, D. Steil, B. Stadtmüller, S. Sharma, M. Aeschlimann, S. Mathias, “Ultrafast optically induced spin transfer in ferromagnetic alloys,” *Science Advances* **6**, eaay8717 (2020). DOI: 10.1126/sciadv.aay8717.
15. Y. H. Lo, C.-T. Liao, J. Zhou, A. Rana, C. S. Bevis, G. Gui, B. Enders, K. M Cannon, Y.-S. Yu, R. Celestre, K. Nowrouzi, D. Shapiro, H. Kapteyn, R. Falcone, C. Bennett, M. Murnane, J. Miao, “Multimodal x-ray and electron microscopy of the Allende meteorite,” *Science Advances* **5**, eaax3009 (2019).

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16. F. Bencivenga, R. Mincigrucci, F. Capotondi, L. Foglia, D. Naumenko, A. A. Maznev, E. Pedersoli, A. Simoncig, F. Caporaletti, V. Chiloyan, R. Cucini, F. Dallari, R. A. Duncan, T. D. Frazer, G. Gaio, A. Gessini, L. Giannessi, S. Huberman, H. Kapteyn, J. Knobloch, G. Kurdi, N. Mahne, M. Manfredda, A. Martinelli, M. Murnane, E. Principi, L. Raimondi, S. Spampinati, C. Spezzani, M. Trovò, M. Zangrando, G. Chen, G. Monaco, K. A. Nelson, C. Masciovecchio, “Nanoscale transient gratings excited and probed by extreme ultraviolet femtosecond pulses,” *Science Advances* **5**, eaaw5805 (2019). DOI: 10.1126/sciadv.aaw5805
17. L. Rego, K. M. Dorney, N. J. Brooks, Q. L. Nguyen, C.-T. Liao, J. San Román, D. E. Couch, A. Liu, E. Pisanty, M. Lewenstein, L. Plaja, H. C. Kapteyn, M. M. Murnane, C. Hernández-García, “Generation of extreme-ultraviolet beams with time-varying orbital angular momentum,” *Science* **364**, eaaw9486 (2019). *Featured on cover*. DOI:10.1126/science.aaw9486
18. E. Pisanty, L. Rego, J. San Román, A. Picón, K. M. Dorney, H. C. Kapteyn, M. M. Murnane, L. Plaja, M. Lewenstein, C. Hernández-García, “Conservation of torus-knot angular momentum in high-order harmonic generation,” *Physical Review Letters* **122**, 203201 (2019). DOI:10.1103/PhysRevLett.122.203201
16. R. Schoenlein, T. Elsaesser, K. Holldack, Z. Huang, H. Kapteyn, M. Murnane, M. Woerner, “Recent advances in ultrafast X-ray sources,” *Phil. Trans. R. Soc. A* **377**: 20180384 (2019). <https://doi.org/10.1098/rsta.2018.0384>
17. X. Shi, W. You, Y. Zhang, Z. Tao, P. Oppeneer, X. Wu, R. Thomale, K. Rossnagel, M. Bauer, H. Kapteyn, M. Murnane, “Ultrafast electron calorimetry uncovers a new long-lived metastable state in 1T-TaSe<sub>2</sub> mediated by mode-selective electron-phonon coupling,” *Science Advances* **5**, eaav4449 (2019). DOI: 10.1126/sciadv.aav4449
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### Publications Submitted and in Preparation

1. *Ultrafast domain dilation induced by optical pumping in ferromagnetic CoFe/Ni multilayers*, D. Zusin, E. Iacocca, L. Le Guyader, A. Reid, W. F. Schlotter, T.-M. Liu, D. J. Higley, G. Coslovich, S. F. Wandel, P. M. Tengdin, S. K. K. Patel, A. Shabalin, N. Hua, S. B. Hrkac, H. T. Nembach, J. M. Shaw, S. A. Montoya, A. Blonsky, C. Gentry, M. A. Hoefler, M. M. Murnane, H. C. Kapteyn, E. E. Fullerton, O. Shpyrko, H. A. Dürr, T. J. Silva, submitted (2020). arXiv:2001.11719
2. *Thermal transport from 1D- and 2D-confined nanostructures on silicon probed using coherent extreme UV light: General and predictive model yields new understanding*, A. Beardo, J. L. Knobloch, L. Sendra, J. Bafaluy, T. D. Frazer, W. Chao, J. N. Hernandez-Charpak, H. C. Kapteyn, B. Abad, M. M. Murnane, F. X. Alvarez, J. Camacho, submitted (2020).
3. *Creation of a novel inverted charge density wave state*, Y. Zhang, X. Shi, M. Guan, W. You, Yi. Zhong, T. R. Kafle, Y. Huang, H. Ding, M. Bauer, K. Rossnagel, S. Meng, H. C. Kapteyn, M. M. Murnane, submitted (2020). arXiv:2011.07623
4. *Necklace-structured high harmonic generation for low-divergence, soft X-ray harmonic combs with tunable line spacing*, L. Rego, N. J. Brooks, Q. L. D. Nguyen, J. San Román, I. Binnie, L. Plaja, H. Kapteyn, M. Murnane, C. Hernández-García, submitted (2021).
5. *Second-harmonic generation and the conservation of spatiotemporal orbital angular momentum of light*, G. Gui, N. Brooks, H. Kapteyn, M. Murnane, C.T. Liao, submitted (2021).
6. *Influence of surface and interfacial roughness on X-ray and extreme ultraviolet reflectance*, Y. Esashi, M. Tanksalvala, Z. Zhang, N. Jenkins, M. Murnane, H. Kapteyn, submitted (2021).
7. *Vector Ptycho-Tomography reveals the 3D Spin Texture of Magnetic Metalattices*, A. Rana et al., in preparation (2021).
8. *Thermal transport channeling by nanoscale heat sources*, H. Honarvar, J. Knobloch, T. D. Frazer, B. Abad, B. McBennett, M. I. Hussein, H. C. Kapteyn, M. M. Murnane, J. N. Hernandez-Charpak, in preparation (2021).
9. *Mapping the electron-phonon coupling and hot electron cooling in copper nanoparticles in the warm-dense matter regime*, Q. Nguyen et al., in preparation (2021).
10. *Inhomogeneous magnon scattering during ultrafast demagnetization*, R. Knut, E. Delczeg, J. Shaw, H. Nembach, P. Grychtol, D. Zusin, C. Gentry, E. Turgut, H. Kapteyn, M. Murnane, D. Arena, O. Eriksson, O. Karis, T. Silva, in preparation (2021).
11. *Sub-ps generation of surface acoustic waves in corrugated thin films*, P. Tengdin et al., in preparation (2021).
12. *Circularly polarized high harmonic generation using collinear two-color counter-rotating circularly polarized beams with wavelength  $2\mu\text{m}$  and  $0.79\mu\text{m}$* , K.M. Dorney, T. Fan, P. Grychtol, R. Knut, J.L. Ellis, D. Hickstein, T. Popmintchev, H.C. Kapteyn, M.M. Murnane, C. Hernandez-Garcia, in preparation (2021).

### Example Invited & Keynote Presentations by Margaret Murnane (reverse chronological order) Colloquia are listed later in vita

*Note that presentations by other members of Kapteyn-Murnane Group are not listed.*

1. **Invited talk**, M. Murnane, "Ultrafast Electron Calorimetry: Uncovering New Light-induced Phases in Magnetic and 2D Materials," presented at the American Physical Society March Meeting 2021, Marc 2021 (remote).
2. **Keynote Talk** (remote), LBNL ALS Users Meeting, "Harnessing coherent EUV and soft X-ray sources for understanding quantum materials," August 2020. Presented by M. Murnane.
3. **Invited talk**, H. Kapteyn and M. Murnane, "ARPES - Theory and Applications," presented at the Time and Angle Resolved Photoemission Spectroscopy for Applications in Materials Science Webinar, AXT PTY LTD, June 2020 (remote).
4. **Plenary Talk**, "Harnessing quantum light science for tabletop x-ray lasers," Conference for Undergraduate Women in Physics, University of Oklahoma, January 2020.

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5. **Plenary Talk**, “Harnessing quantum light science for probing quantum materials,” Nature Conference Functional Dynamics— Visualizing Molecules in Action, Tempe, Arizona, November 2019.
6. **Plenary talk**, “Tabletop X-Ray Lasers: From Starwars to Nanotechnology,” Advanced Light Imaging and Spectroscopy (ALIS) Kickoff Meeting, October 2019, Durham, North Carolina.
7. **Invited talk**, “Coherent Imaging using Tabletop High Harmonic EUV Beams,” presented at Face2Phase Second Edition Conference, October 2019, Delft, The Netherlands.
8. **Invited talk**, “Imaging at the wavelength limit using high harmonic sources,” presented at the 14th Femtochemistry Conference (FEMTO14) – Dynamics of the Complexity in Chemistry, Biology, and Physics, July–August 2019, Shanghai, China. FEMTO 14, Shanghai, China, July 2019.
9. **Plenary talk**, “Harnessing high harmonic sources for real-time functional imaging,” 40th International Conference on Vacuum Ultraviolet and X-ray Physics (VUVX19), July 2019, San Francisco, California.
10. **Plenary talk**, “Harnessing Extreme Quantum Light Science for Understanding Quantum Materials,” presented at the Nonlinear Optics (NLO), Waikoloa Beach, Hawaii, July 2019.
11. **Invited Tutorial**, “Harnessing Coherent High Harmonic Sources for Materials and Imaging Science, Conference on Lasers and Electro-Optics, San Jose, California, May 2019.
12. **Invited talk**, “Uncovering hidden states and phases in quantum materials using ultrafast electron calorimetry,” Princeton Center for Theoretical Science Workshop: Strongly Correlated Systems and Interactions in Quantum Matter,” Princeton, New Jersey, April 2019.
13. **Invited talk**, “Direct light-induced spin transfer between elemental sublattices in a spintronic Heusler materials via femtosecond laser excitation,” Indian Academy of Sciences Meeting on Time-resolved Studies of Dynamics in Advanced Materials, Orange County, Coorg, India, February 2019.
14. **Invited talk**, “Harnessing Quantum Light Science for Applications in Materials and Nano Science,” International Symposium on Ultrafast Science, November 2018.
15. **Keynote address**, “Disruptive Innovation,” Science Foundation Ireland Science Summit- Disruptive Innovation Transforming Society, November 2018.
16. **Plenary talk**, “Harnessing Quantum Light Science for Tabletop X-Ray Lasers, with Applications in Nanoscience and Nanotechnology,” Optical Society of America Laser Congress 2018, October 2018.
17. **Plenary talk**, “Probing Matter at the Spatio-Temporal Limits Using Coherent X-Ray Beams from Tabletop Femtosecond Lasers,” 27<sup>th</sup> International Laser Physics Workshop, July 2018.
18. **Invited talk**, “Sub-Wavelength Full Field Dynamic Imaging Using Tabletop Coherent High Harmonic Beams,” Gordon Research Conference-Image Science, Creating Knowledge from Imaging Data, June 2018
19. **Tutorial**, “Capturing the Fastest Dynamics in Materials using High Harmonic Sources,” Science@FELs 2018, June 2018.
20. **Invited talk**, “Capturing the Fastest Charge and Spin Dynamics in Nanosystems using Tabletop High Harmonic Beams,” APS DAMOP Meeting, May 2018.
21. **Loeb Lecture Series**, “Capturing the Fastest Charge and Spin Dynamics in Nanosystems using Tabletop High Harmonic Beams” and “Coherent Imaging Using Coherent X-Ray Beams,” Harvard University, April 11–12, 2018
22. **Invited talk**, Magnetics and Optics Research International Symposium, CUNY, New York, January 2018
23. **Invited talk**, “Capturing Nanoscale Materials Properties Using Tabletop Coherent Soft X-Ray Beams,” Frontiers of Materials Research, Fall MRS Meeting, Boston, November 2017
24. **Invited talk**, Schawlow-Townes Symposium, Ottawa (October 2017)
25. **Short course**, Ultrafast Optics Conference, Jackson Hole (October 8th 2017)
26. **Invited talks**, Simmons Foundation (September 2017)
27. **Invited talk**, FEMTO 13 Cancun, Mexico (August 2017)
28. **Plenary talk**, Light Science Conference, Changchun, China (July 2017)
29. **Invited talks**, Tongji, Fudan and ECNU Universities, Shanghai (July 2017)
30. **Invited talk**, Computational Optical Sensing and Imaging, San Francisco (June 2017)



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31. **Tutorial**, CLEO (May 2017)
32. **Keynote Talk**, EUV Lithography, Berkeley, CA, June 2017
33. **Invited talk**, Ultrafast Surface Dynamics, Inzell, Germany (June 2017)
34. **Wilson Lecture**, UCSD, June 2017
35. **Invited talk**, FRISNO, Israel, March 2017
36. **Plenary talk**, Physics at Veldhoven, Netherlands, January 2017.
37. **Invited talk**, ASML, Eindhoven, May 2016.
38. **Invited talk**, Uppsala University, Sweden, January 2016.
39. **Invited talk, Student Career Discussions**, OSA Travelling Lecturer, Technion, Haifa, Israel, January 2016.
40. **Invited talks (3)**, ITAMP Winter School in AMO Physics, Tucson, AZ, January 2016.
41. **Invited talk**, "Big Ideas in Quantum Materials," La Jolla, CA, December (2015).
42. **Public Lecture**, Royal Irish Academy, Dublin, Ireland, November 2015.
43. **Invited Masterclass for Students**, Royal Irish Academy, Dublin, Ireland, November 2015.
44. **Invited talk**, International Conference on Nonlinear Optics, Hawaii, July 2015.
45. **Invited talk**, IONS Conference (International OSA Network of Students), Boulder, CO, July 2015.
46. **Plenary talk**, German Physical Society AMO Section, Heidelberg, Germany, March 2015.
47. **Invited talk**, German Physical Society Condensed Matter Section, Berlin, Germany, March 2015.
48. **Invited talk**, APS March Condensed Matter Meeting, Kavli Foundation Special Symposium on Frontiers of Light, March 2015 <http://www.aps.org/meetings/march/events/kavli.cfm>
49. **NSF Distinguished Lecturer**, National Science Foundation, Washington, DC, October 2014.
50. **Plenary talk**, M. Murnane et al., "Capturing dynamics in spintronic and correlated electron materials using ultrafast X-rays," Winter Colloquium on the Physics of Quantum Electronics (PQE), Snowbird UT, January 2014.
51. **Invited talk**, M. Murnane, Wallenberg Foundation, Stockholm, Sweden, January 2014.
52. **Invited talk**, Uppsala University, January 2014.
53. **Invited talk**, AMOLF, Amsterdam, January 2014.
54. **Invited talk**, APS March Meeting, Denver, CO, March 2014.
55. **Invited talk**, CLEO-QELS Special Symposium for AFOSR, San Jose, CA, June 2014.
56. **Invited talk**, Conference on Light induced dynamics and control of correlated quantum systems, Hohwacht (Germany), June 2014.
57. **Invited talk**, Aspen workshop on Many-Body Quantum Systems Far from Equilibrium, August 2014.
58. **Invited talk**, Intel, Hillsboro, OR, September 2014.
59. **Invited talk**, NanoCity: Nanoscience and Technology Conference, Amsterdam, NL, October 2014.
60. **Keynote Address**, Conference on Undergraduate Women in Physics, School of Mines, Golden, January 2013.
61. **Invited talk**, Margaret Murnane et al., "Nonlinear Optics into the X-Ray Regime and Application in Materials Science," Physics @ FOM 2013, Veldhoven, Netherlands, January 2013. Presented by Margaret Murnane.
62. **Invited talk**, Margaret Murnane and Henry Kapteyn, "Applying coherent ultrafast x-rays to real world problems in nano and materials science," ATTOFEL Winter School, Bormio, Italy, January 2013.
63. **Invited talk**, Margaret Murnane et al., "Quantum Control in Extreme Environments," Conference on New Directions in the Quantum Control Landscape," Kavli Institute of Theoretical Physics, Santa Barbara, CA, February 2013. Presented by Margaret Murnane.
64. **Invited talk**, M.M. Murnane et al., "Nanoscale Acoustics, Energy Flow, and Imaging Using Tabletop Coherent EUV High Harmonic Light Sources," 2013 International Conference on Frontiers of Characterization and Metrology for Nanoelectronics, Gaithersburg, MD, March 2013. Presented by Margaret Murnane.
65. **Keynote Talk**, Tenio Popmintchev et al., "Frontiers in Extreme Nonlinear Optics: Attosecond-to-Zeptosecond Coherent Kiloelectronvolt X-rays on a Tabletop," CLEO Europe, Munich, Germany May 2013. Presented by Tenio Popmintchev.

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66. **Invited talk**, Eight International Conference on Ultrafast Surface Dynamics, Estes Park, CO, May 2013.
67. **Invited talk**, “Acoustic Nanometrology using Tabletop Coherent EUV Light,” Semiconductor Research Corporation Annual Review on Nano Materials, Stanford University, Stanford, CA, August 2013.
68. **Invited talk**, 246th ACS National Meeting, Indianapolis, IN, September 2013.
69. **Plenary talk**, Henry C. Kapteyn and Margaret M. Murnane, Frontiers in Optics 2013/ Laser Science XXIX, Orlando, FL, October 2013.
70. **Keynote talk**, Margaret Murnane et al., “Coherent keV X-Rays from Tabletop Femtosecond Lasers and Applications in Nanometrology,” 2013 International Workshop on EUV and Soft X-Ray Sources, Dublin, Ireland, November 2013. Presented by Margaret Murnane.
71. **Invited talk**, “Probing Electron Dynamics in Molecules, Quantum Dots and Materials at the Space-Time Limits Using Coherent Tabletop High Harmonic X-Rays,” FEIS 2013—Workshop on Femtosecond Electron Imaging and Spectroscopy, Key West, Florida, December 2013.
72. **Keynote talk**, “The Quest for the X-Ray Laser: How Diverse Teams lead to Discovery Science and Technology,” MISSION SCIENCE: Global Issues facing Science and Society, Dublin, Ireland, October 11, 2013.
73. **Plenary talk**, Physics of Quantum Electronics (Snowbird, UT, January 2012).
74. **Invited talk**, Winter School on Atomic, Molecular and Optical Physics (Biosphere 2, AZ, January 2012).
75. **Keynote Opening Talk**, Conference on Earth & Energy Research (Golden, CO, February 2012).
76. **Invited talk**, AAAS Annual Meeting (Vancouver, Canada, February 2012).
77. **Invited talk**, American Physical Society March Meeting (Boston, MA, February 2012).
78. **Invited talk**, Black Forest Focus on Soft Matter 7 Multidimensional Optical Spectroscopy and Imaging: Temporal and spatial resolution at the cutting edge, (Black Forest, Germany, March 2012)
79. **Plenary Talk**, Workshop on Frontiers in Ultrafast Optics, National Tsing-Hua Univ., Taiwan, April 2012.
80. **Invited talk**, Institute of Physics Ireland High Flyer Event, Royal College of Surgeons, Dublin, May 2012.
81. **Invited talk**, EuroScience OpenForum Session on Big Science for Small Countries, Dublin, July 2012.
82. **Invited talk**, 21th International Laser Physics Workshop (LPHYS’12), Calgary, Canada, July 2012.
83. **Invited talk**, 4<sup>th</sup> International Symposium on Filamentation, Tucson, AZ, October 2012.
84. **Invited Seminar**, “Capturing the Fastest Dynamics in Materials using Ultrafast Coherent X-Rays,” Department of Physics, Lund University, November 2012. Presented by Murnane.
85. **Plenary talk**, Physics of Quantum Electronics (Snowbird, UT, January 2011).
86. **Plenary talk**, International Conference on Nonlinear Optics, Hawaii, July 2011.
87. **Invited talk**, International Workshop on Surfaces and Interfaces, Kloster Banz, Germany, June 2011. (Presented by Margaret Murnane)
88. **Plenary opening talk**, XXVII International Conference on Photonic, Electronic and Atomic Collisions, Belfast, July 2011.
89. **Plenary opening talk**, Stanford Photonics Research Center, Stanford, September 2011.
90. **Invited talk**, “Attosecond Light and Science at the Time-scale of Electron Motion,” Symposium on the History and Future of Laser Technology, 2010 Annual Meeting of the American Association for the Advancement of Science (AAAS), San Diego CA, February 2010. Presented by Margaret Murnane.
91. **Invited talk**, “Ultrafast molecular and materials dynamics probed by attosecond coherent x-rays,” March Meeting of the American Physical Society, Portland, March 2010. Presented by Margaret Murnane.
92. **Invited talk**, "Materials Dynamics probed by Ultrafast Coherent X-Rays," Gordon Research Conference on Ultrafast Phenomena In Cooperative Systems, Galveston, TX, March 2010. Presented by Margaret Murnane.

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93. **Invited talk**, “Attosecond Science using Extreme Nonlinear Optics,” Special Symposium to celebrate 90th birthday of Nicolaas Bloembergen, University of Arizona, Tucson, AZ, March 2010. Presented by Margaret Murnane.
94. **Invited talk**, APS Division of AMO Physics Annual Meeting, Houston, May (2010). Presented by Margaret Murnane.
95. **Invited talk**, Gordon Research Conference on Multiphoton Processes, Tilton, NH, June 2010. Presented by Margaret Murnane.
96. **Invited talk**, Gordon Research Conference on Radiation Chemistry, Andover, New Hampshire, July 2010. Presented by Margaret Murnane.
97. **Invited talk**, Gordon Research Conference on Vibrational Chemistry, Biddeford, Maine, August 2010. Presented by Margaret Murnane.
98. **Schawlow Prize Lecture**, OSA Annual Meeting, Rochester, NY, October 2010. Presented by Margaret Murnane.
99. **Invited talk**, IEEE Photonics Society Annual Meeting, Denver, CO, October 2010. Presented by Margaret Murnane.
100. **Invited talk**, International Symposium on Frontiers in Quantum Photon Science, Max Planck Hamburg, Germany, November 2010. Presented by Margaret Murnane.
101. **Plenary opening talk**, 2010 Australian Institute of Physics Congress, Melbourne, Australia, December 2010. Presented by Margaret Murnane.
102. **Invited talk**, Physics of Quantum Electronics (Snowbird, UT, January 2009). (Presented by Margaret Murnane)
103. **Invited talk**, "Monitoring Molecular and Materials Dynamics using Ultrafast X-Rays," 2009 Workshop on Wave Function Engineering and Coherent Control in Nanostructured Materials, Los Alamos, February 2009
104. **Invited talk**, Progress on Doubling Session, March Meeting of the American Physical Society, March 2009. (Presented by Margaret Murnane)
105. **Ahmed Zewail Prize talk**, Annual Meeting of the American Chemical Society, Salt Lake City, UT March 2009. (Two talks presented by Margaret Murnane)
106. **Invited talk**, “Observing the Dance of Electrons in Atoms, Molecules and Materials using Coherent Electrons and x-rays,” Graduate Student Symposium, Division of Atomic, Molecular, and Optical Physics of the American Physical Society (DAMOP), Charlottesville, May 2009. Presented by Margaret Murnane.
107. **Invited talk**, DEPS Conference, Boston, June 2009. (Presented by Margaret Murnane)
108. **Invited talk**, Gordon Conference on Atomic Physics, Tilton, NH June, 2009. (Presented by Margaret Murnane)
109. **Invited talk**, “Harnessing Attosecond Science for Extreme Nonlinear Optics,” 18th International Laser Physics Workshop (LPHYS'09), Barcelona, Spain, July 2009. Presented by Margaret Murnane.
110. **Invited talks**, Femtochemistry, Femtobiology, and Femtophysics (Femtochemistry IX), Beijing, China, August, 2009. (Invited talks each presented by Henry Kapteyn and Margaret Murnane)
111. **Invited talk**, Gordon Conference on Quantum Control of Light and Matter, Mt. Holyoke MA, August 2009. (Presented by Margaret Murnane)
112. **Invited talk**, Gordon Conference on Laser Diagnostics, Waterville, NH August 2009. (Presented by Margaret Murnane)
113. **Invited talk**, Margaret Murnane et al., “Coherent X-rays from Ultrafast Lasers, and Applications — Attosecond Science Meets Nonlinear Optics,” 2009 Synchrotron Radiation Center Users’ Meeting, Stoughton WI, October 2009. Presented by Margaret Murnane.

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114. **Invited talk**, “Coherent x-rays from ultrafast lasers, and applications-- attosecond science meets nonlinear optics,” Workshop on Lasers for Extreme Fields and Interactions with Matter (LEFIM), Santa Fe NM, November 2009. Presented by Margaret Murnane.
115. **Invited talk**, Physics of Quantum Electronics (Snowbird, UT, January 2008). (Presented by Margaret Murnane)
116. **Invited Tutorial**, Attosecond Science and Technology, CLEO/QELS, San Jose, May 2008. (Presented by Margaret Murnane)
117. **Invited talk**, 6<sup>th</sup> International Conference on Ultrafast Surface Dynamics 6, Kloster Banz, Germany, July 2008. (Presented by Margaret Murnane)
118. **Invited talk**, International Workshop on Ultrafast X-Ray Science, Dresden Germany, August 2008. (Presented by Margaret Murnane)
119. **Keynote lecture**, 3rd EPS-QEOD Europhoton Conference, Paris, France, August 2008. (Presented by Margaret Murnane)
120. **Plenary lecture**, Sigma Pi Sigma (physics honor society) Congress, Chicago, November 2008. (Presented by Margaret Murnane)
121. **Plenary talk**, “Attosecond Science - Latest Developments and Expanding Opportunities”. Physics of Quantum Electronics (Snowbird, UT, January 2007). (Presented by Margaret Murnane)
122. **After dinner talk**, West Point Academy, APS/AAPT Joint Meeting, April 2007. (Presented by Margaret Murnane)
123. **Invited talk**, Annual Biophysical Society Meeting, Baltimore, MD, March 2007. “How to recruit and retain the best scientists in your department”. (Presented by Margaret Murnane)
124. **Invited talk**, American Physical Society April Meeting, Jacksonville, FL, April 2007. “How to recruit and retain the best scientists in your department”. (Presented by Margaret Murnane)
125. **Edison Lecture**, Naval Research Laboratory, May 2007. (Presented by Margaret Murnane)
126. **Invited talk**, “Attosecond nonlinear optics in high harmonic generation,” Rochester Conference on Coherence and Quantum Optics, Rochester, NY, June 2007. (Presented by Margaret Murnane)
127. **Invited talk**, “Attosecond nonlinear optics and applications,” Summer school on ultrafast x-ray science, Stanford, CA, June 2007. (Presented by Margaret Murnane)
128. **Plenary talk**, 16<sup>th</sup> International Conference on Laser Physics, León, Mexico, August 2007). (Presented by Margaret Murnane)
129. **Invited talk**, “All-optical quasi phase matching of high harmonic generation,” International Conference on Ultrafast Optics and Short Wavelength Generation, Santa Fe, NM, Spetember 2007. (Presented by Margaret Murnane)
130. **Distinguished Lecturer**, University of Arizona, October 2007. (Presented by Margaret Murnane)
131. **Sponer Presidential Lectureship**, Duke University, November 2007. (Presented by Margaret Murnane)
132. **Invited talk**, German Annual AMOP Meeting, Frankfurt, Germany, March 2006. (Presented by Margaret Murnane)
133. **Invited talks**, Daresbury, UK, March 2006. (Presented by Margaret Murnane)
134. **Invited talk**, Gordon Conference on Multiphoton Processes, Tilton, NH June 2006. (Presented by Margaret Murnane)
135. **Invited talk**, University of Sao Paulo, Sao Carlos, Brazil, June 2006. (Presented by Margaret Murnane)
136. **Invited talk**, “Probing vibrational dynamics using electrons rescattered during high-order harmonic generation,” Nizhny, Russia, July 2006. (Presented by Margaret Murnane)

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137. **Invited talk**, “Probing vibrational dynamics using electrons rescattered during high-order harmonic generation,” 15<sup>th</sup> International Laser Physics Workshop (LPHYS'06), Lausanne, Switzerland, August 2006. (Presented by Margaret Murnane)
138. **Invited talk**, Workshop on Attosecond Science, KITP UC Santa Barbara, August 2006. (Presented by Margaret Murnane)
139. **Invited talk**, OSA Annual Meeting, Rochester, NY, October 2006. (Presented by Margaret Murnane)
140. **Invited talk**, Workshop on Nonlinear Optical Processes, Tucson, AZ, October 2006. (Presented by Margaret Murnane)
141. **Invited talk**, “Extreme Nonlinear Optics—Applied Attosecond Science,” APS DAMOP Annual Meeting, Lincoln, NB May 2005. (Presented by Margaret Murnane)
142. **Invited tutorial**, “Extreme Ultraviolet Sources and Applications,” OSA Conference on Lasers and Electro-optics/ Quantum Electronics and Laser Science (CLEO/QELS), Baltimore, MD, May 2005. Presented by Margaret Murnane.
143. **Invited talk**, NEW DEVELOPMENTS IN OPTICS AND RELATED FIELDS: MODERN TECHNIQUES, MATERIALS AND APPLICATIONS , NATO Advanced Study Institute, Ettore Majorana Center Erice, Italy, June 6, 2005. (Presented by Margaret Murnane)
144. **Invited talk**, Gordon Conference on Atomic Physics, Tilton, New Hampshire, June 26 (2005).
145. **Plenary talk**, 20th International Conference on X-ray and Inner-Shell Processes, Victoria, AUSTRALIA, 5–9 July 2005. (Presented by Margaret Murnane)
146. **Plenary talk**, EGAS conference (European Group for Atomic Systems), Dublin, Ireland, August 2005. (Presented by Margaret Murnane)
147. **Invited lecture**, Femtochemistry VII Conference, Washington, DC July 17–22, 2005. (Presented by Margaret Murnane)
148. **Plenary talk**, BA Festival of Science, Dublin, Ireland, September 2005. (Presented by Margaret Murnane)
149. **Invited Talk**, M. Murnane et al., “Probing vibrational dynamics using electrons rescattered during high-order harmonic generation,” 4th International Workshop on Optimal Control of Quantum Dynamics: Theory and Experiment, Ringberg, Bavaria, Germany, December 2005. (Presented by Margaret Murnane)
150. **Invited talk**, “Coherent Control and Chemical Sensing,” Physics of Quantum Electronics (Snowbird, UT, January 2004). (Presented by Margaret Murnane)
151. **Invited Lecture Series**, Institute of Physics, (University College Cork, University College Dublin, Queens University Belfast, Ireland, January 2004. (Presented by Margaret Murnane)
152. **Invited talk**, “Multiphoton and Attosecond EUV Photonics,” American Chemical Society Annual Meeting (March 2004). (Presented by Margaret Murnane)
153. **Invited talk**, “Ultrafast EUV Spectroscopy,” Conference on Molecular Reaction Dynamics (March 2004).
154. **Invited talk**, “Multiphoton and Attosecond EUV Photonics,” Center for Ultracold Atoms, Harvard/MIT (March 2004). (Presented by Margaret Murnane)
155. **Invited talk**, “Ultrafast EUV Photonics and Applications in Spectroscopy,” Workshop on Attoscience, Ringberg, Germany (April 2004 (Presented by Margaret Murnane)
156. **Invited talk**, “How to make Atoms Sing and Molecules Dance – using fast light pulses to observe and control nature,” APS April Meeting (Denver, CO, May 2004). (Presented by Margaret Murnane)
157. **Invited talk**, “Multiphoton and Attosecond EUV Photonics,” CLEO/IQEC, San Francisco, CA (May 2004). (Presented by Margaret Murnane)
158. **Invited lecture**, Roman Baths Summer School on Advanced Glass-Based Nano-Photonics, Newton St. Loe, Bath, United Kingdom, 12-16 July 2004. (Presented by Margaret Murnane)

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159. **Richtmeyer Memorial Lecturer of the AAPT**, Austin, TX, January 2003. (Presented by Margaret Murnane)
160. **Invited talk**, “Ultrafast, coherent, laser and x-ray science,” Western Spectroscopy Annual Meeting, Silamar, CA (January 2003). (Presented by Margaret Murnane)
161. **Invited talk**, “Ultrafast, coherent, laser and x-ray science,” AAAS Annual Meeting, Denver, CO (February 2003). (Presented by Margaret Murnane)
162. **Keynote Speaker**, “How to make atoms sing and molecules dance,” National Council of University Research Administrators,” Denver, CO (April 2003). (Presented by Margaret Murnane)
163. **Invited talk**, “Multiphoton EUV Photonics: Quasi Phase Matching of EUV High Harmonic Generation,” CLEO/QELS Conference, Baltimore, MD (June 2003). (Presented by Ariel Paul)
164. **Invited talk**, Gordon Research Conference on Electronic Spectroscopy and Dynamics, Bates College, Lewiston, ME, July 6–11, 2003. (Presented by Margaret Murnane)
165. **Invited talk**, Gordon Research Conference on Photoions, Photoionization and Photodetachment, Queen's College, Oxford, England, 21–26 September 2003. (Presented by Margaret Murnane)
166. **Invited talk**, “Multiphoton EUV Photonics,” Four Corners Section of the American Physical Society (Arizona, October 2003). (Presented by Margaret Murnane)
167. **Invited talk**, “Multiphoton EUV Photonics,” Annual IEEE LEOS Meeting, October 26–30, Tucson, Arizona (Presented by Margaret Murnane)
168. **Invited talk**, “Table-top EUV Sources,” ALFF Workshop, October 30–31, Argonne National Lab, Illinois (Presented by Margaret Murnane)
169. **Invited talk**, “Attosecond timescale coherent control of EUV generation,” Workshop on Coherent Control (Ringberg, Germany, December 2003). (Presented by Margaret Murnane)
170. **Plenary talk**, “Coherent control techniques in quantum systems,” Winter Quantum Electronics Conference, Snowbird, UT, January 2002. (Presented by Margaret Murnane)
171. **Science Innovation Topical Lecture**, “Can we make atoms sing and molecules dance? Using fast light pulses to observe and control nature,” AAAS Annual Meeting, Boston, MA (2002).
172. **Invited speaker**, Launch event of new Graduate Research Fellowships for Science Foundation Ireland (April 2002) (Presented by Margaret Murnane)
173. **Invited tutorial**, American Physical Society Division of Atomic, Molecular, and Optical Physics, Williamsburg, VA, May 2002. (Presented by Margaret Murnane)
174. **Invited talk**, Gordon Conference on Nonlinear Optics, New Hampshire, July 2002. (Presented by Margaret Murnane)
175. **Invited talk**, “Nonlinear Optics for Coherent EUV Generation,” International Workshop on Photoionization, IWP2002, SPring-8, Japan, August 2002. (Presented by Margaret Murnane)
176. **Keynote Speaker**, “Multiphoton Photonics,” OPTO-IRELAND, Galway, Ireland, September 2002. (Presented by Margaret Murnane)
177. **Invited talk**, AIP Industrial Physics Forum, October 2002. (Presented by Margaret Murnane)
178. **Invited talk**, Optical Society of America Annual Meeting, October 2002. (Presented by Margaret Murnane)
179. **Invited talk**, “EUV Photonics,” Air Force Workshop on Strong Field Physics, December 2002.
180. **Invited talk**, “Direct observation of surface chemistry using ultrafast x-ray pulses,” Winter Quantum Electronics Conference, Snowbird, UT, January 2001. (Presented by Margaret Murnane)
181. **Invited talk**, “Optics – where does it belong?” AAPT Meeting, San Diego, CA, January 2001.
182. **Invited talk**, “Feedback Optimization of Coherent X-Ray Generation using Shaped X-Ray Pulses,” March Meeting of the American Physical Society, Seattle, WA, March 2001. (Presented by Margaret Murnane)

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183. **Invited talk**, “Generation of coherent, ultrafast, EUV pulses,” VUV 2001, Trieste, July 2001. (Presented by Margaret Murnane)
184. **Invited talk**, “Coherent Control of Extreme Nonlinear Systems,” ACMS Workshop, Cork, Ireland, September 2001. (Presented by Margaret Murnane)
185. **Invited talk**, International Workshop on Optimum Control of Quantum Dynamics: Theory and Experiment, Tegernsee, Germany, December 2001. (Presented by Margaret Murnane)
186. **Invited talk**, APS Topical Conference on Atomic Processes in Plasmas, Reno, NM, March 2000.
187. **Invited talk**, Advanced Accelerator Concepts Workshop, Santa Fe, NM, June 2000. (Presented by Margaret Murnane)
188. **Invited**, M. Murnane et al., “Extreme Nonlinear Optics,” DOE Workshop, MD, October 1998 and January 1999.
189. **Invited Centennial Talk**, M. Murnane et al., “New Physics with Femtosecond Lasers,” APS Centennial Symposium, Atlanta, GA, March 1999.
190. **Invited talk**, M. Murnane et al., “Extreme Nonlinear Optics,” Gordon Conference on Atomic Physics, July 1999.
191. **Plenary Speaker**, M. Murnane et al., “Extreme Nonlinear Optics,” OSA Conference on Generation and Application of Short Wavelength Sources, Potsdam, Germany, July 1999.
192. **Invited talk**, M. Murnane et al., “Ultrafast Coherent Soft-X-Ray Sources,” International Conference on X-Ray Processes, Chicago, IL August 1999.
193. **Invited talk**, M. Murnane et al., “Phase-matching at short wavelengths,” International Conference on Ultrafast Spectroscopy, Taipei, Taiwan, October 1999.
194. **Plenary Speaker**, M. Murnane et al., “Extreme Nonlinear Optics,” Israeli Optical Society, Tel Aviv, Israel, November 1999.
195. **Invited talk**, LEOS Annual Meeting, San Jose, CA, November 1999. (Presented by Margaret Murnane)
196. **Invited**, M. Murnane et al., “Extreme Nonlinear Optics: Generation of Coherent X-Rays below 2.7nm,” XIth International Conference on Ultrafast Phenomena, Garmish-Partenkirchen, Germany, July 1998.
197. **Invited**, M. Murnane et al., “Generation of Coherent, Femtosecond Light in the UV and X-Ray Regions,” SPIE Photonics West, San Jose, CA, January 1998. (Presented by Margaret Murnane)
198. **Invited**, M. Murnane et al., “Femtosecond Coherent X-Rays below 2.7nm,” ICAP ‘98 (International Conference on Atomic Physics), Windsor, Canada, August 1998. (Presented by Margaret Murnane)
199. **Invited**, M. Murnane et al., “Ultrahigh E-fields and X-Rays,” Winter Colloquium on Quantum Electronics, Snowbird, UT, January 1998. (Presented by Margaret Murnane)
200. **Prize talk**, “The Science of Ultrashort Pulse Generation in the Visible and X-Ray Regions.” American Physical Society/AAPT Joint Meeting, Washington, DC 1997. (Presented by Margaret Murnane)
201. **Invited talk**, “Generation and Applications of Coherent Soft-X-Rays,” European Femtochemistry Conference, Lund, Sweden 1997. (Presented by Margaret Murnane)
202. **Invited talk**, “Femtosecond superhigh, supershort, harmonics,” Quantum Electronics and Laser Science Conference, QELS '97, Baltimore, MD, May 1997. (Presented by Margaret Murnane)
203. **Invited talk**, “Attosecond Pulse Generation using High Harmonic Emission,” International Conference on Superstrong Fields in Plasmas, Varenna, Italy, August 1997. (Presented by Margaret Murnane)
204. **Invited talk**, C. Durfee et al., “Guided-Wave Phase-Matching in Hollow-Core Fibers,” Conference on Ultrafast Optics, Monterey, CA, August 1997. (Presented by Margaret Murnane)
205. **Invited talk**, “Enhanced high-harmonic generation using 25 fs laser pulses,” International Quantum Electronics Conference, IQEC, Sydney Australia 1996. (Presented by Margaret Murnane)

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206. **Invited talk**, “Generation of 12 fs UV pulses by third-harmonic generation in air.” Nonlinear Optics: Materials, Fundamentals, and Applications, Maui, HI, July 1996. (Presented by Margaret Murnane)
207. **Invited talk**, “XUV High-harmonic generation using 25 fs laser pulses.” Quantum Electronics and Laser Science Conference, QELS '96, Anaheim, CA May 1996. (Presented by Margaret Murnane)
208. **Invited talk**, SPIE Annual Symposium OE/LASE, San Jose, CA, February 1995. (Presented by Jianping Zhou) “Generation of 26 fs, 2 TW pulses near the gain-narrowing limit in Ti:sapphire”
209. **Invited Tutorial**, APS March Meeting, San Jose, CA, March 1995. “Advances in Femtosecond Lasers.”
210. **Invited Talk**, NSF Forum on Optical Science and Engineering, SPIE Annual Meeting, San Diego, CA 1995. “Advances in Femtosecond Laser Technology” (Presented by Margaret Murnane)
211. **Plenary Talk**, Australian Optical Society Annual Meeting, Brisbane, Australia, July 1995. “Advances in Femtosecond Lasers.” (Presented by Margaret Murnane)
212. **Invited talk**, Gordon Conference on Nonlinear Optics, July 1995. “Dispersive Limits of Ultrashort-Pulse Generation.” (Presented by Margaret Murnane)
213. **Invited talk**, Euroconference on Generation and Application of Ultrashort X-Ray Pulses II, Pisa, Italy 1995. “High Intensity Laser-Matter Interactions with sub-30fs Optical Pulses.” (Presented by Margaret Murnane)
214. **Invited talk**, International Conference on Lasers and Applications, Cairo, Egypt, 1994. “Ultrashort-Pulse Lasers.”
215. **Invited talk**, Optical Society of America Annual Meeting, Dallas, TX (1994). “Review of Ultrashort Pulse Generation in Solid-State Lasers - Capabilities and Limitations.” (Presented by Margaret Murnane)
216. **Invited talk**, SPIE Annual International Symposium on Optical and Optoelectronic Applied Science and Engineering, Los Angeles, CA, January 1993. “Ultrashort-Pulse Solid-State Lasers.”
217. **Invited talk**, Workshop on Short Scale-length Plasmas, Ann Arbor, MI, April 1993. “Applications of Ultrashort X-Ray Pulses.” (Presented by Margaret Murnane)
218. **Invited talk**, OSA Annual Meeting, Toronto, Canada, October 1993. “Generation and Amplification of Ultrashort Light Pulses.” (Presented by Margaret Murnane)
219. **Invited talk**, Oregon Center for Advanced Technology Education, March 1992. “High-Power Lasers and Applications.”
220. **Invited talk**, American Physical Society March Meeting, Indianapolis, IN (1992). “Intense femtosecond x-ray emission from waveguides and clusters.”
221. **Invited talk**, Gordon Conference on Nonlinear Optics, Wolfboro, NH, July 1991. “Generation of efficient sub-picosecond x-ray sources.”
222. **Invited talk**, APS Meeting of the Division of Plasma Physics, Cincinnati, OH, November 1990. “High-density plasmas—generation of efficient sub-picosecond x-ray sources.”
223. **Invited talk**, Workshop on Highly Charged Ions, Lawrence Berkeley Laboratory, Berkeley, CA, March 1989. “Sub-picosecond laser-produced plasmas.”
224. **Invited talk**, APS Meeting of the Division of Atomic, Molecular, and Optical Physics, Windsor, Ontario, Canada, May 1989.
225. **Invited talk**, SPIE 33rd Annual International Symposium on Optical and Optoelectronic Applied Science and Engineering, San Diego, CA, August 1989. “Generation and Measurement of Sub-Picosecond X-Ray Pulses.”
226. **Invited talk**, OSA Meeting on Short Wavelength Coherent Radiation: Generation and Applications, Cape Cod, MA, September 1988. “X-Ray Emission Studies of Sub-Picosecond Laser Produced Plasmas.”

### Colloquia presented by M. Murnane (reverse chronological order)

1. FIP Virtual Seminar, Fitzpatrick Inst. For Photonics, Duke University, March 2021



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2. Colloquium, Freie Universität Berlin, February 2021 (remote)
3. Colloquium, UC Irvine, December 2020 (remote).
4. Colloquium, The Institute of Photonic Sciences (ICFO), Barcelona, Spain, January 2020.
5. Colloquium, New York University Physics, April 2019
6. Colloquium, University of California Davis Chemistry, April 2019
7. Physics Colloquium, University of California Berkeley, November 2017
8. AMO Seminar, University of California Berkeley, November 2017
9. Bethe Lecture, Cornell University, October 2017
10. Wilson Lecture, University of California San Diego, 2017
11. Chapman Lecture, Rice University, February 2016.
12. Colloquium, Rice University, February 2016.
13. Colloquium, Rutgers University, February 2016.
14. Colloquium, University of Indiana Physics, February 2015.
15. Colloquium, Johns Hopkins University Physics, February 2015.
16. Colloquium, University of Southern California Physics, February 2015.
17. UCLA Arman Physics Colloquium, February 2015.
18. **Marker Lectures**, Penn State University, 2014.
19. **Small** Lecture, College of William and Mary, March 2014.
20. **Irons** Public Lecture, Rutgers University, March 2014.
21. Colloquium, Princeton University Mechanical Engineering, April 2014.
22. Colloquium, Cornell University Applied Physics, April 2014.
23. Colloquium, MIT Chemistry, May 2014.
24. Colloquium, CUNY Physics, May 2014.
25. Colloquium, Department of Physics, University of Groningen, Netherlands, January 2013.
26. Colloquium, Colorado State University, April 2013.
27. **Bernstein** Lecture, Chemistry, UCLA, April 2013.
28. **Bertman** Lecture, Physics, Wesleyan University, April 2013.
29. McElvain Lecture, University of Wisconsin Chemistry Department, February 2012.
30. Colloquium, IAMS, National Taiwan University, March 2012.
31. Vasser-Woolley Seminar in Chemistry, Georgia Tech, April 2012.
32. Yale Rosenthal Lecture, Yale April 2012.
33. Colloquium, Institute of Atomic and Molecular Science, National Taiwan University, Taipei, April 2012.
34. Physics Colloquium, University of Ottawa, September 2012.
35. Colloquium, University of Minnesota, May 2011.
36. Colloquium, Northwestern University, June 2011. Presented by Margaret Murnane.
37. Colloquium, Louisiana State University, September 2011.
38. Colloquium, Stanford University, November 2011.
39. Colloquium, UCLA, November 2011.
40. Physical Chemistry Colloquium, UC Berkeley, January 2010.
41. Colloquium, Fermilab, IL, March 2010.
42. Colloquium, UC San Diego, June 2010.
43. Colloquium, Frontiers in Chemistry Series, Wayne State University, September 2010.
44. Colloquium, Physics, University of Madison, March 2009.
45. Colloquium, Physics, MIT, March 2009.

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46. Colloquium, Chemistry), University of Washington, April 2009.
47. Colloquium, Technical University of Vienna, Vienna Austria, April 2009.
48. Condensed Matter Seminar, UC Berkeley, May 2009.
49. Seminar, Dept. of Physics, University of Oxford, July 2009.
50. Colloquium, BYU, January 2008.
51. **Munushian Lecturer**, University of Southern California, March 2008.
52. Colloquium, Penn State University, April 2008.
53. **Malmstrom Lecturer**, Hamline University, May 2008.
54. Basic Energy Sciences Invited Speaker Series, Sandia National Labs, September 2008).
55. Colloquium (Physics), University of Washington, November 2008.
56. Invited talk (Chemistry) Temple University, November 2008.
57. Colloquium, Ecole Polytechnique de Montreal, February 2007.
58. Colloquium, University of Richmond, April 2007.
59. Lecture Series: Distinguished Women in Science and Engineering , Colorado State University, October 2007.
60. Distinguished Women in Science and Engineering, University of Arizona, October 2007.
61. **Sponer Presidential Lectureship**, Duke University, November 2007
62. Colloquium, UC Santa Barbara, January 2006.
63. Colloquium, IBM Yorktown Hights, April 2006.
64. Colloquium, Princeton University, February 2005.
65. Colloquium, Institute of Physics Lecture Series, University College Dublin, January 2004.
66. Colloquium, Institute of Physics Lecture Series, University College Cork, January 2004.
67. Colloquium, Institute of Physics Lecture Series, Queen's College Belfast, January 2004.
68. Colloquium, University of Southern California, February 2004.
69. Colloquium, Center for Ultracold Atoms, MIT, April 2004.
70. Colloquium, The Ohio State University, May 2004.
71. Colloquium, Northwestern University, November 2004.
72. Colloquium, Harvard University, November 2004.
73. Colloquium, Trinity College Dublin, March 2003.
74. Colloquium, UC Irvine, May 2003.
75. Colloquium, Stanford University, April 2002
76. Colloquium, Sonoma State University, April 2002
77. Colloquium, Kansas State University, September 2002.
78. Colloquium, University of Chicago, February 2001.
79. Colloquium, University of San Diego, February 2001.
80. Colloquium, Harvard University, March 2001.
81. Colloquium, Colorado State University, March 2001.
82. Colloquium, Yale University, May 2001.
83. Seminar, MIT, May 2001.
84. Colloquium, Vanderbilt University, November 2001.
85. Colloquium, Reed College, November 2001.
86. Colloquium, Colorado School of Mines, January 2000.
87. Colloquium, College of William and Mary, April 2000.
88. Colloquium, Temple University, April 2000
89. Colloquium, University of Arizona, October 2000.

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90. Colloquium, University of Michigan, October 2000.
91. Colloquium, Caltech, April 1999.
92. Seminar, Princeton University, April 1999.
93. Colloquium, University of Toronto, February 1998.
94. Colloquium, University of Michigan, February 1998.
95. Colloquium, University of Rochester, February 1998.
96. Colloquium, Bryn Mawr College, March 1998.
97. Colloquium, Purdue University (Physics), September 1998.
98. Colloquium, University of California at Berkeley, September 1998.
99. Seminar, MIT, November 1998.
100. Colloquium, University of Minnesota, May 1997.
101. Colloquium, University of Connecticut, June 1997.
102. Colloquium, University of Illinois at Urbana-Champaign, October 1997.
103. Colloquium, Argonne National Laboratory, October 1997.
104. Colloquium, Williams College, October 1997.
105. Colloquium, University of Groningen, Holland, December 1997.
106. Colloquium, Ohio State University, April 1996.
107. Colloquium, Harvard University, April 1996.
108. Seminar, Purdue University (Engineering), April 1996.
109. Colloquium, Swarthmore College, October 1996.
110. Colloquium, University of Maryland, February 1995.
111. Colloquium, University of Michigan, Ann Arbor, MI, March 1995.
112. Seminar, Lawrence Livermore National Laboratory, March 1995.
113. Colloquium, Utah State University, April, 1995.
114. Seminar, University of Washington, May 1995.
115. Colloquium, State University of New York at Stony Brook, October 1995.
116. Colloquium, University of Texas at Austin, November 1995.
117. Colloquium, University of Michigan, Ann Arbor, MI, January 1994.
118. Invited talk, American Association of University Women, Pullman, WA, February, 1993.
119. Quantum Electronics Seminar, Stanford University, Stanford, CA, January 1993.
120. Colloquium, Oregon State University, Spring 1991.
121. Departmental Colloquium, University of Idaho, Moscow, ID 1991.
122. Condensed Matter Physics Seminar, University of California at Davis, May 1990.
123. Plasma Physics Seminar, University of California at Los Angeles, May 1990.
124. Colloquium, University of Maryland, 1990.
125. Seminar, SUNY Stony Brook, 1990.