

**Philip H. Bucksbaum**  
**Curriculum Vita**

**Faculty Annual Report 2019-20 section listing accomplishments (papers, talks, service activities) for 2019-2020 are on the next and following pages pp. FAR-1 to FAR-10**

**Education:**

1975, A.B. magna cum laude in Physics, Harvard University.  
1978, M.A. in Physics, University of California, Berkeley, CA.  
1980, Ph.D. in Physics, University of California, Berkeley, CA.

**Professional Experience:**

8/80-10/81 Post-doctoral research at Lawrence Berkeley Laboratories, Berkeley, CA 94720, under the supervision of Eugene Commins.  
11/81-11/82 Post-doctoral research at AT&T Bell Laboratories, Holmdel, NJ 07733, with Jeffrey Bokor.  
11/82-8/90 Principal Investigator Member of Technical Staff, Physics Research Division, AT&T Bell Laboratories, Murray Hill, NJ 07974.  
1/89-8/90 Adjunct Associate Professor of Applied Physics, Columbia University, New York, NY 10027.  
1996: Miller Visiting Professor of Physics and Electrical Engineering, University of California, Berkeley, CA 94720.  
1997: Visiting Research Investigator, Service des Photons, Atomes et Molecules, Centre d'Etudes de Saclay, Commissariat a l'Energie Atomique. Gif-Sur-Yvette 91191 France.  
1990-1998: Professor of Physics, University of Michigan.  
1998-2005: Otto Laporte Collegiate Professor, College of Literature, Science, and the Arts, University of Michigan  
2001-2005: Director of FOCUS, the Center for Frontier Optical Coherent Ultrafast Science, (on leave 8/04-7/05);  
2004-2005: Visiting Scholar, Department of Applied Physics and SSRL, Stanford University  
2005-2006: Peter Frankin Distinguished University Professor, University of Michigan  
2006-present: Professor of Physics, Applied Physics, and the Stanford Synchrotron Radiation Laboratory, Stanford University  
2006-2019: Director of the Stanford PULSE Institute, Stanford University and SLAC  
2007-2010: Chair, Department of Photon Science, SLAC, Stanford University  
2009-present: Marguerite Blake Wilbur Professor in Natural Science, Stanford University.  
2013: Visiting Professor of Physics, Weizmann Institute of Science, Rehovot, Israel

***2019-2020 Chairmanships and other leadership positions:***

President of the American Physical Society (2020). Elected to the Presidential Line of the American Physical Society (VP in 2018, President-Elect in 2019, President in 2020, Past President in 2021) This involves membership or chairmanship on about six additional standing committees of APS: PPC, POPA, Fellowships, Finance, Board, Board Executive Committee, Awards, Council Steering Committee, etc.

***2019-2020 Other significant professional service outside of Stanford:***

Member, Science Advisory Committee for the Shanghai Institute for Optics and Fine Mechanics of the Chinese Academy of Sciences (2020-2023)

Member, Department Review Committee for the Institute of Optics, University of Rochester, (2020)

Member, Science Advisory Committee for the Laboratory for Laser Energetics, Rochester, NY. (2020)

Member of the Math and Physical Sciences Advisory Committee for the National Science Foundation (2013-19)

Member of the Weizmann Institute of Science International Board of Directors (2012-present)

Member of the Science Advisory Committee for the Weizmann Institute of Science

Member of the Max Planck Institute for Quantum Optics Science Advisory Committee (2012-present)

Member, Steering Committee for the National Photonics Initiative (2014-present)

***Recent Awards and Recognition:***

Norman F. Ramsey Prize in Atomic, Molecular and Optical Physics, and in Precision Tests of Fundamental Laws and Symmetries (2020). Citation: "For pioneering explorations of ultrafast strong field physics from the optical to the X-ray regime."

***Physics, Applied Physics, and Photon Science Department service and committees:******2019-2020***

Director of Graduate Studies, Department of Applied Physics (2020)

Member of the Space Committee, Physics Department (2020)

Member of the Applied Physics Graduate Admissions Committee in Applied Physics (2020)

Member, Physics Graduate Admissions Committee (2018-20)

Member, Applied Physics Faculty Search Committee (2018-19)

***Ph.D. Students who graduated this year (2019-2020)***

Matthew Ware

Chelsea Liekhus-Schmaltz

Gregory McCracken

Andrei Kamalov

***Other Ph.D. Committee Memberships (2019-2020)***

Siqi Li,  
Hanzhe Liu  
James MacArthur  
Yanwen Sun  
Kathryn Ledbetter  
Monika Williams  
Mathew Britton

***Continuing Ph.D. Students (2019-2020)***

Anna Wang  
Jordan O'Neal  
Kareem Hegazy  
Nick Werby  
Ian Gabalski  
Andrew Howard

***Postdoctoral Associates (2019-2020)***

Andreas Kaldun, 2015-2018  
Giulio Vampa, 2016-present  
Ruaridh Forbes, 2019-present  
Taran Driver, 2018-present  
Stephan Kuschel, 2018-present

***Other graduate student or Postdoctoral advisees (2019-2020):***

Anthony Ho  
Yanwen Sun  
Wil Kao  
Xuxin Huang  
Jiachen Yu  
Ishita Kemeny

***Stanford University courses taught (2019-2020):***

Fall 2018: Physics 290  
Winter 2019: Applied Physics 384  
Fall 2019: Physics 290

***Research Funding (2019-2020):***

I have several areas of interest in ultrafast AMO Science. Research in strong field laser-atom interactions, in attosecond processes in atoms and molecules, and in coherent x-ray diffraction for ultrafast molecular movies is funded by the Department of Energy through PULSE and SLAC. Research on Quantum Control is funded by the National Science Foundation through PULSE. Research on solid-state HHG is funded by the Keck Foundation. Research on strong-field QED is just beginning, with no current funding but interest expressed by the Moore Foundation and by the Plasma Physics program at DOE.

***Funding Sources (2019-2020):***

Strong Field Quantum Control, renewed in 2015 and in 2018

Source of Support: National Science Foundation

Original Award Amount: \$1,685,000, 05/15/2005-07/31/2010

Additional Award Amount: \$1,667,000 08/01/2010-07/31/2015

Additional Award Amount: \$825,000 8/01/2015-7/31/2018

Additional Award Amount: \$1,400,000 08/01/2018-07/31/2023

PULSE Institute (Includes only the Ultrafast Chemical Science FWP that I lead, and not including one-time allocations)

Source of Support: Department of Energy

Current Total Award Amount: \$12,300,000 10/01/2019-09/30/2021. This amount does not include supplements received annually for specific additional scope of work.

Time-resolved Serial Femtosecond X-ray Kinetic Crystallography of the Ribosome Complexes

Source of Support: Hauptman-Woodward Medical Research Institute

Total Award Amount: \$120,000 10/01/16 - 09/30/18.

Watching Chemical and Material Processes on the Atomic-scale in Space and Time (Co-PI. The PI is David Reis)

Source of Support: Keck Foundation

Total Award Amount: \$1,000,000 10/01/2018-12/31/2020

Probing Strong-Field Effects in QED (Co-PI with David Reis)

Source of Support: Department of Energy (FES)

Current Total Award Amount: \$930,000 10/01/2018-09/30/2021

### ***Articles published in 2019-2020***

*Archival refereed journals or the ArXiv:*

1. O'Neal JT, Champenois EG, Oberli S, Obaid R, Al-Haddad A, Barnard J, Berrah N, Coffee R, Duris J, Galinis G, Garratt D, Glowonia JM, Haxton D, Ho P, Li S, Li X, MacArthur J, Marangos JP, Natan A, Shivaram N, Slaughter DS, Walter P, Wandel S, Young L, Bostedt C, Bucksbaum PH, Picón A, Marinelli A, Cryan JP (2020) Electronic Population Transfer via Impulsive Stimulated X-Ray Raman Scattering with Attosecond Soft-X-Ray Pulses. *Physical Review Letters*, 125(7):073203. <https://doi.org/10.1103/PhysRevLett.125.073203>
2. McCracken GA, Bucksbaum PH (2020) Ionization induced dynamic alignment of water. *The Journal of Chemical Physics*, 152(13):134308. <https://doi.org/10.1063/5.0002877>
3. Liu H, Vampa G, Zhang JL, Shi Y, Buddhiraju S, Fan S, Vuckovic J, Bucksbaum PH, Reis DA (2020) Beating absorption in solid-state high harmonics. *Communications Physics*, 3(1):1–6. <https://doi.org/10.1038/s42005-020-00472-5>
4. Liekhus-Schmaltz C, Zhu X, McCracken GA, Cryan JP, Martinez TJ, Bucksbaum PH (2020) Strictly non-adiabatic quantum control of the acetylene dication using an infrared field. *The Journal of Chemical Physics*, 152(18):184302. <https://doi.org/10.1063/5.0007058>

5. Kierspel T, Morgan A, Wiese J, Mullins T, Aquila A, Barty A, Bean R, Boll R, Boutet S, Bucksbaum P, Chapman HN, Christensen L, Fry A, Hunter M, Koglin JE, Liang M, Mariani V, Natan A, Robinson J, Rolles D, Rudenko A, Schnorr K, Stapelfeldt H, Stern S, Thøgersen J, Yoon CH, Wang F, Küpper J (2020) X-ray diffractive imaging of controlled gas-phase molecules: Toward imaging of dynamics in the molecular frame. *The Journal of Chemical Physics*, 152(8):084307. <https://doi.org/10.1063/1.5133963>
6. Kamalov A, Wang AL, Bucksbaum PH, Haxton DJ, Cryan JP (2020) Electron correlation effects in attosecond photoionization of  $\text{CO}_2$ . *Physical Review A*, 102(2):023118. <https://doi.org/10.1103/PhysRevA.102.023118>
7. Gabalski I, Ware M, Bucksbaum P (2020) X-ray scattering signatures of early-time accelerations in iodine dissociation. *Journal of Physics B: Atomic, Molecular and Optical Physics*, <https://doi.org/10.1088/1361-6455/abc22a>
8. Forbes R, Allum F, Bari S, Boll R, Brouard M, Bucksbaum P, Ekanayake N, Erk B, Howard A, Johnsson P, Lee J, Manschwetus B, Mason R, Passow C, Peschel J, Rivas D, Roerig A, Rouzee A, Vallance C, Ziaee F, Rolles D, Burt M (2020) Time-resolved site-selective imaging of predissociation and charge transfer dynamics: the CH<sub>3</sub>I B-band. *Journal of Physics B: Atomic, Molecular and Optical Physics*, <https://doi.org/10.1088/1361-6455/abb1fd>
9. Duris J, Li S, Driver T, Champenois EG, MacArthur JP, Lutman AA, Zhang Z, Rosenberger P, Aldrich JW, Coffee R, Coslovich G, Decker F-J, Glowonia JM, Hartmann G, Helml W, Kamalov A, Knurr J, Krzywinski J, Lin M-F, Marangos JP, Nantel M, Natan A, O'Neal JT, Shivaram N, Walter P, Wang AL, Welch JJ, Wolf TJA, Xu JZ, Kling MF, Bucksbaum PH, Zholents A, Huang Z, Cryan JP, Marinelli A (2020) Tunable isolated attosecond X-ray pulses with gigawatt peak power from a free-electron laser. *Nature Photonics*, 14(1):30–36. <https://doi.org/10.1038/s41566-019-0549-5>
10. Driver T, Li S, G. Champenois E, Duris J, Ratner D, J. Lane T, Rosenberger P, Al-Haddad A, Averbukh V, Barnard T, Berrah N, Bostedt C, H. Bucksbaum P, Coffee R, F. DiMauro L, Fang L, Garratt D, Gatton A, Guo Z, Hartmann G, Haxton D, Helml W, Huang Z, LaForge A, Kamalov A, F. Kling M, Knurr J, Lin M-F, A. Lutman A, P. MacArthur J, P. Marangos J, Nantel M, Natan A, Obaid R, T. O'Neal J, H. Shivaram N, Schori A, Walter P, Wang AL, A. Wolf TJ, Marinelli A, P. Cryan J (2020) Attosecond transient absorption spooktscopy: a ghost imaging approach to ultrafast absorption spectroscopy. *Physical Chemistry Chemical Physics*, 22(5):2704–2712. <https://doi.org/10.1039/C9CP03951A>
11. Bucksbaum PH, Ware MR, Natan A, Cryan JP, Glowonia JM (2020) Characterizing Multiphoton Excitation Using Time-Resolved X-ray Scattering. *Physical Review X*, 10(1):011065. <https://doi.org/10.1103/PhysRevX.10.011065>
12. Ware MR, Glowonia JM, Al-Sayyad N, O'Neal JT, Bucksbaum PH (2019) Characterizing dissociative motion in time-resolved x-ray scattering from gas-phase diatomic molecules. *Physical Review A*, 100(3):033413. <https://doi.org/10.1103/PhysRevA.100.033413>

13. Ware Matthew R., Glowonia James M., Natan Adi, Cryan James P., Bucksbaum Philip H. (2019) On the limits of observing motion in time-resolved X-ray scattering. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 377(2145):20170477. <https://doi.org/10.1098/rsta.2017.0477>
14. Vampa G, Vasilyev S, Liu H, Mirov M, Bucksbaum PH, Reis DA (2019) Characterization of high-harmonic emission from ZnO up to 11 eV pumped with a Cr:ZnS high-repetition-rate source. *Optics Letters*, 44(2):259–262. <https://doi.org/10.1364/OL.44.000259>
15. Chakraborti P, Senfftleben B, Kettle B, Teitelbaum SW, Bucksbaum PH, Ghimire S, Hastings JB, Liu H, Nelson S, Sato T, Shwartz S, Sun Y, Weninger C, Zhu D, Reis DA, Fuchs M (2019) Multiple Fourier Component Analysis of X-ray Second Harmonic Generation in Diamond. *arXiv:1903.02824 [physics]*, <http://arxiv.org/abs/1903.02824>
17. Adams B, Aeppli G, Allison T, Baron AQR, Bucksbaum P, Chumakov AI, Corder C, Cramer SP, DeBeer S, Ding Y, Evers J, Frisch J, Fuchs M, Grübel G, Hastings JB, Heyl CM, Holberg L, Huang Z, Ishikawa T, Kaldun A, Kim K-J, Kolodziej T, Krzywinski J, Li Z, Liao W-T, Lindberg R, Madsen A, Maxwell T, Monaco G, Nelson K, Palffy A, Porat G, Qin W, Raubenheimer T, Reis DA, Röhlberger R, Santra R, Schoenlein R, Schünemann V, Shpyrko O, Shvyd'ko Y, Shwartz S, Singer A, Sinha SK, Sutton M, Tamasaku K, Wille H-C, Yabashi M, Ye J, Zhu D (2019) Scientific Opportunities with an X-ray Free-Electron Laser Oscillator. *arXiv:1903.09317 [physics]*, <http://arxiv.org/abs/1903.09317>
18. Wolf TJA, Paul AC, Folkestad SD, Myhre RH, Cryan JP, Berrah N, Bucksbaum PH, Coriani S, Coslovich G, Feifel R, Martinez TJ, Moeller SP, Mucke M, Obaid R, Plekan O, Squibb RJ, Koch H, Gühr M (2020) Transient Resonant Auger-Meitner Spectra of Photo-excited Thymine. *arXiv:2009.14355 [physics]*, <http://arxiv.org/abs/2009.14355>
19. Werby N, Natan A, Forbes R, Bucksbaum P (2020) The Sub-Cycle Electron Momentum Spectrum in Strong-Field Ionization. *arXiv:2008.09712 [physics]*, <http://arxiv.org/abs/2008.09712>
20. Meuren S, Bucksbaum PH, Fisch NJ, Fiúza F, Glenzer S, Hogan MJ, Qu K, Reis DA, White G, Yakimenko V (2020) On Seminal HEDP Research Opportunities Enabled by Colocating Multi-Petawatt Laser with High-Density Electron Beams. *arXiv:2002.10051 [hep-ph, physics:physics]*, <http://arxiv.org/abs/2002.10051>
21. Haber J, Kaldun A, Teitelbaum SW, Baron AQR, Bucksbaum PH, Fuchs M, Hastings JB, Inoue I, Inubushi Y, Krebs D, Osaka T, Santra R, Shwartz S, Tamasaku K, Reis DA (2020) Nonlinear resonant X-ray Raman scattering. *arXiv:2006.14724 [physics, physics:quant-ph]*, <http://arxiv.org/abs/2006.14724>

### **Conference Proceedings in 2019-2020:**

22. Werby N, Natan A, Forbes R, Lucchese RR, Bucksbaum P (2020) Disentangling Rescattering Interference Structures in High Fidelity Laser-Induced Photoelectron Imaging. *Bulletin of the American Physical Society*, Volume 65, Number 4 <https://meetings.aps.org/Meeting/DAMOP20/Session/E01.39>

23. Ware M, Glowonia JM, Sanchez D, Bucksbaum P (2020) APS -51st Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics - Event - De novo production of polyatomic molecular movies. *Bulletin of the American Physical Society*, Volume 65, Number 4 <http://meetings.aps.org/Meeting/DAMOP20/Session/D04.1>
24. Wang A, Kamalov A, Bucksbaum P, Cryan J, Serov V, Bray A, Kheifets A (2020) Investigation of coupled nuclear and electronic motion in H<sub>2</sub> photoionization. *Bulletin of the American Physical Society*, Volume 65, Number 4 <https://meetings.aps.org/Meeting/DAMOP20/Session/K01.42>
25. Howard A (2020) Dynamic Alignment of Water in the Few-Cycle Limit. *Bulletin of the American Physical Society*, <http://meetings.aps.org/Meeting/DAMOP20/Session/E01.40>
26. Gabalski I, Ware M, Bucksbaum P (2020) Observation of non-ballistic dissociation trajectories in iodine pump-probe x-ray scattering experiments. *Bulletin of the American Physical Society*, Volume 65, Number 4 <https://meetings.aps.org/Meeting/DAMOP20/Session/N04.7>
27. Forbes R, Rolles D, Driver T, Burt M, Brouard M, Bucksbaum P (2020) Time resolved Coulomb explosion imaging of multi-channel non-adiabatic photodissociation dynamics. *Bulletin of the American Physical Society*, Volume 65, Number 4 <https://meetings.aps.org/Meeting/DAMOP20/Session/S04.4>
28. Cheng C, Forbes R, Howard A, Bucksbaum P, Weinacht T (2020) Coincidence measurements of channel resolved above threshold ionization of D<sub>2</sub>O molecule. *Bulletin of the American Physical Society*, Volume 65, Number 4 <https://meetings.aps.org/Meeting/DAMOP20/Session/J04.3>
29. Bucksbaum P (2020) Ultrafast strong field AMO Physics. *Bulletin of the American Physical Society*, <http://meetings.aps.org/Meeting/DAMOP20/Session/B01.3>
30. McCracken G, Liekhus-Schmaltz C, Bucksbaum P (2019) Dynamic Alignment in Enhanced Ionization of Water. *Bulletin of the American Physical Society*, <http://meetings.aps.org.stanford.idm.oclc.org/Meeting/DAMOP19/Session/E01.66>
31. Ware MR (2019) From Time-resolved to Frequency-resolved X-ray Scattering. <https://searchworks.stanford.edu/view/13133017>
32. Ware M, Glowonia JM, Al-Sayyad N, Bucksbaum P (2019) Following population transfer in a pump-dump experiment using time-resolved x-ray scattering. *Bulletin of the American Physical Society*, Volume 64, Number 4 <http://meetings.aps.org/Meeting/DAMOP19/Session/N03.4>
33. Ware (2019) APS -50th Annual Meeting of the APS Division of Atomic, Molecular and Optical Physics APS Meeting - Event - Following population transfer in a pump-dump experiment using time-resolved x-ray scattering. *Bulletin of the American Physical Society*, <http://meetings.aps.org/Meeting/DAMOP19/Session/N03.4>
34. Liekhus-Schmaltz C, Zhu X, McCracken G, Cryan J, Bucksbaum P (2019) Non-Adiabatic Control of the Acetylene Dication Using an Infrared Field. *Bulletin of the American Physical Society*, Volume 64, Number 4 <http://meetings.aps.org/Meeting/DAMOP19/Session/N03.3>

35. Li S, Li S, Rosenberger P, Rosenberger P, Champenois EG, Driver T, Bucksbaum PH, Bucksbaum PH, Coffee R, Gattton A, Hartmann G, Helml W, Huang Z, Knurr J, Kling MF, Kling MF, Kling MF, Lin M-F, MacArthur JP, MacArthur JP, Maxwell TJ, Nantel M, Nantel M, Natan A, Oneal JT, Oneal JT, Shivaram NH, Walter P, Wolf TJA, Cryan JP, Cryan JP, Marinelli A (2019) Generation and Characterization of Attosecond Pulses from an X-ray Free-electron Laser. *Conference on Lasers and Electro-Optics (2019)*, paper FF2C.5, :FF2C.5. [https://doi.org/10.1364/CLEO\\_QELS.2019.FF2C.5](https://doi.org/10.1364/CLEO_QELS.2019.FF2C.5)
36. Li S, Bucksbaum P, Champenois E, Cryan J, Driver T, Coffee R, Gattton A, Huang Z, Knurr J, Lin MF, MacArthur J, Maxell T, Nantel M, O'Neal J, Shivaram N, Walter P, Wolf T, Marinelli A, Kling M, Rosenberger P, Hartmann G, Helml W (2019) Measuring sub-femtosecond x-ray pulses with angular streaking. *Bulletin of the American Physical Society*, Volume 64, Number 4:L01.00066. <http://meetings.aps.org/Meeting/DAMOP19/Session/L01.66>
37. Bucksbaum P, Ware M, Al-Sayyad N, Natan A, Glownia JM (2019) Characterizing multiphoton excitation using time-resolved x-ray scattering. *Bulletin of the American Physical Society*, Volume 64, Number 4<http://meetings.aps.org/Meeting/DAMOP19/Session/H03.3>
38. Bucksbaum PH (2019) X-rays, attoseconds, and boiling the quantum vacuum: Frontier research made possible by chirped-pulse amplification. *Frontiers in Optics + Laser Science APS/DLS (2019)*, paper LTh3E.1, :LTh3E.1. <https://doi.org/10.1364/LS.2019.LTh3E.1>
39. Al-Sayyad N, Ware M, Glownia J, O'Neal J, Bucksbaum P (2019) Frequency-resolved~x-ray~scattering. *Bulletin of the American Physical Society*, Volume 64, Number 4<http://meetings.aps.org/Meeting/DAMOP19/Session/L01.67>
40. Kamalov A, Bucksbaum PH, Haxton DJ, Cryan JP (2019) Temporal Observation of Inter-channel Coupling in Molecular Photoionization. *Bulletin of the American Physical Society*, Volume 64, Number 4<http://meetings.aps.org/Meeting/DAMOP19/Session/D03.5>
41. Glownia J, Ware M, Al-Sayyad N, O'Neal J, Bucksbaum P (2019) Discerning Molecular Dynamics using Time Resolved X-ray Scattering. *Bulletin of the American Physical Society*, Volume 64, Number 4<http://meetings.aps.org/Meeting/DAMOP19/Session/H03.4>
42. Glownia JM, Ware M, Ware M, Al-Sayyad N, Al-Sayyad N, Bucksbaum P, Bucksbaum P, Bucksbaum P (2019) Observing Molecular Dynamics Using Frequency Resolved X-ray Scattering. *2019 Conference on Lasers and Electro-Optics Europe and European Quantum Electronics Conference (2019)*, paper ee\_1\_4, :ee\_1\_4. [http://www.osapublishing.org/abstract.cfm?uri=EQEC-2019-ee\\_1\\_4](http://www.osapublishing.org/abstract.cfm?uri=EQEC-2019-ee_1_4)

### List of invited talks, lectures, colloquia, and seminars

#### 2020

*Ultrafast x-ray lasers and making molecular movies*, Arizona State University, Tucson, AZ, January 17, 2020.

*Tracking the motion inside molecules with x-ray lasers*, Ford Lecture, University of Michigan, February 12, 2020.



*Scientific principles and open research are under threat*, Stanford Science Policy Seminar, Stanford, CA, February 26, 2020.

*Ultrafast strong field AMO Physics*, Ramsey Prize Lecture, DAMOP, June 2, 2020. (Virtual)

*Ultrafast Strong Field AMO Physics*, Colloquium at the University of Mary Washington, June 23, 2020. (Virtual)

*Ultrafast Strong Field Atomic and Molecular Physics*, Colloquium at the University of San Carlos, Brazil, August 21, 2020. (Virtual)

*Ultrafast strong field AMO Physics*, Physics colloquium at Amherst College, Amherst, MA, October 20, 2020. (Virtual)

*Ultrafast AMO Physics in Strong Fields*, Talk at the AMOS Contractors Meeting, October 27, 2020. (Virtual)

## 2019

*The Schwinger Threshold and Beyond: An experimental program to rip open the quantum vacuum and study what's inside*, Invited talk at *Progress in Quantum Optics*, Snowbird, UT, January 10, 2019

*Strong-field electron imaging: What we can learn from all those electrons that DON'T end up making high harmonics*, European School on The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Sicily, Italy: March 12, 2019.

*X-ray free electron laser basics, and especially how they produce femtosecond to attosecond pulses*, European School on The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Sicily, Italy: March 12, 2019.

*X-ray movies of molecules*, European School on The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Sicily, Italy: March 14, 2019.

*Ultrafast x-ray lasers and making molecular movies*, Physics Colloquium, Ohio State University, March 26, 2019.

*Opportunities in Intense Ultrafast Lasers; Reaching for the Brightest Light*, Plenary talk at Brightest Light Initiative Workshop, Washington, DC March 27 2019.

*Characterizing multiphoton excitation using time-resolved x-ray scattering: How x-ray movies of molecules can reveal nonlinear laser-molecule interactions*, DAMOP, Milwaukee, March 29, 2019.

*Reaching for the Brightest Light: Building the user community for ultrafast ultra-intense lasers*, Invited talk at the International Extreme High Intensity Laser Physics (EXHILP) meeting, Stanford, September, 2019.

*X-rays, attoseconds, and boiling the quantum vacuum: Frontier research made possible by chirped-pulse amplification*, Invited talk at Frontiers in Optics (DLS Annual Meeting), Washington, September, 2019.

*Exploring motion on the quantum scale*, Physics 290 seminar, September, 2019.

*What can we learn from X-ray diffraction*, Workshop on Frontiers of Physical Sciences with X-

ray FELs, Imperial College, London, UK, November, 13, 2019.

*The Schwinger plasma: An experimental program to study the plasmas that exist inside the vacuum*, Lecture at MIPSE, University of Michigan, December 4, 2019.

**Description of selected research in 2019-2020 (Numbers refer to publications listed above):**

**Tracking atomic forces in molecular movies [7]**

Ultrafast time-resolved X-ray scattering (TRXS) from a photoexcited molecular ensemble measures a distribution  $S(Q, \tau)$  of the X-ray momentum transfer  $Q$  and pump-probe delay  $\tau$  in which all modes of motion induced by the excitation overlap. Frequency-resolved X-ray scattering (FRXS) based on  $S(Q, \omega)$  separates each oscillation and dissociation channel in the TRXS data, enabling measurements of vibrational frequencies and phases, and dissociation velocities and time shifts. Here we extend FRXS analysis to study early-time accelerations as well. We show how these appear as diffuse scattering patterns with characteristic phase evolution in FRXS and we develop a set of transformations that isolate individual channels to measure the early-time accelerated motion. This procedure is used to analyze diatomic iodine X-ray scattering data with multiple dissociations, and the ability of this technique to characterize early-time accelerations of one dissociation channel even in the presence of another dissociation is demonstrated.

**Spooktroscopy: Ghost imaging [10]**

The recent demonstration of isolated attosecond pulses from an X-ray free-electron laser (XFEL) opens the possibility for probing ultrafast electron dynamics at X-ray wavelengths. An established experimental method for probing ultrafast dynamics is X-ray transient absorption spectroscopy, where the X-ray absorption spectrum is measured by scanning the central photon energy and recording the resultant photoproducts. The spectral bandwidth inherent to attosecond pulses is wide compared to the resonant features typically probed, which generally precludes the application of this technique in the attosecond regime. In this paper we propose and demonstrate a new technique to conduct transient absorption spectroscopy with broad bandwidth attosecond pulses with the aid of ghost imaging, recovering subbandwidth resolution in photoproduct-based absorption measurements.

**Subcycle interference from tunnel ionization [19]**

We present a simple and effective technique to recover sub-cycle features in the momentum distributions for atoms and small molecules subject to strong-field ionization. Quantum calculations predict complex sub-cycle interferences that have attracted wide interest. Experimental searches for these features must overcome the significant challenge that a highly controlled 1- to 2-cycle pulse is difficult to realize in the laboratory, whereas sub-cycle features produced by longer pulses are dominated by above-threshold ionization (ATI), a signature of multi-cycle interference. We overcome these difficulties by first decomposing the momentum distributions in a Legendre basis, and then directly filtering the one-dimensional radial coefficients. This method reveals interference structures in unprecedented detail.

**Attosecond impulsive scattering on bound electrons [1]**

Free-electron lasers provide a source of x-ray pulses short enough and intense enough to drive nonlinearities in molecular systems. Impulsive interactions driven by these x-ray pulses provide a way to create and probe valence electron motions with high temporal and spatial resolution. Observing these electronic motions is crucial to understand the role of electronic coherence in chemical processes. A simple nonlinear technique for probing electronic motion, impulsive stimulated x-ray Raman scattering (ISXRS), involves a single impulsive interaction to produce a coherent superposition of electronic states. We demonstrate electronic population transfer via ISXRS using broad bandwidth (5.5 eV full width at half maximum) attosecond x-ray pulses produced by the Linac Coherent Light Source. The impulsive excitation is resonantly enhanced by the oxygen  $1s \rightarrow 2\pi^*$  resonance of nitric oxide (NO), and excited state neutral molecules are probed with a time-delayed UV laser pulse.

### **Physics opportunities by collocating lasers and accelerators [20]**

The scientific community is currently witnessing an expensive and worldwide race to achieve the highest possible light intensity. Within the next decade this effort is expected to reach nearly  $10^{24}$  W/cm<sup>2</sup> in the lab frame by focusing of 100 PW, near-infrared lasers. A major driving force behind this effort is the possibility to study strong-field vacuum break-down and an accompanying electron-positron pair plasma via a quantum electrodynamic (QED) cascade [Edwin Cartlidge, “*The light fantastic*”, *Science* 359, 382 (2018)]. Whereas Europe is focusing on all-optical 10 PW-class laser facilities (e.g., Apollon & ELI), China is already planning on co-locating a 100 PW laser system with a 25 keV superconducting XFEL and thus implicitly also a high-quality electron beam [Station of Extreme Light (SEL) at the Shanghai Superintense-Ultrafast Lasers Facility (SULF)]. This white paper elucidates the seminal scientific opportunities facilitated by colliding dense, multi-GeV electron beams with multi-PW optical laser pulses. Such a multi-beam facility would enable the experimental exploration of extreme HEDP environments by generating electron-positron pair plasmas with unprecedented densities and temperatures, where between strong-field quantum and collective plasma effects becomes decisive.

**Curriculum Vita (continued from first page of this document):****Consulting experience**

Technical Expert for the Defendant in IMRA America vs. IPG Photonics, United States District Court Case No. 06-CV-15139, (2007-2011).

Technical Expert for the Plaintiff in Newport Corporation vs. Lighthouse Photonics, United States District Court Case No. Case No. SACV12-719, (2012-14)

Technical Expert for the Patent Owner in ASML vs. Energetiq Inter Partes Review (Settled in 2016)

**National/Professional Service, Memberships, Awards, and Honors***Awards and Honors:*

Norman F. Ramsey Prize in Atomic, Molecular and Optical Physics, and in Precision Tests of Fundamental Laws and Symmetries (2020)

Elected to Presidential line of the American Physical Society (2017)

Past President and Member of the Executive Board of the Optical Society (2015)

President of the Optical Society (2014)

President-elect of the Optical Society(2013)

Fellow of American Academy of Arts and Sciences (2012)

Vice-President of the Optical Society (2012)

Marguerite Blake Wilbur Professor in Natural Science (2009)

Peter Frankin Distinguished University Professor (2005)

Membership in the National Academy of Sciences (2004)

Sokol Award, (2001)

Otto Laporte Professor of Physics, (1998-)

Distinguished Traveling Lecturer, Division of Laser Science, American Physical Society, 1996-99.

APS Centennial Speaker, (1998-9).

Distinguished Faculty Research Award, University of Michigan, (1996).

John Simon Guggenheim Memorial Foundation Fellow (September 1996- July 1997).

Miller Visiting Research Professor, University of California at Berkeley August-December, 1996).

Fellow of the American Physical Society, (1990); cited for "Seminal work on electrons and atoms in strong radiation fields."

Fellow of the Optical Society of America, (1995); cited for "Distinguished service in the interaction of intense electromagnetic fields with atoms and molecules."

Rosenberg Lecturer in Physics, Yale University, (1995).

NATO Post-doctoral Fellowship, (1981) (resigned before the fellowship tenure began in order to join Bell Laboratories).

NSF Graduate Fellowship, (1975-1978).

*National/professional service*

**2019-2020***Chairmanships and other leadership positions:*

President of the American Physical Society (2020). President-elect in 2019. This also includes chairmanship of several major committees within the APS, including the Compensation Committee, the Awards Committee, and the Annual Leadership Conference Program Committee (2019)

Member of the Weizmann Institute of Sciences International Board of Directors (2012-present)

Member, Steering Committee, National Photonics Initiative (2014-present)

Member of the Math and Physical Sciences Advisory Committee for the National Science Foundation (2013-19)

Member of the Max Planck Institute for Quantum Optics Science Advisory Committee (2012-present)

Member of the NSF Committee of Visitors Subcommittee on AMO Physics and Quantum Information Science, for the Math and Physical Sciences Directorate, (2018-19).

*Other significant professional service outside of Stanford:****Past service:***

Member, OSA Board of Directors Nominating Committee (2016)

Member, OSA Executive Committee (2015)

Member, OSA Finance Committee (2015)

Member of the National Academy Divisional Board for Engineering and Physical Sciences (2012-14)

Member of the Physical Review Letters Advisory Board (2012-2017)

Member of the Optics and Photonics Special Committee for the Math and Physical Sciences Directorate, NSF (2013-14)

Member of the Science Advisory Committee for the Advanced Photon Source at Argonne (2010-present).

Member, DAMOP Nominating Committee (2016)

Member, Search Committee for Associate Director of NSF for Math and Physical Sciences (2016)

Chair of the National Academy Study on High Intensity Lasers (2015-2017);

President of the Optical Society (2014);

Chair of the Board on Physics and Astronomy of the National Research Council, (2012-14);  
Member,(2006-2014).

Chair of the Advanced Light Source Crosscut Review on AMO Physics (2013)

Member of the LBNL Molecular Foundry Science Advisory Committee (2012)

Member of the QANU International Evaluation Committee for Physics in The Netherlands, 2011.

Physics Class Representative to the Class Membership Committee of the National Academy of Sciences (2012)

Chair of the Weizmann Institute of Sciences Science Advisory Committee for Atomic, Molecular, and Optical Physics (2012)

Chair of the Science Advisory Subcommittee for the APS Upgrade in Ultrafast Science, (2011-2012)

Chair of the NSF Committee of Visitors Subcommittee on AMO Physics and Quantum Information Science, for the Math and Physical Sciences Directorate, (2011-12).

Editor of the Virtual Journal of Ultrafast Science (2002-2012).

Member of the Harvard Physics Visiting Committee (2009).

Member of the National Research Council Committee for Physics at NIST (2010- 2012).

Member of the Advisory Board of the NSF ERC for Extreme Ultraviolet Science, Fort Collins, CO (2006-2012).

Member of the Advisory Board of the Materials Research Laboratory, University of Illinois at Urbana-Champaign; (2007-present);

Member of the Science Advisory Committee for the Advanced Light Source at Berkeley (2006-2009);

Member of the Advisory Committee of Physics Today; (2006-2009)

Member of the Board on Physics and Astronomy of the National Research Council, (2006-2010)

Member of the Science Advisory Committee for the SLAC Linac Coherent Light Source (LCLS) (1999-2009);

Divisional Associate Editor of Physical Review Letters (2002-2008);

Member of the Board of Directors of the Optical Society of America (2006-2008)

Member of the UCSB iQCD External Review Committee, May 2007

Member of the Harvard ITAMP External Advisory Board (2004-2007)

Member of the BESAC Grand Challenges Committee (2005-2007);

Chair of the 2007 Quantum Control Gordon Research Conference, Newport, RI, August 2007.

Chair, AMO 2010, the National Academy of Sciences decadal study of AMO physics (2005-2006);

Member of BESAC (The Basic Energy Sciences Advisory Committee to the Office of Science, Department of Energy)(resigned January 2005);

Member of the NAS Committee on AMO Science (CAMOS);

Chair of the American Physical Society nominating committee (this committee selects nominees for the APS presidential line, and for POPA, the Public Affairs Committee;

Member of the DOE-Basic Energy Sciences committee to review the 25-year plan for major facilities (2004);

Member of the SAUUL advisory group (Science and Applications of Ultra-intense Ultrafast Lasers).

General Coucilor at Large, American Physical Society(1998-2002).

Executive Board Member, American Physical Society (2001-2002).

I lobbied Congress on behalf of the University of Michigan at a CNSF event in 2002.

Member of the National Academy Committee to update the FAMOS report: Future of Atomic, Molecular, and Optical Science (1999-2001).

Co-author of the Science Case for X-ray Free Electron Lasers, commissioned by Basic Energy Sciences, Department of Energy (1999-2000)

Member of the Program Committees for the APS Annual Meeting Division of Atomic, Molecular and Optical Physics, 1999,2000.

Member of Technical Advisory Committee for the Laser Program, LLNL (1996-2000).

Centennial Speaker, American Physical Society (1998-99).

General Co-Chair, Quantum Electronics and Laser Science Meeting (A major joint meeting of

the Optical Society and the APS Division on Laser Science), (May 1999).  
Member of the Leone Panel, to review 4th generation synchrotron facilities, (1999.)  
Program Co-Chairman of the Quantum Electronics and Laser Spectroscopy Meeting (A major joint meeting of the Optical Society and the APS Division on Laser Science), (May, 1997.)  
Co-Chairman of the US-Japan Seminar on Coherent Manipulation of Matter, (September 1997).  
Chairman of DoE-BES Report on Future Directions of High Field Interactions Atoms and Molecules with Photons, (September, 1997).  
Member of Special NSF Review Panel for Stanford/LIGO project (May 1996).  
Member of the Program Committee for the International Conference on Multiphoton Processes, (1996,) Garmisch-Partenkirchen, Germany.  
Session Organizer and Local Committee Member for APS Division of Atomic, Molecular, and Optical Physics, (1996).  
Participant to the National Research Council Workshop on Research and Education in Optical Science and Engineering, Irvine, (January 1996.)  
Member of the Fellowship Committee for the Laser Science Topical Group of the APS, (1995.)  
Chair of NSF Special Emphasis Panel on Manipulating Matter with Light, Cambridge, MA, (February, 1995.)  
Member of the Program Committee for the Annual Meeting of the Optical Society, (1993,94,95).  
Member of the Program Committee for the International Laser Spectroscopy Conference, (1992,93,94,95).  
Member of the Executive Committee of the Division of Atomic, Molecular, and Optical Physics of the APS, (1993,94,95.)  
Member of Program Committee and Session Organizer of the APS annual meeting for AMO Physics (1991,92,93,94,95).  
Chair of the Optical Science Division and member of the Technical Executive Council of the Optical Society of America, (1992,93,94).  
Participant to the National Academy Panel on Future Free Electron Lasers, Washington, (March, 1994).  
Member of the Program Committee for the OSA Topical Meeting on Ultrafast Processes, California, May, 1994.  
Member of the Program Committee for the OSA Topical Meeting on High Field Interactions and Short Wavelength Generation, St. Malo, August, 1994.  
Member of the Program Committee for the International Conference on Atomic Physics, 1994.  
Member of National Research Council selection panel for NRC Postdoctoral Fellowships, 1993,94.  
Member, selection committee for the APS Award for Outstanding Doctoral Thesis Research in AMO Physics, 1993,94.  
Member of the Fellows Committee for the APS Topical Group on Precision Measurements, 1993.  
Member, AIP expert panel on new publishing directions, May, 1992.  
Member of the International Physics Advisory Panel, IUPAP, 1992.  
Co-editor (with M. Skalsey, R. Conti, D. Gidley) of "Arthur Rich Memorial Conference on Time Reversal" AIP publication.  
Program Committee, Optical Society Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications; San Diego, CA, March 28-31, 1993.  
Program Chairman, Laser Spectroscopy Subcommittee, Conference on Quantum Electronics

and Laser Spectroscopy (QELS'91), Baltimore, Maryland, May, 1991.

Member, Laser Spectroscopy Subcommittee, International Quantum Electronics Conference (IQEC'90), Los Angeles, CA, May, 1990.

**University-wide and Laboratory-wide Service (Includes University of Michigan service, Bell Laboratories service and awards prior to 1990)**

Director of the Stanford PULSE Center, a research unit of SLAC and an Independent Laboratory at Stanford, 2006-present.

Director of the Division of Chemical Sciences, Photon Science Directorate, SLAC, until 12/31/11.

Chair of the Department of Photon Science, SLAC, Stanford University, term ended 2007-2010

SLAC Faculty Task Force (2008)

Search Committee for the SLAC Associate Laboratory Director for LCLS, 2007-2008

SLAC Strategic Planning Committee, 2007-2008

Space Working Group, SLAC, 2006-2007.

Accelerator Center Committee at SLAC, 2006-2007.

Scientific Computing Committee at SLAC, 2006-2007.

Director of FOCUS, the Center for Frontier Optical Coherent Ultrafast Science, 2001-2005, on leave 8/04-7/05);

Chair Michigan OVPR Search Committee, 2002.

Member, LS&A Nominating Committee, 2002.

Member, OPIL Executive Committee, 2001-2002.

Member of the Provost's Working Group on University Research, 1999-2000.

Chairman, Rackham Divisional Board, 1998-99.

Member of the faculty promotions and appointments committee of LS&A, 1993-6.

Associate Director for Science, University of Michigan Center for Ultrafast Optical Science, 1991-2000

Director of the Fellows Program at the NSF Center for Ultrafast Optical Science, 1993-2000

Acting Director of the University of Michigan Center for Ultrafast Optical Science, Fall 1994.

Member of the selection committee for the Rackham Research Partnership Fellowship Awards, Winter 1992.

Extraordinary Contribution Award, AT&T Bell Laboratories, 1987, 1988, 1989.

Membership on the Advisory Committee for Research at AT&T Bell Laboratories, 1989,1990.

***Physics, Applied Physics, and Photon Science Department service and committees:  
2017-2018***

Chair, Applied Physics Graduate Admissions Committee.

Physics Graduate Admissions Committee

Photon Science/Materials Science Engineering Promotion Committee for Aaron Lindenberg

Physics Qualifying Exam Committee

Physics Colloquium Committee

Physics Graduate Studies Committee

Applied Physics Digonnet Reappointment Committee

Photon Science Department Tony Heinz Appointment Committee



Photon Science Directorate Appointment Committees for PULSE Associate Staff Scientist and PULSE Staff Scientist.

***Previous years***

Chair, Applied Physics Graduate Admissions Committee (2017).  
Chair, Physics Department Leo Hollberg reappointment Committee  
Member, Search Committee for SLAC Associate Laboratory Director for Accelerators  
Chair, Physics and Applied Physics Graduate Orientation and Open House Committees (2012)  
Member, Applied Physics Grad Admissions Committee (2010-2014)  
Chair, Applied Physics Graduate Admissions Committee.(2010-2011)  
Chair, Kathryn Moler Promotion Committee (Applied Physics and Physics).  
Chair, Department of Photon Science (2007-10)  
Physics Graduate Curriculum Committee.  
Applied Physics Graduate Admissions Committee, (2007-2010)  
Applied Physics Joint Appointments Committee (2008-2009)  
Physics AMO Search Committee (2007-2009)  
Physics Graduate Admissions Committee, (2007-2010)  
Applied Physics Photonics Seminar Committee, (2007).  
Materials Science/SSRL Faculty Search Committee, (2006).  
SSRL Condensed Matter Theory Search Committee (2006-7).  
Physics AMO Search Committee (2006-7)  
Applied Physics special faculty appointment committee (2006-7)

***Michigan Physics Committees are below this line:***

Member, faculty search committee (2005)  
Member, Departmental Internal Review Committee (2001-2005)  
Member, Graduate Admissions Committee (1998-2005)  
Member, AMO Faculty search committee (2002-2003).  
Chairman, AMO Faculty search committee (1999-2000)  
Member, Graduate Concerns Committee (1999-2000)  
Member, Long Range Plan Committee (1998-2000)  
Member, faculty search committee for Physical Chemistry (1998-2000)  
Member, Awards and Prizes Committee (1996-1997)  
Member, Computing Committee (1995-)  
Member, Physics Department Executive Committee (1994-1996).  
Chair, Physics/Chemistry faculty appointment committee (1995-96)  
Chair, Target of Opportunity Committee, (1991-95).  
Member, Building Committee, (1992).  
Member, Administrative Services Review Committee, (1992).  
Member, Rich Memorial Symposium Organizing Committee, (1992).  
Co-editor, Rich Memorial Symposium Proceedings, (1992).  
Atomic, Molecular, and Optical Physics Recruitment and Advisory Committee, (1991-95);  
Chairman (1991-95).  
Colloquium committee (1990-91)

***Research Funding (2017-2018)***

I have three areas of interest in ultrafast AMO Science. Research in strong field laser-atom interactions and in high harmonics in atoms and molecules is funded by the Department of Energy through PULSE and SLAC. Research on Quantum Control is funded by the National Science Foundation through PULSE. Each of these activities has also acquired a strong component of LCLS research.

***Funding Sources (2017-2018)***

Strong Field Quantum Control, renewed in 2009

Source of Support: National Science Foundation

Original Award Amount: \$1,685,000, 05/15/2005-07/31/2010

Additional Award Amount: \$1,667,000 08/01/2010-07/31/2015

Additional Award Amount: \$825,000 8/01/2015-7/31/2018

PULSE Institute (only included my own research tasks, plus a portion of the management task)

Source of Support: Department of Energy

Total Award Amount: \$5,245,000, 10/01/2012-09/30/2015.

Continued at the same rate for FY16 pending a federal FY16 budget.

Time-resolved Serial Femtosecond X-ray Kinetic Crystallography of the Ribosome Complexes

Source of Support: Hauptman-Woodward Medical Research Institute

Total Award Amount: \$120,000

**I. Articles in refereed journals and the e-print archive:**

230. O'Neal JT, Champenois EG, Oberli S, Obaid R, Al-Haddad A, Barnard J, Berrah N, Coffee R, Duris J, Galinis G, Garratt D, Glowina JM, Haxton D, Ho P, Li S, Li X, MacArthur J, Marangos JP, Natan A, Shivaram N, Slaughter DS, Walter P, Wandel S, Young L, Bostedt C, Bucksbaum PH, Picón A, Marinelli A, Cryan JP (2020) Electronic Population Transfer via Impulsive Stimulated X-Ray Raman Scattering with Attosecond Soft-X-Ray Pulses. *Physical Review Letters*, 125(7):073203. <https://doi.org/10.1103/PhysRevLett.125.073203>

229. McCracken GA, Bucksbaum PH (2020) Ionization induced dynamic alignment of water. *The Journal of Chemical Physics*, 152(13):134308. <https://doi.org/10.1063/5.0002877>

228. Liu H, Vampa G, Zhang JL, Shi Y, Buddhiraju S, Fan S, Vuckovic J, Bucksbaum PH, Reis DA (2020) Beating absorption in solid-state high harmonics. *Communications Physics*, 3(1):1–6. <https://doi.org/10.1038/s42005-020-00472-5>

227. Liekhus-Schmaltz C, Zhu X, McCracken GA, Cryan JP, Martinez TJ, Bucksbaum PH (2020) Strictly non-adiabatic quantum control of the acetylene dication using an infrared field. *The Journal of Chemical Physics*, 152(18):184302. <https://doi.org/10.1063/5.0007058>

226. Kierspel T, Morgan A, Wiese J, Mullins T, Aquila A, Barty A, Bean R, Boll R, Boutet S, Bucksbaum P, Chapman HN, Christensen L, Fry A, Hunter M, Koglin JE, Liang M, Mariani V, Natan A, Robinson J, Rolles D, Rudenko A, Schnorr K, Stapelfeldt H, Stern S, Thøgersen J,

- Yoon CH, Wang F, Küpper J (2020) X-ray diffractive imaging of controlled gas-phase molecules: Toward imaging of dynamics in the molecular frame. *The Journal of Chemical Physics*, 152(8):084307. <https://doi.org/10.1063/1.5133963>
225. Kamalov A, Wang AL, Bucksbaum PH, Haxton DJ, Cryan JP (2020) Electron correlation effects in attosecond photoionization of  $\{\mathrm{CO}\}_2$ . *Physical Review A*, 102(2):023118. <https://doi.org/10.1103/PhysRevA.102.023118>
224. Gabalski I, Ware M, Bucksbaum P (2020) X-ray scattering signatures of early-time accelerations in iodine dissociation. *Journal of Physics B: Atomic, Molecular and Optical Physics*, <https://doi.org/10.1088/1361-6455/abc22a>
223. Forbes R, Allum F, Bari S, Boll R, Brouard M, Bucksbaum P, Ekanayake N, Erk B, Howard A, Johnsson P, Lee J, Manschwetus B, Mason R, Passow C, Peschel J, Rivas D, Roerig A, Rouzee A, Vallance C, Ziaee F, Rolles D, Burt M (2020) Time-resolved site-selective imaging of predissociation and charge transfer dynamics: the CH<sub>3</sub>I B-band. *Journal of Physics B: Atomic, Molecular and Optical Physics*, <https://doi.org/10.1088/1361-6455/abb1fd>
222. Duris J, Li S, Driver T, Champenois EG, MacArthur JP, Lutman AA, Zhang Z, Rosenberger P, Aldrich JW, Coffee R, Coslovich G, Decker F-J, Glowonia JM, Hartmann G, Helml W, Kamalov A, Knurr J, Krzywinski J, Lin M-F, Marangos JP, Nantel M, Natan A, O'Neal JT, Shivaram N, Walter P, Wang AL, Welch JJ, Wolf TJA, Xu JZ, Kling MF, Bucksbaum PH, Zholtens A, Huang Z, Cryan JP, Marinelli A (2020) Tunable isolated attosecond X-ray pulses with gigawatt peak power from a free-electron laser. *Nature Photonics*, 14(1):30–36. <https://doi.org/10.1038/s41566-019-0549-5>
221. Driver T, Li S, G. Champenois E, Duris J, Ratner D, J. Lane T, Rosenberger P, Al-Haddad A, Averbukh V, Barnard T, Berrah N, Bostedt C, H. Bucksbaum P, Coffee R, F. DiMauro L, Fang L, Garratt D, Gattton A, Guo Z, Hartmann G, Haxton D, Helml W, Huang Z, LaForge A, Kamalov A, F. Kling M, Knurr J, Lin M-F, A. Lutman A, P. MacArthur J, P. Marangos J, Nantel M, Natan A, Obaid R, T. O'Neal J, H. Shivaram N, Schori A, Walter P, Wang AL, A. Wolf TJ, Marinelli A, P. Cryan J (2020) Attosecond transient absorption spooktroscopy: a ghost imaging approach to ultrafast absorption spectroscopy. *Physical Chemistry Chemical Physics*, 22(5):2704–2712. <https://doi.org/10.1039/C9CP03951A>
220. Bucksbaum PH, Ware MR, Natan A, Cryan JP, Glowonia JM (2020) Characterizing Multiphoton Excitation Using Time-Resolved X-ray Scattering. *Physical Review X*, 10(1):011065. <https://doi.org/10.1103/PhysRevX.10.011065>
219. Chakraborti P, Senfftleben B, Kettle B, Teitelbaum SW, Bucksbaum PH, Ghimire S, Hastings JB, Liu H, Nelson S, Sato T, Shwartz S, Sun Y, Weninger C, Zhu D, Reis DA, Fuchs M (2019) Multiple Fourier Component Analysis of X-ray Second Harmonic Generation in Diamond. *arXiv:1903.02824 [physics]*, <http://arxiv.org/abs/1903.02824>
218. Adams B, Aeppli G, Allison T, Baron AQR, Bucksbaum P, Chumakov AI, Corder C, Cramer SP, DeBeer S, Ding Y, Evers J, Frisch J, Fuchs M, Grübel G, Hastings JB, Heyl CM, Holberg L, Huang Z, Ishikawa T, Kaldun A, Kim K-J, Kolodziej T, Krzywinski J, Li Z, Liao W-T, Lindberg R, Madsen A, Maxwell T, Monaco G, Nelson K, Palffy A, Porat G, Qin W, Raubenseimer T, Reis DA, Röhlberger R, Santra R, Schoenlein R, Schünemann V, Shpyrko O, Shvyd'ko Y, Shwartz S, Singer A, Sinha SK, Sutton M, Tamasaku K, Wille H-C, Yabashi M, Ye

- J, Zhu D (2019) Scientific Opportunities with an X-ray Free-Electron Laser Oscillator. *arXiv:1903.09317 [physics]*, <http://arxiv.org/abs/1903.09317>
217. Wolf TJA, Paul AC, Folkestad SD, Myhre RH, Cryan JP, Berrah N, Bucksbaum PH, Coriani S, Coslovich G, Feifel R, Martinez TJ, Moeller SP, Mucke M, Obaid R, Plekan O, Squibb RJ, Koch H, Gühr M (2020) Transient Resonant Auger-Meitner Spectra of Photoexcited Thymine. *arXiv:2009.14355 [physics]*, <http://arxiv.org/abs/2009.14355>
216. Werby N, Natan A, Forbes R, Bucksbaum P (2020) The Sub-Cycle Electron Momentum Spectrum in Strong-Field Ionization. *arXiv:2008.09712 [physics]*, <http://arxiv.org/abs/2008.09712>
215. Meuren S, Bucksbaum PH, Fisch NJ, Fiúza F, Glenzer S, Hogan MJ, Qu K, Reis DA, White G, Yakimenko V (2020) On Seminal HEDP Research Opportunities Enabled by Colocating Multi-Petawatt Laser with High-Density Electron Beams. *arXiv:2002.10051 [hep-ph, physics:physics]*, <http://arxiv.org/abs/2002.10051>
214. Haber J, Kaldun A, Teitelbaum SW, Baron AQR, Bucksbaum PH, Fuchs M, Hastings JB, Inoue I, Inubushi Y, Krebs D, Osaka T, Santra R, Shwartz S, Tamasaku K, Reis DA (2020) Non-linear resonant X-ray Raman scattering. *arXiv:2006.14724 [physics, physics:quant-ph]*, <http://arxiv.org/abs/2006.14724>
213. Ware MR, Glowonia JM, Al-Sayyad N, O'Neal JT, Bucksbaum PH (2019) Characterizing dissociative motion in time-resolved x-ray scattering from gas-phase diatomic molecules. *Physical Review A*, 100(3):033413. <https://doi.org/10.1103/PhysRevA.100.033413>
212. Ware Matthew R., Glowonia James M., Natan Adi, Cryan James P., Bucksbaum Philip H. (2019) On the limits of observing motion in time-resolved X-ray scattering. *Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences*, 377(2145):20170477. <https://doi.org/10.1098/rsta.2017.0477>
211. Vampa G, Vasilyev S, Liu H, Mirov M, Bucksbaum PH, Reis DA (2019) Characterization of high-harmonic emission from ZnO up to 11 eV pumped with a Cr:ZnS high-repetition-rate source. *Optics Letters*, 44(2):259–262. <https://doi.org/10.1364/OL.44.000259>
210. Young L, Ueda K, Gühr M, Bucksbaum PH, Simon M, Mukamel S, Nina Rohringer, Prince KC, Masciovecchio C, Meyer M, Rudenko A, Rolles D, Christoph Bostedt, Fuchs M, Reis DA, Santra R, Kapteyn H, Murnane M, Heide Ibrahim, Légaré F, Vrakking M, Isinger M, Kroon D, Gisselbrecht M, Anne L'Huillier, Wörner HJ, Leone SR (2018) Roadmap of ultrafast x-ray atomic and molecular physics. *Journal of Physics B: Atomic, Molecular and Optical Physics*, 51(3):032003. <https://doi.org/10.1088/1361-6455/aa9735>
209. Liu H, Guo C, Vampa G, Zhang JL, Sarmiento T, Xiao M, Bucksbaum PH, Vučković J, Fan S, Reis DA (2018) Enhanced high-harmonic generation from an all-dielectric metasurface. *Nature Physics*, :1. <https://doi.org/10.1038/s41567-018-0233-6>
204. Chakraborti P, Senfftleben B, Kettle B, Teitelbaum SW, Bucksbaum PH, Ghimire S, Hastings JB, Liu H, Nelson S, Sato T, Shwartz S, Sun Y, Weninger C, Zhu D, Reis DA, Fuchs M (2019) Multiple Fourier Component Analysis of X-ray Second Harmonic Generation in Diamond. *arXiv:1903.02824 [physics]*, <http://arxiv.org/abs/1903.02824>
203. Adams B, Aeppli G, Allison T, Baron AQR, Bucksbaum P, Chumakov AI, Corder C, Cramer SP, DeBeer S, Ding Y, Evers J, Frisch J, Fuchs M, Grübel G, Hastings JB, Heyl CM,

Holberg L, Huang Z, Ishikawa T, Kaldun A, Kim K-J, Kolodziej T, Krzywinski J, Li Z, Liao W-T, Lindberg R, Madsen A, Maxwell T, Monaco G, Nelson K, Palffy A, Porat G, Qin W, Raubenheimer T, Reis DA, Röhlberger R, Santra R, Schoenlein R, Schünemann V, Shpyrko O, Shvyd'ko Y, Shwartz S, Singer A, Sinha SK, Sutton M, Tamasaku K, Wille H-C, Yabashi M, Ye J, Zhu D (2019) Scientific Opportunities with an X-ray Free-Electron Laser Oscillator. *arXiv:1903.09317 [physics]*, <http://arxiv.org/abs/1903.09317>

202. Co-author of BASIC ENERGY SCIENCES ROUNDTABLE OPPORTUNITIES FOR BASIC RESEARCH AT THE FRONTIERS OF XFEL ULTRAFAST SCIENCE, [https://science.energy.gov/~media/bes/pdf/reports/2018/Ultrafast\\_x-ray\\_science\\_rpt.pdf](https://science.energy.gov/~media/bes/pdf/reports/2018/Ultrafast_x-ray_science_rpt.pdf)

201. *Filming non-adiabatic population transfer with x-ray diffraction*, M. R. Ware, J. M. Glowina, J. P. Cryan, R. Hartsock, A. Natan, and P. H. Bucksbaum, *arXiv:1708.03847 [physics]* (2017).

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21. "Stimulated Compton Backscattering and the High Intensity Kapitza-Dirac Effect," D.W. Schumacher, P.H. Bucksbaum, and M. Bashkansky, in *Optical Society Proceedings on Short Wavelength Coherent Radiation: Generation and Applications*, ed. by R.W. Falcone and J. Kirz, Optical Society of America, Washington DC, p.236 (1988).
20. "Symmetries and Asymmetries in Above-Threshold Ionization," P.H. Bucksbaum, M. Bashkansky, and D.W. Schumacher, in *Optical Society Proceedings on Short Wavelength Coherent Radiation: Generation and Applications*, ed. by R.W. Falcone and J. Kirz, Optical Society of America, Washington DC, 258 (1988).
19. "An Equation for Melting and Freezing Transition Rates", P. H. Bucksbaum and M. O. Thompson, in *Beam-Solid Interactions and Transient Processes*, Materials Research Society Symposium Proceedings **74**, 123 (1987).

18. "Atoms in Intense Optical Fields: Ponderomotive Forces and Above-Threshold Ionization", P. H. Bucksbaum, in *Atomic Spectra and Collisions in External Fields*, ed. by K.T. Taylor, M.H. Nayfeh, and C.W. Clark, Plenum, New York, p.359 (1988).
17. "Intensity and Polarization Effects on Above Threshold Ionization," T. J. McIlrath, R. R. Freeman, M. Bashkansky, and P. H. Bucksbaum, *Bulletin of the American Physical Society* 31, 947 (1986).
16. "Electron Angular Distributions in Above Threshold Ionization of Xenon", M. Bashkansky, P. H. Bucksbaum, R. R. Freeman, T. J. McIlrath, L. F. DiMauro, and J. Custer, *Proceedings of the Third Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications*, ed. by J. Bokor and D. T. Attwood, American Institute of Physics Conf. Proc 147, 174 (1986).
15. "Studies of Intensity and Polarization Effects on ATI Electrons from Xe Multiphoton Ionization", P. H. Bucksbaum, R. R. Freeman, T. J. McIlrath and M. Bashkansky, *Proceedings of the Workshop on High Intensity Multiphoton Ionization*, Orsay (1986).
14. "Suppression of Multiphoton Ionization with Circularly Polarized Coherent Light", T. J. McIlrath, P. H. Bucksbaum, M. Bashkansky, R. R. Freeman, and L. F. DiMauro, *Proceedings of the Third Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications*, ed. by J. Bokor and D. T. Attwood, American Institute of Physics Conf. Proc 147, 89 (1986).
13. "Time-resolved VUV Photoemission Spectroscopy", P. H. Bucksbaum, J. Bokor, R. Haight and R. R. Freeman, *Proceedings of the Third Topical Meeting on Short Wavelength Coherent Radiation: Generation and Applications*, ed. by J. Bokor and D. T. Attwood, American Institute of Physics Conf. Proc 147, 401 (1986).
12. "Picosecond Time-Resolved Photoemission Spectroscopy of Semiconductor Surfaces", J. Bokor, R. A. Haight, R. R. Freeman, and P. H. Bucksbaum, *Proc. of the Seventh International Conference on Laser Spectroscopy*, Springer Verlag (1986).
11. "Ultraviolet photoemission studies of surfaces using picosecond pulses of coherent XUV radiation", R. A. Haight, J. Bokor, R. H. Storz, J. B. Stark, R. R. Freeman, and P. H. Bucksbaum, in *Ultrafast Phenomena V*, ed. by G. R. Fleming and A. E. Siegman, Springer series in chemical physics 46 (1986).
10. "Relation between temperature and solidification velocity in rapidly cooled liquid silicon", M. O. Thompson, P. H. Bucksbaum, and J. Bokor, *Materials Research Society Symposium Proceedings* 35, 181 (1985).
9. "Generation of 35 nm coherent radiation", J. Bokor, P. H. Bucksbaum, and R. R. Freeman, *Proceedings of the SPIE* 461, 42 (1984).

8. "Measurement of ultrafast melting and regrowth velocities in pulsed laser heated silicon", P. H. Bucksbaum and J. Bokor, *Energy Beam-Solid Interactions and Transient Thermal Processing*, ed. J. C. C. Fan and N. M. Johnson, Materials Research Society Symposium Proceedings 23, 93 (1984).
7. "Photoemission Apparatus Using XUV Harmonics of a Picosecond KrF Laser", R. Haight, J. Bokor, R. H. Storz, P. H. Bucksbaum, and R. R. Freeman, Proc. SPIE International Society of Optical Engineers 476, 61 (1984).
6. "Wavelength conversion with excimer lasers", J. Bokor, L. Eichner, R. H. Storz, P. H. Bucksbaum, and R. R. Freeman, in *Excimer Lasers-1983*, American Institute of Physics Conference Proceedings 100, ed. by C. K. Rhodes, H. Egger, and H. Pummer, 143 (1983).
5. "Time Resolved Amorphous Silicon Formation from Laser Melted Liquid Silicon Films", P. H. Bucksbaum and J. Bokor, in *Excimer Lasers-1983*, American Institute of Physics Conference Proceedings 100, ed. by C. K. Rhodes, H. Egger, and H. Pummer, 279 (1983).
4. "Measurement of Fast Melting and Regrowth Velocities in Picosecond Laser Heated Silicon", P. H. Bucksbaum and J. Bokor, *Laser-Solid Interactions and Transient Thermal Processing of Materials*, ed. by J. Narayan, W. L. Brown, and R. A. Lemons, Materials Research Society Symposium Proceedings 13, 51 (1983).
3. "Laser generation of light in the extreme ultraviolet and soft x-ray regime", R. R. Freeman, R. M. Jopson, J. Bokor, and P. H. Bucksbaum, Proceedings of the International Conference on X-rays, (1982).
2. "Generation and Pulsewidth Measurement of Amplified Ultrashort Ultraviolet Laser Pulses in Krypton Fluoride", P. H. Bucksbaum, J. Bokor, R. H. Storz, J. W. White, and D. H. Auston, *Picosecond Phenomena III*, ed. by K. B. Eisenthal, R. M. Hochstrasser, W. Kaiser, and A. Laubereau, Springer-Verlag series in Chemical Physics 23, 130 (1982).
1. "Experimental Tests of Parity Nonconservation in Atomic Thallium", *Proceedings of the International Workshop on Neutral Current Interactions in Atoms*, ed. by W. Williams, 92 (1979).

### III. Books:

6. Arthur, John, Bronwyn Barnett, Uwe Bergmann, Christoph Bostedt, Sebastien Boutet, John Bozek, Axel Brunger, et al. LCLS Ultrafast Science Instruments II (LUSI-II) Proposal. SLAC National Accelerator Laboratory (SLAC), 2013.
5. *Controlling the Quantum World of Atoms, Molecules, and Photons*, AMO2010 Committee, P.H. Bucksbaum and R.Eisenstein, co-chairs, Washington: National Academies Press (2006).

4. *Controlling the Quantum World of Atoms, Molecules, and Photons: An Interim Report*, AMO2010 Committee, P.H. Bucksbaum and R.Eisenstein, co-chairs, Washington: National Academies Press (2005).

3. *Atoms, Molecules, and Light: AMO Science Enabling the Future*, C.K.N. Patel, W. Hill, P.H. Bucksbaum, et al., National Research Council (2002).

2. *Short Wavelength Coherent Radiation: Generation and Applications*, edited by P.H. Bucksbaum and N.M. Ceglio, OSA 11, (1992).

1. *Weak Interactions of Leptons and Quarks*, E. D. Commins and P. H. Bucksbaum, New York: Cambridge University Press (1983).

#### IV. Book chapters or sections:

10. P. H. Bucksbaum, "CHAPTER 19:Ultrafast Laser-pumped, X-ray-probed Quantum Dynamics at Short-pulsed Light Sources," in *X-Ray Free Electron Lasers* (2017), pp. 365–379.1.

9. Bucksbaum, P.H. "Ultrafast Quantum Control in Atoms and Molecules." In *Ultrafast Nonlinear Optics*, 105–28. Springer, 2013.

8. *The First Atomic and Molecular Experiments at the Linac Coherent Light Source X-Ray Free Electron Laser*. Bucksbaum P. H., R. Coffee & N. Berrah In: E. Arimondo, P. R. Berman. and C.C. LIN, (eds.) *Advances In Atomic, Molecular, and Optical Physics. Chapter 5* - Academic Press (2011).

7. *Directing Matter and Energy: Five Challenges for Science and the Imagination*, ed. by G. Fleming and M. Ratner, U.S. Department of Energy Basic Energy Sciences Advisory Committee, [http://www.sc.doe.gov/bes/reports/files/GC\\_rpt.pdf](http://www.sc.doe.gov/bes/reports/files/GC_rpt.pdf)

6. *Science and Applications of Ultrafast, Ultra-Intense Lasers*, ed. by T. Ditmire and L. Dimauro, [http://www.ph.utexas.edu/~utlasers/papers/SAUUL\\_report.pdf](http://www.ph.utexas.edu/~utlasers/papers/SAUUL_report.pdf)

5. "Wave packets and Half-cycle Pulses," P. H. Bucksbaum, in *Wavepackets*, ed. by J. Yaezell, New York: John Wiley (1999).

4. "H<sub>2</sub> in Intense Laser Fields," A. Zavriyev and P.H. Bucksbaum, in *Molecules in Laser fields*, edited by A. Bandrauk, Dekker Press, (1993).

3. "Photoionization of Atoms with Ultrashort Laser Pulses," R.R. Freeman, P.H. Bucksbaum, W.E. Cooke, G.Gibson, T.J. McIlrath, and L.D. Van Woerkom, in *Advances in Atomic, Molecular, and Optical Physics, Supplement 1* , ed. by M. Gavrilu, Academic Press (1991).

2. "Parity Violation in Atomic Physics", P. H. Bucksbaum, in *Opportunities in Atomic and Molecular Science*, Report by the Committee on Atomic and Molecular Science of the National Research Council (1982).

1. "The Parity Nonconserving Electron-Nucleon Interaction", E. D. Commins and P. H. Bucksbaum, *Annual Reviews of Nuclear and Particle Science* 30, 1 (1980).

**Abstracts of short talks at professional meetings (prior to 1997)**

"Strong Field Quantum Control," invited talk at the Bat Sheva Conference on Coherent Control, Neve Ilan, Israel, March 3-8, 1996.

Invited Talk at Multiphoton Gordon Conference, New Hampshire, August, 1996

"Observation of Atomic Wavepacket Evolution in a Non Separable System," invited presentation at the Twelfth International Conference on Laser Spectroscopy, Capri, June 1995.

"Coherent Control of Above-Threshold Ionization," invited talk at the Super-Intense Laser-Atom Physics conference, Volga River, Russia, August (1995).

"Observation of core scattering by Rydberg wavepackets," invited talk at ITAMP workshop, Cambridge, MA, September 1995.

"Rotation of Elliptical Polarization in High Harmonic Generation," invited talk at the OSA Topical Conference on High Field Interactions and Short Wavelength Generation, Saint Malo, France, August, 1994.

"Control of Atoms and Molecules with Phase-Coherent 2-color Radiation Fields," P. H. Bucksbaum and D. W. Schumacher, Invited Paper at the ILS-X Conference, Dallas, October 1994.

"Programmable Wavefunction Engineering in Cs Rydberg States," P. H. Bucksbaum, D. W. Schumacher, J. H. Hoogenraad, Jeffrey L. Krause, Kent R. Wilson, Post-Deadline contributed paper, Ultrafast '94, Dana Point, CA, May, 1994.

"Beyond ATI," P.H. Bucksbaum, Abstract for Invited Talk at ICAP-14, Boulder, August, 1994.

"Strong Field Control," P.H. Bucksbaum, Abstract for Invited Talk at US-Japan Workshop on Atomic Physics and Technology, Napa, August, 1994.

"Physics of Single-Cycle Far Infrared Interactions with Atoms," Invited Paper at the Seattle Meeting of The American Physical Society 22-26 March 1993.

"ATI in a 2-color field: and example of strong-field coherent control," (contributed poster), Gordon Conference on Optics and Lasers, Wolfboro, NH, August 1993.

"Elliptical Polarization Rotation in High Harmonic Generation," F. Weihe and P. Bucksbaum (poster) Annual Meeting of the Optical Society, Toronto, October 1993.

"Amplified Shaped Optical Pulses," D. Pinkos and P. Bucksbaum (poster) Annual Meeting of the Optical Society, Toronto, October 1993.

"Stability of Stark States in Intense Laser Fields," invited talk at the DAMOP meeting, Chicago, May, 1992.

"Generation of High Power THz Radiation," D. You, R.R. Jones, D.W. Schumacher, D.R. Dykaar, and P.H. Bucksbaum, DAMOP, Chicago, May, 1992.

"Phase Dependent Ionization Using an Intense Two-Color Light Field," D.W. Schumacher, M.P. deBoer, H.G. Muller, and P.H. Bucksbaum, DAMOP, Chicago, May, 1992.

"Population Trapping in Atoms Exposed to Intense Laser Fields," R.R. Jones and P.H. Bucksbaum, DAMOP, Chicago, May, 1992.

"Light-Induced Molecular Bound States in Intense Laser Fields," A. Zavriyev and P.H. Bucksbaum, DAMOP, Chicago, May, 1992.

"High Intensity Above-Threshold Ionization of Xe," U. Mohideen, M.H. Sher, H.W.K. Tom, G.D. Aumiller, O.R. Wood, II, R.R. Freeman, J. Bokor, and P.H. Bucksbaum, submitted to Ultrafast Phenomena, June, 1992.

"Generation of Pulsed High Power Far Infrared Radiation," D. Dykaar, R.R. Jones, D. You, D.W. Schumacher, and P.H. Bucksbaum, submitted to Ultrafast Phenomena, June, 1992.

"Phase Dependent Ionization Using an Intense Two-Color Light Field, D. Schumacher, M.P. de Boer, H.G. Muller, R.R. Jones, and P.H. Bucksbaum, submitted to Ultrafast Phenomena, June, 1992.

"Experiments with Negative Ions in Strong Laser Fields," M.D. Dabidson, B. Broers, D. Schumacher, P.H. Bucksbaum, H.G. Muller, and H.B. van Linden van den Heuvell, European Conference on Atomic and Molecular Physics, Riga, Latvia, June 1992.

"New Tests of P-Conserving T-Violation in Atoms," R.S. Conti, P.H. Bucksbaum, D. Kilper, and D. Jenkins, Bull. Am. Phys. Soc. (submitted to DAMOP '91). 1988

"Angle resolved study of ATI in Xe, Kr, and He with elliptically polarized laser light," M. Bashkansky, P.H. Bucksbaum, and D.W. Schumacher, DAMOP Meeting of APS, Baltimore, MD, April 18-20, 1988. POSTER

"The high-intensity Kapitza-Dirac effect," D.W. Schumacher, P.H. Bucksbaum, and M. Bashkansky, DAMOP Meeting of APS, Baltimore, MD, April 18-20, 1988. POSTER 1987

"Above-threshold ionization and ponderomotive forces", P. H. Bucksbaum, R. R. Freeman, T. J. McIlrath, and M. Bashkansky, IQEC 87 Technical Digest, 21, 194 (1987). 1986

"Time Resolved Photoemission from Semiconductor Surfaces and Interfaces", J. Bokor, R. R. Freeman, P. H. Bucksbaum and R. A. Haight, IQEC 86 Technical Digest Series, (1986).



"Intensity and Polarization Effects on Above Threshold Ionization," T. J. McIlrath, R. R. Freeman, M. Bashkansky, and P. H. Bucksbaum, DEAP Meeting, Eugene, Oregon, 18-20 June, 1986.

### **Unpublished reports and papers (optional)**

25 Year Roadmap for DOE (Report to BESAC, 2004).  
THZ workshop report (Report to NSF and DOE, 2005)

SAUUL: Science and Applications of Ultrafast Ultraintense Lasers (2003).

LCLS: The First Experiments (Report to BESAC, 2001).

Leone Panel Report on 4th Generation X-ray Light Sources, Report to the Department of Energy Basic Energy Sciences Advisory Panel (BESAC), 1999.

"Future Research Directions In High-Field Atomic, Molecular, And Optical Physics," Workshop report to the Department of Energy, September 1997.

"Measurement of the Parity Nonconserving Neutral Weak Interaction in Atomic Thallium", Doctoral Thesis, Lawrence Berkeley Laboratory publication LBL-11641 (1980).

### **List of invited talks, lectures, colloquia, and seminars**

#### **2020**

*Ultrafast x-ray lasers and making molecular movies*, Arizona State University, Tucson, AZ, January 17, 2020.

*Tracking the motion inside molecules with x-ray lasers*, Ford Lecture, University of Michigan, February 12, 2020.

*Scientific principles and open research are under threat*, Stanford Science Policy Seminar, Stanford, CA, February 26, 2020.

*Ultrafast strong field AMO Physics*, Ramsey Prize Lecture, DAMOP, June 2, 2020. (Virtual)

*Ultrafast Strong Field AMO Physics*, Colloquium at the University of Mary Washington, June 23, 2020. (Virtual)

*Ultrafast Strong Field Atomic and Molecular Physics*, Colloquium at the University of San Carlos, Brazil, August 21, 2020. (Virtual)

*Ultrafast strong field AMO Physics*, Physics colloquium at Amherst College, Amherst, MA, October 20, 2020. (Virtual)

*Ultrafast AMO Physics in Strong Fields*, Talk at the AMOS Contractors Meeting, October 27, 2020. (Virtual)

**2019**

*The Schwinger Threshold and Beyond: An experimental program to rip open the quantum vacuum and study what's inside*, Invited talk at *Progress in Quantum Optics*, Snowbird, UT, January 10, 2019

*Strong-field electron imaging: What we can learn from all those electrons that DON'T end up making high harmonics*, European School on The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Sicily, Italy: March 12, 2019.

*X-ray free electron laser basics, and especially how they produce femtosecond to attosecond pulses*, European School on The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Sicily, Italy: March 12, 2019.

*X-ray movies of molecules*, European School on The Frontiers of Attosecond and Ultrafast X-ray Science, Erice, Sicily, Italy: March 14, 2019.

*Ultrafast x-ray lasers and making molecular movies*, Physics Colloquium, Ohio State University, March 26, 2019.

*Opportunities in Intense Ultrafast Lasers; Reaching for the Brightest Light*, Plenary talk at Brightest Light Initiative Workshop, Washington, DC March 27 2019.

*Characterizing multiphoton excitation using time-resolved x-ray scattering: How x-ray movies of molecules can reveal nonlinear laser-molecule interactions*, DAMOP, Milwaukee, March 29, 2019.

*Reaching for the Brightest Light: Building the user community for ultrafast ultra-intense lasers*, Invited talk at the International Extreme High Intensity Laser Physics (EXHILP) meeting, Stanford, September, 2019.

*X-rays, attoseconds, and boiling the quantum vacuum: Frontier research made possible by chirped-pulse amplification*, Invited talk at Frontiers in Optics (DLS Annual Meeting), Washington, September, 2019.

*Exploring motion on the quantum scale*, Physics 290 seminar, September, 2019.

*What can we learn from X-ray diffraction*, Workshop on Frontiers of Physical Sciences with X-ray FELs, Imperial College, London, UK, November, 13, 2019.

*The Schwinger plasma: An experimental program to study the plasmas that exist inside the vacuum*, Lecture at MIPSE, University of Michigan, December 4, 2019.

**2018**

*Opportunities in Intense Ultrafast Lasers*. Briefing to the Office of Science, January 19, 2018.

*Imaging Ultrafast Molecular Motion*, Colloquium at Hebrew University, Jerusalem January 11, 2018.

*Petawatt Lasers*, Briefing to the National Photonics Initiative Steering Committee, San Francisco, January 28, 2018.

*Electron Motion Induced by HHG and Strong Fields*, Seminar at Tel Aviv University, Tel Aviv, January 10, 2018.

*When Ultrafast X-rays Meet Matter*, Convergence at Weizmann Institute, Rehovot, Israel, January

14, 2018.

*Plotting electron and nuclear motion in molecules using ultrashort x-rays*, Conference on Compact XFELs, Arizona State University, Tempe, AZ February 5, 2018.

*Alternative Probes of Structure and Dynamics*, Photoionization and photodetachment Gordon Research Convergence, Galveston, TX, February 22, 2018.

*Reaching for the Brightest Light*, Briefing for the White House Office of Science and Technology Policy, Washington, February, 2018.

*Petawatts at SLAC*, SLAC Science Council Retreat, February 16, 2018.

*High Intensity Lasers*, Briefing to the Division of Engineering and Physical Sciences, National Academies of Science, Engineering, and Medicine, Washington DC, March, 2018.

*Attosecond Sources, Attosecond Science*, Talk at the IEEE Section, Intel Corporation, March 6, 2018.

*Imaging Ultrafast Molecular Motion*, Colloquium at the University of Ottawa, March 2018.

*X-ray free electron laser basics, and especially how they produce femtosecond to attosecond pulses and the highest focused electromagnetic fields*. Tutorial at the University of Ottawa, March 20, 2018.

*Opportunities for Petawatt Laser Science*, Seminar at the National Research Council, Ottawa, March 23, 2018.

*Viewing and Controlling Electron Motion in Strong Fields*, Seminar at the University of Ottawa, March 27, 2018.

*SLAC Colloquium: Opportunities in Intense Ultrafast Lasers; Reaching for the Brightest Light*, SLAC Colloquium, March 7, 2018.

*Clocking electrons in strong-field ionization*, Talk at the Corkum Fest, Quebec, May 2018.

*Molecular movies: how to make them and what are they good for?*, Invited talk at DAMOP, Fort Lauderdale, FL, May, 2018.

*X-ray movies of molecules (current work) Breaking the quantum vacuum (maybe future work?)*, Seminar at Imperial College, London, May, 2018.

*Random thoughts on high intensities*, Seminar in Astronomy Department, Oxford University, May, 2018.

*Attosecond x-ray physics in atoms and molecules*, Seminar in the Physics Department, Oxford University, May, 2018.

*Research using x-ray free electron lasers. Today: Making Molecular Movies*, Colloquium at RAL, U.K., May, 2018.

*Ultrafast X-ray AMO Physics: Poking around the inside of atoms and molecules using x rays*, Lecture at the PULSE Ultrafast X-ray Summer School, June, 2018.

*Imaging molecules with ultrafast x-rays, in space and time: An Fahy Féile contribution*, Talk at the Fahy Fest, Cork, Ireland, August, 2018.

*Science Opportunities with Petawatt-Class Lasers; Reaching for the Brightest Light*, Plenary

Lecture at Europhoton 2018, Barcelona, Spain, August, 2018.

*"The Story of Jerry and the SPPS"*, Jerry Hastings Symposium, SLAC, September, 2018.

*Ultrafast X-ray Physics in the Bucksbaum group*, Physics 290, September, 2018.

*Ultrafast, strong-field, and short-wavelength AMO-2020 Physics; ...and Lessons Learned from AMO-2010*, Briefing to the AMO-2020 Decadal Committee, Washington DC, September 2018  
**2017**

*Opportunities and challenges for ultrafast molecular movies at x-ray free electron lasers*, Weizmann Institute Ultrafast Ultraslow Workshop, January, 23, 2017

*Strong-field electron imaging: What we can learn from all those electrons that DON'T end up making high harmonics*. Lecture 1 at the Erice School on Attosecon Science, Erice, Sicily, March 2017.

*X-ray free electron laser basics, and especially how they produce femtosecond to attosecond pulses and the highest focused electromagnetic fields*. Lecture 2 at the Erice School on Attosecon Science, Erice, Sicily, March 2017.

*Impulsive x-ray methods: A path to realize molecular movies*. Lecture 3 at the Erice School on Attosecon Science, Erice, Sicily, March 2017.

*Imaging motion in molecules with X-ray FELs*, Stanford Imaging Workshop, April 19, 2017, Stanford University.

*Imaging molecules with ultrafast x-rays, in space and time*. Plenary lecture at Photonics North, Ottawa, ON, June, 2017.

*Imaging molecules with ultrafast x-rays, in space and time*, JILA Workshop on Ultrafast Science, University of Colorado, July, 2017.

*Electron Motion Induced by HHG and Strong Fields*, Invited talk at Frontiers in Optics, Washington DC, September, 2017.

*Reaching for the Brightest Light: Opportunities in the Science, Applications, and Technology of Intense Ultrafast Lasers*, High Intensity Lasers, SLAC, October, 2017.

*Imaging Ultrafast Molecular Motion*, Department of Energy AMOS Contractors Meeting, Gaithersburg, MD, October, 2017.

*Reaching for the Brightest Light: Opportunities in the Science, Applications, and Technology of Intense Ultrafast Lasers*, Ultrafast Optics Conference, Jackson Hole, WY, October, 2017.

*Fundamental atomic & molecular dynamics at LCLS-II-HE*, LCLS-II-HE "First Experiments" Meeting: AMO, Biology, and Quantum Materials, SLAC, October, 2017.

*Following electron motion on the scale of the interatomic bond*, Frontiers of XFEL Ultrafast Science, DOE Roundtable Workshop, Gaithersburg, MD, October, 2017.

*Opportunities in Intense Ultrafast Lasers: Reaching for the Brightest Light*, Sponsors Briefing, National Academy, December 1, 2017.

*Reaching for the Brightest Light*, Briefings before various Congressional Committees, December 13, 2017.

*Reaching for the Brightest Light*, Public release event, National Academies Keck Building, December 14, 2017.

## 2016

*Strong-field photoionization: What we can learn from all those electrons that DON'T end up making high harmonics*, ITAMP Winter School Lecture, Biosphere 2, January 2016.

*Lecture 2: X-ray free electron laser basics, and especially how they produce femtosecond to attosecond pulses and the highest focused electromagnetic fields*. ITAMP Winter School Lecture, Biosphere 2, January 2016.

*Lecture 3: Transient Impulsive methods: A path to realize molecular movies through nonlinear multipulse interactions*. ITAMP Winter School Lecture, Biosphere 2, January 2016.

*Molecular movies: how to make them and what are they good for?* Stony Brook Physics Colloquium, Stony Brook University, February 16, 2016.

*Strong-field photoionization: What we can learn from all those electrons that DON'T end up making high harmonics*. AMO Seminar, Stony Brook University, February 15, 2016.

*Molecular movies: how to make them and what are they good for?* Physics Colloquium, San Francisco State University, San Francisco, CA, April 10, 2016.

*HIGH INTENSITY X-RAY MATTER INTERACTIONS AT X-RAY FELS*, talk at the Volkswagen Symposium, SLAC, April 2016.

*Electrons, Atoms, H<sub>2</sub><sup>+</sup>, and Andre*, Invited talk at the Andre Bandrauk Symposium, Orford, Quebec, Canada, May 7, 2016.

*Opportunities in the Science, Applications, and Technology of Intense Ultrafast Lasers*, talk before the Board on Physics and Astronomy of the National Academy, May 3, 2016.

*Probing transient electron dynamics using ultrafast x rays*, Invited talk at DAMOP, Providence, RI, May 15, 2016.

*Multiphoton FEL Science*, Gordon Research Conference on Multiphoton Processes, Proctor Academy, Andover, NH, June, 2016.

*Lecture 1: Ultrafast X-ray Lasers: What are they?*, lecture at the Siegman School for Laser Science, Barcelona, Spain, July 2016.

*Lecture 2: Ultrafast X-rays: What are they good for?*, lecture at the Siegman School for Laser Science, Barcelona, Spain, July 2016.

*Self-Referenced Coherent Diffractive Imaging at LCLS-II-HE*, Invited talk at the SLAC Workshop on LCLS-II-HE

*Transient Impulse-Driven Attosecond Electron Dynamics at LCLS-II*. Invited talk at the SLAC User Meeting Workshop on Nonlinear X-ray Science, October 2016

*0.5M fs of PULSE history in only 1μM fs...* Introductory talk at the PULSE 10<sup>th</sup> Anniversary Symposium

*Self-Referenced Coherent Diffractive Imaging*, AMO Seminar, Weizmann Institute of Science,

Rehovot, Israel, November 2016.

## 2015

*Science opportunities in nonlinear and strong x-ray fields*, LCLS-II Science Opportunity workshop, SLAC, February, 2015

*Quantum Control in Strong Fields*, Physics Colloquium at Texas A&M University, February 26, 2015.

*Building a Career in Optics and Photonics*, Invited talk for Student Chapter of the Optical Society, Texas A&M University, February 26, 2015.

*The Stanford PULSE Institute*, Talk for the Director of the Chemistry Division, Basic Energy Sciences, Department of Energy, March 13, 2015.

*Attosecond Science*, AMO Seminar, Applied Physics, Stanford, April 8, 2015.

*LCLS-II AMO Opportunities*, Presentation for the LCLS Science Advisory Committee, SLAC, April 12, 2015.

*X-ray-probed ultrafast electron and nuclear dynamics in molecule*, Nobel Symposium on Free Electron Laser Research, Sigtuna, Sweden, June 16, 2015.

*X-ray-probed ultrafast electron and nuclear dynamics in molecules*, Max Planck Center Workshop, Pohang, S. Korea, June 28, 2015.

*Ultrafast dynamics of atoms and molecules in strong short wavelength coherent radiation*, Physics Colloquium, Technical University, Vienna, Austria, June 21, 2015.

*Strong fields and X-ray free electron lasers for atomic and molecular physics*, invited talk at ICPEAC 2015, Toledo, Spain, July 27 2015.

*Renewal: PULSE Ultrafast Chemical Science*, PULSE External Advisory Board, September 1, 2015.

*SFA: Strong field AMO Physics*, PULSE External Advisory Board, September 1, 2015

*PULSE Ultrafast Chemical Science*, DOE AMOS site visit, September 14, 2015.

*SFA: Strong field AMO Physics*, DOE AMOS site visit, September 14, 2015.

*Ultrafast electron motion in atoms and molecule*, EPSCOR Symposium at the University of Nebraska, Lincoln, NB October 7, 2015.

*Ultrafast AMO Physics: The Big Questions...* Physics 59, October, 2015

*Ultrafast processes in strong-field photoionization*, Invited talk at Atom15, Max Planck Institute for Complex Systems, Dresden, November, 2015.

*Building a Career in Optics and Photonics*, Invited talk at the University of Potsdam, November 2015.

*AMO Photon Science Opportunities*, Physics retreat, December 2015.

**2014.**

*Commins Group in the 1970's*, talk at the Stuart Freedman Symposium --Measuring Nothing and Getting it Right, U.C. Berkeley, January 11, 2014.

*Science Policy for Optics and Photonics* President's Address, OSA Leadership Conference, Washington, DC, February 13, 2014.

*The OSA: Light in Focus*, AIP March 2014 Governing Board Meeting, College Park, MD, March 27, 2014.

*Molecular dynamics driven by strong-field multiple ionization*, Invited talk at the APS March Meeting, Denver, CO, March 3, 2014.

*BESAC New Grand Challenge: Photonics and the Energy Frontier*, BESAC 2014 Grand Challenge Workshop, Washington DC, July 31, 2014.

*Femtosecond Time-Resolved X-ray-Induced Isomerization*, Conference on Ultrafast Phenomena, Okinawa, Japan, July 2014.

*Probing electron delays in above threshold ionization*, OIST Workshop on Ultrafast Dynamics in Nanoscale Systems, Okinawa, Japan, July 2014.

*Quantum coherent control of conical intersections*, Legacy of Moshe Shapiro Conference, Univ. of British Columbia, Vancouver, BC, Canada, August 13, 2014.

*Building a career in optics and photonics*, IONS East Asia conference, University of Hokkaido, Sapporo, Japan, September 15, 2014.

*Quantum Control in Strong Laser Fields*, Japan Society of Applied Physics Annual Meeting, Sapporo, Japan, September 15, 2014.

*Optical Society President's Address*, Frontiers in Optics, Tucson, AZ, October 20, 2014.

*Optical Society Fellows Luncheon Address*, Frontiers in Optics, Tucson, AZ, October 21, 2014.

*Attosecond Science and Strong Field Physics programs in PULSE*, AMOS Contractors Meeting, Potomac, MD, October 27, 2014.

*Optical Society Address*, ACP Annual Meeting, Shanghai, China, November, 2014.

*Research careers in optics*, OSA Student meeting, Shanghai, China, November, 2014.

*Quantum Control in Strong Laser Fields*, Physics Colloquium at Shanghai Institute of Optics and Fine Mechanics, Shanghai, China, November 2014.

*Quantum Control in Strong Laser Fields*, Physics Colloquium at Shanghai Institute of Optics and Fine Mechanics, Shanghai, China, November 2014.

*Quantum Control in Strong Laser Fields*, Physics Colloquium at Fudan University, Shanghai, China, November 2014.

*Quantum Control in Strong Laser Fields*, Physics Colloquium at Shanghai Jiao Tong University, Shanghai, China, November 2014.

*Optical Society Address*, Advanced Solid State Lasers Conference (ASSL), Shanghai, China, November 2014.

*Ultrafast Quantum Control*, Physics Colloquium at TIFR, Mumbai, India, December, 2014.

*Quantum Control in Strong Laser Fields*, Indian Photonics Society Meeting, Karaghpur, India, December, 2014.

### 2013

*Atomic and Molecular Processes in Strong Fields at the LCLS X-ray Laser*, Physics Colloquium, Ben-Gurion University, Beer Sheva, Israel, January 10, 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free Electron Lasers*, Physics Department Colloquium, Weizmann Institute of Science, Rehovot, Israel, January 31, 2013.

*The Optical Society: Advancing the Science and Technology of Light*, Talk to the combined Israeli Student Chapters of the Optical Society, February, 2013.

*Ultrafast Short Wavelength Probes of Inner Electron Sub-Cycle Dynamics in Molecules*, French-Israeli Nonlinear Optics Conference, Ein Gedi, Israel, March 1, 2013.

*Prospects for strong field control beyond the single active electron model*, Kavli Institute for Theoretical Physics, Santa Barbara, CA, March 2013.

*On the possibility of enhanced multiple ionization near conical intersections*, Faraday Discussion on Quantum Control, Nottingham, U.K., April 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free-Electron Lasers*, Physics Colloquium, University of Maryland, College Park, MD, April 30, 2013.

*Ultrafast AMO Physics with Short Wavelength Coherent Radiation*, Colloquium at the Max Planck Institute for the Study of Light (MPL), Erlangen, Germany, May 2013.

*Atomic and Molecular Processes in Strong Fields at the LCLS X-ray Laser*, Plenary talk, Nordic Physics Days, Lund, Sweden, June 2013.

*Quantum Control and Electron Dynamics*, Talk before the BESAC Subcommittee on Future Light Sources, Washington, DC, July 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free-Electron Lasers*, DOE SCGF conference, at SLAC, July 2013.

*Coherence and control*, Talk for the NSF MPSAC Special Committee on Photonics, (web conference), July, 2013.

*The future of quantum control*, Gordon Research Conference on Quantum Control, Mt. Holyoke College, South Hadley, MA, August 2013.

*Prospects for strong field control beyond the single active electron model*, PRAQSYS meeting, Monterey, CA, August 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free-Electron Lasers*, Physics Colloquium, University of British Columbia, September 26, 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free-Electron Lasers*, Physics Colloquium, Simon Fraser University, Vancouver, BC, September 27, 2013.



*Dan and me*, Dan Kleppner 80<sup>th</sup> Birthday Celebration, MIT, Cambridge, MA, October 14, 2013.

*Ultrafast laser-matter science at the PULSE Institute at SLAC*, Seminar at IPG Photonics Corporation Research Labs, Sunnyvale, CA, November 13, 2013.

*Ultrafast Strong Field AMO Physics in the Bucksbaum group*, Physics 290 seminar, November 14, 2013.

*The Optical Society: Preparing students to be future leaders in the field of optics and photonics*, seminar for the Melbourne combined student chapters of the Optical Society, December 3, 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free-Electron Lasers*, Physics colloquium, University of Melbourne, Australia, December 5, 2013.

*Ultrafast AMO Physics with strong laser fields: High Harmonic Generation and X-ray Free-Electron Laser*, invited talk at the 2013 Australia-New Zealand Conference on Optics and Photonics, Fremantle, Western Australia, December 8, 2013.

*ANZCOP OSA Student Luncheon*, 2013 Australia-New Zealand Conference on Optics and Photonics, Fremantle, Western Australia, December 9, 2013.

## 2012

*Probing atoms and molecules with ultrafast x-ray lasers*, ITAMP Winter School, Biosphere 2, AZ, January 16, 2012.

*Ultrafast Quantum Control: Ultrafast control of molecular dynamics*, ITAMP Winter School, Biosphere 2, AZ, January 18, 2012.

*Atomic and Molecular Processes in Strong Fields at the LCLS X-ray Laser*, General Science Colloquium, Ecole Polytechnique, Palaiseau, March 15, 2012.

*Atomic and Molecular Processes in Strong Fields at the LCLS X-ray Laser*, Stanford Optical Society Retreat, Asilomar, CA, April 14, 2012.

*Space-time patterns in molecules at XFELs*, Dynamic Molecular Imaging Conference, Banff, Alberta, Canada, July 1, 2012.

*Ultrafast AMO Physics at the LCLS X-ray FEL*, University of Ottawa General Physics Colloquium, Ottawa, Canada, July 20, 2012.

*Ultrafast AMO Physics at the LCLS X-ray FEL*, International Conference on Atomic Physics 23, Paris, France, July 27, 2012.

*Progress Towards Attosecond Control with X-rays*, Safed Conference on Quantum Control, Safed, Israel, September 3, 2012.

*Atomic and Molecular Physics at the LCLS X-ray Laser*, Annual Meeting of the Optical Society of Mexico, San Luis Potosi, Mexico, September 20, 2012.

*High harmonic probes of inner electron sub-cycle dynamics in molecules*, FIO Conference, Rochester, NY, October 16, 2012.

*Ultrafast Atomic and Molecular X-ray Physics at the LCLS Free Electron Laser*, Weizmann Institute of Science General Colloquium, Rehovot, Israel, October 28, 2012.

*Small molecules in strong fields at the Stanford PULSE Institute*, NGLS Colloquium, Lawrence

Berkeley National Lab, Berkeley, CA, November 19, 2012.

*Ultrafast AMO Physics at the LCLS X-ray FEL*, General Physics Colloquium, University of Colorado, November 28, 2012.

2011

*Ultrafast x-ray experiments in simple molecules: early experiments and new opportunities*, Ringerg Conference on X-ray FEL Research, Ringerg, Germany, February 2011.

*The Ultrafast Quantum World of Atoms and Molecules*, Sonoma State University, March 2011.

*Atomic and Molecular Processes in Strong Laser Fields at the LCLS X-ray Laser*, CFEL Colloquium, DESY, Hamburg, March 2011.

*Observing structure and motion in molecules with ultrafast strong field and short wavelength laser radiation*, APS Colloquium, Argonne National Laboratory, April 2011.

*Ultrafast laser technology; characterization of ultrafast pulses*, Ultrafast X-ray Summer School, DESY, Hamburg, June 2011.

*Capturing transient processes in diatomic molecules*, CFEL/PULSE Ultrafast X-ray Summer School, Hamburg, June 2011.

*Atomic and Molecular Processes in Strong Fields at the LCLS X-ray Laser*, Femto 10, Madrid, July, 2011.

*Attoseconds (and Strong Fields)*, Quantum Control Gordon Research Conference, South Hadley, MA, August 2011.

*Nonlinear laser-matter interactions at SLAC's hard x-ray free electron laser LCLS*, Nonlinear Optics at 50, Ann Arbor, October, 2011.

2010

*AMO physics with ultrafast hard and soft xrays*, McMaster University, April 2010.

*The Atto-Femto Frontier at the Stanford PULSE Institute*, seminar at the National Science Foundation, April, 2010.

*AMO physics with ultrafast hard and soft xrays*, Waterloo University, April, 2010

*AMO-CMP Connections in ultrafast, short wavelength, and strong field laser science*, invited talk at CAMOS, Washington, April 2010.

*Ultrafast Processes in Atoms and Molecules by Strong Laser Fields*, Ultrafast Sciences Lab, LBNL, May, 2010

*Ultrafast strong field xray interactions with aligned molecules at LCLS*, DAMOP, May, 2010.

*Introduction to Ultrafast X-ray Science*, UXSS10, June 2010.

*Ultrafast Coherent Control*, Multiphoton GRC, Tilton, NY, June 2010.

*AMO - Physics Program at LCLS*, CIPS Conference, MIT, June 2010.

*NEW Ultrafast Opportunities at LCLS*, ACS Fall Meeting, Boston, August 2010.

*Ultrafast control of molecular dynamics, Lecture I a SUSSP66*, Heriot-Watt University, Edinburgh, August 2010.

*Probing molecules with high harmonics, Lecture II a SUSSP66*, Heriot-Watt University, Edinburgh, August 2010.

*Probing molecules with x-ray lasers, Lecture III a SUSSP66*, Heriot-Watt University, Edinburgh, August 2010.

*AMO physics with ultrafast short wavelength coherent radiation*, Stanford Colloquium, October, 2010.

*Toward Science at LCLS, Workshop on FELs*, Catalina, October 2010.

2009

“Ultrafast Quantum Control,” University of Arizona Colloquium, Feb 27, 2009.

“Directing Matter and Energy: Five Challenges for Science and the Imagination,” Banquet talk at THz Conference, Santa Barbara, CA, March 9, 2009.

“Ultrafast Quantum Control,” Spectra Physics Colloquium, Mountain View, CA, March 20, 2009.

“Femtosecond x-rays and gigavolt/cm fields in AMO Physics,” University of Colorado colloquium, April 15, 2009.

“Femtosecond x-rays and strong fields in AMO Physics,” Physical Review Colloquium, Ridge, NY, April 23, 2009.

“Interface of Theory and Experiment in Coherent Control,” KITP Workshop on Quantum Control, May 18, 2009.

“Research at the LCLS X-ray Laser,” CLEO tutorial, June 3, 2009.

“Intense Femtosecond Short Wavelength Laser-Molecule Interactions,” Conference on Nonlinear Optics, Honolulu, July 13, 2009

“Attosecond Control of Atoms and Molecules by Strong Laser Fields,” Invited talk at Quantum Control GRC, Mt. Holyoke, August 3, 2009

“LCLS: It lases, it tunes, it focuses, it diffracts. It just works great.” Banquet talk at FIO, October 13, 2009.

“Attoscience at NGLS: Summarizing the Case,” LBNL NGLS Workshop, December 2, 2009

2008

“Strong-field Control of Molecules, Atomic and Molecular Interactions,” GRC July 10, 2008.

“Picosecond (not femto- or attosecond) AMO X-ray Opportunities,” SPX at ANL, May 9, 2008.

“Ultrafast Quantum Control,” U. Chicago Physics Colloquium, Jan 17, 2008

“Structure of aligned molecules viewed with short wavelength radiation,” Time Resolved X-rays 2008, Dresden, August, 2008

“Ultrafast Quantum Control,” KSU Physics Colloquium, March 31, 2008.

“AMO Physics Applications: a fruitful partnership,” Invited talk to the NSF panel on light source facilities, LLNL, Jan 10, 2008

“Ultrafast imaging and control of atoms and molecules,” MIT Spectroscopy Lab Symposium, MIT, Feb 27, 2008

“Strong-field Control of Molecules,” Multiphoton GRC, June 9, 2008

“Ultrafast Quantum Control,” ORNL Director’s Colloquium, Feb 26, 2008

“Ultrafast Quantum Control,” UIUC Mat. Sci. Colloquium, Feb, 2008

“AMO Research at the PULSE Institute,” AMOP DOE Contractors Meeting, Airlie, VA, 9/15/08

“Control of Quantum Systems Using Ultrafast Lasers,” P. Bucksbaum, LEOS, November 13, 2008.

2007

- “Ultrafast X-ray Science at SLAC and LCLS,” APS March Meeting, Denver, CO, March 2007
- “Ultrafast X-ray Science at SLAC: Preparing for LCLS,” International Plasma Physics Meeting, NIST Gaithersburg, March 2007.
- “AMO 2010: Controlling the Quantum World,” Invited talk to the Board on Physics and Astronomy of the National Research Council, Irvine, CA, March 2007
- “Ultrafast Quantum Control: New tools to view and control the quantum world,” Director’s Colloquium, Los Alamos National Lab, April, 2007
- “AMO physics with LCLS,” PULSE Ultrafast X-ray Summer School, June 20, 2007.
- “Atomic Attophysics,” AMO Gordon Conference, Tilton, NH, July 2007
- “Advances in time-resolved x-ray science: Tutorial, from Synchrotrons to X-ray FEL’s,” Frontiers in Optics, San Jose, September 18, 2007
- “PULSE: The Center for Photon Ultrafast Laser Science and Engineering,” AMOS Contractors’ Meeting, September 10, 2007
- “Advances in time-resolved x-ray science,” Tutorial for Frontiers in Optics Meeting, September 18, 2007.
- “LCLS Science Perspective,” LCLS-SSRL Users Meeting, October 2, 2007
- “Fundamental science challenges for soft x-ray FEL research in the 21st Century: Quantum Coherence and Quantum Control,” LBNL Workshop on Future Light Sources, Berkeley, October 9, 2007.
- “LCLS Science Perspective,” X-ray and Neutron Contractor’s Meeting, October 19, 2007

2006

- “Ultrafast Control of Atoms and Molecules,” Peter Frankin Distinguished University Professorship Lecture, Feb 7, 2006.
- “Ultrafast Control of Atoms and Molecules,” Physics Colloquium, Georgia Tech, April 2006.
- “Ultrafast X-ray studies of dynamics at SPPS,” Attosecond Workshop, Imperial College, London, UK, April 2006.
- “Opportunities in Atomic, Molecular, and Optical Physics: Controlling the Quantum World of Atoms, Molecules, and Photons, AIP 75<sup>th</sup> anniversary, Washington, May 2006.
- “Ultrafast Science at SLAC: The Stanford Center for Photon Ultrafast Laser Science and Engineering,” SLAC faculty retreat, May 2006.
- “Ultrafast Control of Atoms and Molecules,” Physics Colloquium, Ohio State University, May 2006
- “LCLS: Experiments and Challenges for Ultrafast X-ray Science,” ITAMP XFEL Workshop, Harvard Smithsonian Center for Astrophysics, June 2006.
- “X-ray Free Electron Lasers An introduction to the science of XFEL’s,” 2006 ALS-SSRL Summer School, June 2006.
- “Attosecond X-ray Science Opportunities at X-ray Free Electron Lasers,” KITP workshop, University of California at Santa Barbara, August 2006.
- “High-field Physics with Single-cycle Pulses,” SPRC annual meeting, Sept 2006.
- “Ultrafast Control of Atoms and Molecules,” Physics Colloquium, University of California at Berkeley, October 2006.
- “Ultrafast Control of Atoms and Molecules,” Physics Colloquium, Harvard University, October 2006.

"Ultrafast Control of Atoms and Molecules," Physics Colloquium, The University of Oregon, November 2006.

2005

"Ultrafast X-ray Science at SPPS, DOE Review," SSRL, January, 2005.

"Ultrafast X-ray Science at the Stanford Linear Accelerator," Colloquium at the Free University, Amsterdam, February, 2005.

"Ultrafast Quantum Control," Lawrence Livermore National Laboratory Physics Colloquium, January, 2005.

"Ultrafast X-ray Science at the Stanford Linear Accelerator," Invited talk at the French-Israeli Nonlinear Optics Conference, En Bokek, Israel, February, 2005.

"Ultrafast X-ray Science at the Stanford Linear Accelerator," Second Conference on Chemical Dynamics, Radiation Chemistry, and Ultrafast X-rays, (FIAP2005) Paris, March 2005.

"Ultrafast X-ray Science," Colloquium at Princeton Plasma Physics Laboratory, Princeton, March, 2005.

"Ultrafast X-ray Science at SLAC," SLAC SPC, May, 2005

"NAS DAMOP Town Meeting", DAMOP, Lincoln, NB, May, 2005.

"The Physics of Super Lasers," SLAC Public Lecture, June, 2005.

"Ultrafast control of atoms and molecules," Stanford P.Chem Seminar, June 2005.

"Free Electron Lasers," SSRL Summer School, June 2005.

"Ultrafast Quantum Control of Atoms and Molecules," *ICOLS 17, Aviemore, Scotland*

"Learning Search Strategies in Quantum Control," International Femtochemistry Conference, July, 2007, Washington DC.

"Coherent Control: Light That Learns on the Job," AAPT meeting, August 10, 2006, Salt Lake City

"DOE-NSF-NIH Workshop on Opportunities in THz Science," SLAC workshop, August 19, 2006, SLAC.

"What to Do with Femtosecond Pulses?" Invited talk at FEL2005, Stanford, August, 2005.

"Sub-femtosecond Research Opportunities," LBNL talk, MURI Kickoff, October, 2005

"Coherent Control: Light That Learns on the Job," UM Dearborn Physics Colloquium, Nov 11, 2005.

"Learning Feedback in Photoabsorption," Pacifichem 2005, Honolulu, December, 2005.

2004

"Ultrafast coherent control in x-ray scattering," ACS Symposium on Emerging Ultrafast Spectroscopies: From Chemistry to Biophysics (2004).

"Controlling the quantum evolution of Rydberg wave packets," Int. Workshop on Rydberg Physics, Dresden, May 2004.

"Ultrafast Quantum Control: Teaching Atoms, Learning from Molecules," Colloquium at the University of Indiana, Bloomington, January, 2004.

"Learning about Quantum Dynamics from Learning Control Algorithms," Symposium on Molecular Reaction Dynamics in Condensed Matter, Laguna Beach, CA, March, 2004.

"Ultrafast Science Community and Ultrafast X-ray Science," Advanced Photon Source Sector 7 Review, Argonne National Laboratory, February, 2004.

"Ultrafast coherent control in x-ray scattering," ACS Symposium on Emerging Ultrafast Spectroscopies: From Chemistry to Biophysics, Anaheim, March 2004.

"Controlling the quantum evolution of Rydberg wave packets," Int. Workshop on Rydberg Physics, Dresden, May 2004.

"Quantum control if you know what you are doing ... or if you don't," invited talk at the Multiphoton Gordon Conference," June 2004.

"Learning about Quantum Dynamics from Learning Control Algorithms," Workshop on Building Computational Devices using Coherent Control, University of Michigan, Ann Arbor June, 2004

“Learning about Quantum Dynamics from Learning Control Algorithms,” Invited talk at Fields Meeting on Chemical Control, Toronto, July 2004.

“Opportunities for Ultrafast X-ray Physics: New science at the APS with short x-ray pulses,” Argonne workshop on the future of the Advanced Light Source, Lake Geneva, WI, August, 2004.

“Quantum control if you know what you are doing ... or if you don't”, Advanced Light Source Colloquium, August, 2004.

“Ultrafast X-rays,” DOE AMO Science Meeting, Airlie, VA, September 2004

“Ultrafast X-ray Science,” SLAC Colloquium, September, 2004.

“Ultrafast X-ray Science,” Keynote address at SSRL Users Meeting, October, 2004.

“Quantum control if you know what you are doing ... or if you don't,” Colloquium at Michigan State University, November, 2004.

“Ultrafast Quantum Control: Learning about Quantum Dynamics from Learning Control Algorithms,” Quantum Optics Seminar, Stanford, November, 2004.

“Quantum control if you know what you are doing ... or if you don't,” Yale University Colloquium, December, 2004.

“Experiments at the Sub-Picosecond Pulse Source,” invited talk at the Berkeley Attosecond MURI workshop, December, 2004.

### 2003

“Coherent control of stimulated processes in molecular liquids,” PQE'03, Snowbird, UT, January 2003.

“High field x-ray physics,” AAAS Annual Meeting, Denver, CO, February, 2003.

“Ultrafast Coherent Control,” Applied Physics Colloquium, Stanford, April 2003.

“Connections between AMO and Solid State Physics,” Invited talk to the NAS Committee on Solid State Physics, April, 2003.

“Ultrafast X-ray Physics,” Invited talk at the New England Section APS Meeting, Williamstown, MA, April, 2003.

“Ultrafast and High Field X-ray Physics,” Colloquium at the University of Illinois at Urbana-Champaign, April 2003

“High Intensity Laser Physics,” Invited talk at DAMOP, Boulder, CO, May, 2003.

“Ultrafast Coherent Control for X-rays and Other Things, AMO Gordon Conference, June 2003.

“Ultrafast Hard X Rays,” Invited talk at Ultrafast Optics, Vienna, July 2003.

“Ultrafast Coherent Control,” invited lecture at JILA, Boulder, August, 2003.

“Ultrafast X Rays at Accelerators,” invited lecture at JILA, Boulder, August, 2003.

“Ultrafast X-ray Experiments: New Science Applications at Electron Synchrotrons, LINACS, and Elsewhere,” Invited Talk at the Synchrotron Radiation Instrumentation Conference, San Francisco, August, 2003.

“Ultrafast Quantum Control: Teaching Atoms, Learning from Molecules,” Physics Colloquium at the University of Notre Dame, South Bend, October 2003.

“Temporal Aspects of Laser-Matter Interactions,” University of Lund, Sweden, December 2003.

“What can we learn from learning feedback control algorithms?” Workshop on Coherent Control, Ringberg, Germany, December 2003.

### 2002

“Coherent Control of Molecular Excitation in Liquids,” Sanibel Symposium, St. Augustine, FL, February 2002

“Ultrafast X-ray Science,” PEB Presentation, Advanced Photon Source, Argonne, IL, February 2002

“Genetic Algorithms,” FOCUS Texas Retreat, Austin, TX, March 2003.  
“Ultrafast AMO Physics,” invited talk for the NAS Committee for AMO Science (CAMOS), Irvine, November 2002  
“Wave PacketSculpting Applications to Quantum Information Science,” Seminar at MIT, May, 2002  
“Ultrafast Coherent Control at FOCUS,” talk at NSF, June 2002.  
“Atomic interactions in intense laser fields,” Multiphoton Gordon Conference, Tilton, NH, July 2002.  
“Quantum Information in Rydberg Atoms,” QCPR, Nashville, TN, August 2002  
“Strong field ultrafast excitation of molecular liquids: Applications to decoherence,” MCTP Workshop on Decoherence and Control, September, 2002.  
“Strong field ultrafast excitation of molecular liquids: Applications to decoherence,” Cargese Summer School on Coherent Control, October 2002.  
“Quantum control in Rydberg wave packets: Applications to quantum information,” Cargese Summer School on Coherent Control, October 2002.

2001

“Quantum Control, Techniques and Applications,” Frontiers in Spectroscopy Lecture I, P. Bucksbaum, Ohio State University 7 Feb 2001  
“Feedback control and genetic learning algorithms,” P.H. Bucksbaum, Frontiers in Spectroscopy Lecture II, Ohio State University 8 Feb 2001  
“Applications of Coherent Control: quantum computing to chemistry to x-rays,” P.H. Bucksbaum, Frontiers in Spectroscopy Lecture III, Ohio State University 9 Feb 2001.  
“Quantum control and Quantum Information,” P.H. Bucksbaum, National Research Council Colloquium, Ottawa, March 2001  
“Quantum Control,” P.H. Bucksbaum, Sokol Award lecture, April 2, 2001.  
“Quantum Sculpting,” P.H. Bucksbaum, Stony Brook Physics Colloquium, April, 2001.  
“Study of Coherent Raman Energy Transfer in Molecular Liquids  
“Quantum Control,” P.H. Bucksbaum, Commins Festival Conference, Berkeley, May, 2001.  
“LCLS – The First Experiments,” DOE Workshop on x-ray free electron lasers, P.H. Bucksbaum, Washington, May 2001.  
“Quantum Control of a Rydberg Wave packet using Terahertz Half-Cycle Pulses,” P.H. Bucksbaum, Quantum Optics V, Zakopane, Poland, June 2001.  
“Rydberg Atoms and Quantum Information Science I,” P.H. Bucksbaum, Enrico Fermi Summer School, Lake Como, Italy, July 2001.  
“Rydberg Atoms and Quantum Information Science II,” P.H. Bucksbaum, Enrico Fermi Summer School, Lake Como, Italy, July 2001.  
“Strong Field Coherent Control,” Coherent Control Gordon Conference, Mt. Holyoke, August 2001  
“Quantum wave packet sculpting,” Philip H. Bucksbaum, ILS01, Long Beach, October, 2001.  
“Wave PacketSculpting: Techniques and applications, P.H. Bucksbaum, Physics Colloquium, Michigan State University, November 12, 2001.

2000

“Coherent Control,” Chemistry Department P-Chem Seminar, Wayne State University, February, 2000.  
“Quantum Algorithms,” Department of Applied Science Colloquium, University of California at

Davis, February, 2000.

"Evolutionary Algorithms in Quantum Dynamics," invited talk at the International Workshop on Extreme Fields, Max Planck Institute for Complex Systems, Dresden, Germany, March 2000.

"Wave packet sculpting, quantum information storage, and learning algorithms," Physics Colloquium at IBM Watson Research Center, April 2000.

"The Quantum Sculptor's New Tools," Physics Seminar at the Institute for Theoretical AMO Physics, Harvard University, May 2000.

"Perspectives on Strong Field Quantum Control," Invited talk at the Cross Border Workshop, May 2000

"Ultrafast quantum control in atoms," Invited talk at the International Conference on Atomic Physics (ICAP), Florence, Italy, June 2000.

"Algorithms for strong field wave packet control," Invited talk at the Annual Meeting of the APS Division of AMO Physics (DAMOP), Storrs, CT, June 2000.

"Rydberg wave packets and quantum sculpting," Invited talk at the Gordon Conference on Multiphoton Physics, Tilton School, New Hampshire, June 2000.

"Coherent control of x-rays in Bragg crystals," CNRS-NSF workshop 29Jun 2000

"Coherent control of quantum dynamics in strong laser fields," Invited talk at the International Conference on Laser Physics (LPHYS 2000), Bordeaux, France, July, 2000.

"Atomic Physics with Intense X-rays at LCLS," talk at LCLS workshop, Sept 7, 2000

"Strong field coherent control, and applications," Invited talk at the Super-Intense Laser-Atom Physics Conference, Belgium, September, 2000.

"Atomic Physics with Intense X-rays," Talk at BESAC, Oct 10, 2000 (Maryland)

"Ultrafast lattice dynamics, and why at a synchrotron," Invited talk at LBL workshop, Oct 18, 2000

"The process of Discovery," Talk for Curie Symposium, 28 Oct, 2000

"Ultrafast quantum control of atomic and molecular systems," MIT seminar, 28 Nov, 2000

"Coherent control of quantum systems with strong laser pulses," Tucson colloquium, 30 Nov, 2000

"Strong field coherent control of molecular modes," Invited talk at Pacificchem, 17Dec 2000

1999

"Wave Packet Sculpting," Colloquium at Old Dominion University, January 29, 1999.

"Really Intense Light," APS Distinguished Travelling Lecture, Saint Mary's University of Minnesota, February 23, 1999.

"Wave Packet Sculpting," APS Distinguished Travelling Lecture, Saint Mary's University of Minnesota, February 23, 1999.

"Coherent Control of Quantum Systems," Physics Department Colloquium, Argonne National Laboratory, February 26, 1999.

"Photon Bragg Switch," Contributed talk at the March Meeting, Atlanta, March 1999.

"Quantum Sculpting," Saturday Morning Physics lecture, April 1999.

"Properties of Really Intense Light," Saturday Morning Physics lecture, April, 1999.

"Wave Packet Sculpting," Colloquium at Ohio State University, May 1999.

"Quantum Algorithms," invited talk at QELS, Baltimore, May 1999.

"Coherent Control of X-rays at Synchrotrons," Invited talk at Super-Intense Laser-Atom Physics, Washington, May 1999.



"Wave Packet Sculpting," Invited talk at the Canadian Physical Society Annual Meeting, Fredericton, New Brunswick, June, 1999.

"X-ray Scattering of Coherent Acoustic Phonons," invited talk at the OSA Topical Meeting on Coherent VUV Radiation Generation and Applications, Pottsdam, Germany, June 1999.

"Quantum Algorithms," invited talk at LPHYS '99, Budapest, June 1999.

"CUOS activities at Third Generation Synchrotrons," invited talk at CNRS-NSF Rendez-Vous, Palaiseau, France, July, 1999.

"Quantum Algorithms," Physics Seminar at CEA, Saclay, July, 1999.

"Ultrafast Coherent Control," Invited talk at the Gordon Conference on Coherent Control, New Hampshire, August 1999.

"Quantum Sculpting," Physics Colloquium, University of Nebraska, Lincoln, NB, October 1999.

"Quantum Sculpting," Hascoe Lecture, University of Connecticut, Storrs, CT, November 1999.

"Quantum Algorithms," invited talk at the international workshop on Quantum Computing and Control, Nof Ginosar, Israel, November 1999.

"Quantum Algorithms," invited talk at the US-Japan Workshop on Coherent Control, Honolulu, Hawaii, December 1999.

1998

"Atoms in Really Intense Light," Physics Department Colloquium, Wayne State University, Detroit, January 22, 1998.

"Quantum Control of Wavepackets," Chemical Physics Seminar, University of Waterloo, Waterloo, Ontario, February 4, 1998.

"Wavepacket sculpting with high intensity optical radiation", Physics Seminar, University of Toronto, February 5, 1998.

"Correlation in High-order ATI Spectra" Invited Lecture, IVth German-Israeli Winter-School on Photo-Induced Nonlinear Dynamics in Strong Laser Fields, Technion - Israel Institute of Technology, Haifa, Israel, February 22 - 28, 1998.

"The future of high-field laser-atom physics", summary talk, IVth German-Israeli Winter-School on Photo-Induced Nonlinear Dynamics in Strong Laser Fields, Technion - Israel Institute of Technology, Haifa, Israel, February 22 - 28, 1998.

"Strong field THz interactions with wavepackets," APS invited talk, March Meeting, Los Angeles, March 20, 1998.

"Really Intense Light," APS Distinguished Travelling Lecture, Rowan University, Glassboro, NJ, April 6, 1998.

"Wavepacket Sculpting," APS Distinguished Travelling Lecture, Rowan University, Glassboro, NJ, April 7, 1998.

"Quantum Wave Packet Engineering," Physics Department Colloquium, University of Texas, April 29, 1998.

"Adaptive Control of Quantum Phase in Rydberg Wavepackets," IQEC, San Francisco, Monday May 4, 1998:

"Programmable structure in Rydberg systems," Invited talk at the APS Annual Meeting for DAMOP, Santa Fe, May 27, 1998.

Session Chair summary talk at Multiphoton Gordon Conf, Tilton School, New Hampshire, June 14, 1998,

"New resonant effects in ATI spectra: rescattering and electron-electron correlation," Invited Talk at the Laser Physics Conference LPHYS98, Berlin July 6, 1998.

"Wave Packet Sculpting," Colloquium at the University of Ulm, Germany, July 21, 1998.  
"Wave Packet Sculpting," Plenary Talk at the ILS/OSA Annual Meeting, Baltimore, October, 1998.  
"Ultrafast Coherent Phonon Bragg Modulator for X-rays," Invited talk, Advance Light Source Workshop, October 22, 1998.  
"Rydberg Wavepacket Sculpting," Invited talk at DoE Contractors Meeting for the Atomic Physics Program, Maryland, October 27, 1998.  
"Atoms in Really Intense Light," Colloquium delivered as an APS Centennial Speaker, Hope College, Holland, MI, 11/13/98.

1997

"Making and propagating half-cycle optical pulses," Chem. Phys. Seminar, Weizmann Institute, Rehovot, Israel, January 2, 1997  
"Strong Field Quantum Control," Chemistry Seminar at Hebrew University, Jerusalem, January 21, 1997  
"Above-Threshold Ionization," Chem. Phys. Seminar, Weizmann Institute, Rehovot, Israel, January 20, 1997.  
"Gauge Problems in High Intensity Laser-Atom Theory," Chem. Phys. Seminar, Weizmann Institute, Rehovot, Israel, January 23, 1997.  
"Quantum Wavepacket Sculpting," Optical Physics Seminar, Imperial College, London, January 28, 1997.  
"Propagation of Shaped Wavepackets in a Nonseparable Potential," Atomic Physics Seminar, CEA/Saclay, France, February 12, 1997.  
"Strong field control and wavepacket sculpting in atoms." Physics Seminar, Ecole Normale, April 1, 1997.  
"Atomic Wavepacket Sculptures," Atomic Physics Seminar, FOM/AMOLF, Amsterdam, April 7, 1997.  
"Resonant effects in high-order ATI," CEA Saclay, April 30, 1997.  
"Resonant effects in high-order ATI," Physics Seminar, Max Planck Inst, Garching, May 5, 1997.  
"Atomic Wavepacket Sculptures and Shaped Optical Fields," Physics Colloquium, Max Planck Inst, Garching, May 6, 1997.  
"Strong field coherent control," Seminar, Aime Cotton, Orsay, May 29, 1997.  
"High Order ATI Electrons," Seminar, Laboratoire d'Optique Applique, Palaiseau, June 13, 1997.  
"Control of quantum wavepackets in atoms and molecules," Invited talk, Workshop of Fluctuations, Escape and Optimal Control, Traverse City, August 17, 1997.  
"Quantum Control of atomic wavefunctions," invited talk in the U.S.-Japan Joint Seminar: Manipulation of Matter by Coherent Light, Kusatsu, Japan, August 30-Sept.6, 1997.  
"Future Directions of Intense Field Interactions of Atoms and Molecules with Photons," invited talk at the Atomic, Molecular and Optical Physics (AMOP) Workshop, Chantilly, Virginia, September 21-24, 1997.  
"Wavepacket sculpting with high intensity optical radiation," Physics Department Colloquium, University of Iowa, October 6, 1997.  
"Making and shaking electron wavepackets in atoms," CM/AMO Seminar, Ann Arbor, October

14, 1997.

"Wavepacket sculpting with high intensity optical radiation," Optics Seminar, Purdue University, October 28, 1997.

"Strong Field Quantum Control," North American Chemical Congress, Cancun, November 11, 1997.

"Really Intense Light," APS Distinguished Travelling Lecture, Colgate University, December 1, 1997.

"Wavepacket Sculpting," APS Distinguished Travelling Lecture, Colgate University, December 2, 1997.

1996

"Strong Field Control," Atomic Physics Seminar MIT, April 23, 1996.

"Half-cycle optical pulses," ITAMP Seminar, Harvard/Smithsonian Observatory, April 24, 1996.

"Quantum control in the strong field limit," Multiphoton Processes Gordon Conference New London, NH, June 10, 1996.

"High Intensity Physics," Lunch Seminar to SPS, Berkeley, CA, September 9, 1996.

"Strong Field Quantum Control and Wavepacket Sculpting," Physics Department Colloquium, University of California, Berkeley, CA, September 9, 1996.

"Physics of really intense light," Public Lecture at Illinois St. Univ. (part of my obligation as one of the Distinguished Travelling Lecturers for APS Laser Science Division), September 19, 1996.

"Quantum Control," Seminar at Ill. St. Univ., Friday September 20, 1996.

"Sculpting quantum wavefunctions with light," Lunch Seminar for Miller Institute, Berkeley, CA, September 24, 1996.

"Half-Cycle Pulses," Lunch Seminar, LBL-MRD October 4, 1996.

"Strong Field Quantum Control and Wavepacket Sculpting," Physics Department Colloquium, U.C. Santa Cruz, October 24, 1996.

"Strong Field Quantum Control and Wavepacket Sculpting," Physics/Applied Physics Joint Colloquium, Stanford University, November 5, 1996.

"Making and propagating half-cycle optical pulses," Quantum Electronics Seminar, EECS Department, Berkeley, November 8, 1996.

"Quantum control of chemistry using shaped optical pulses," Chemistry Department Seminar, U.C. San Diego, November 22, 1996.

"Wavepacket Sculpting," Chem. Phys. Seminar, Weizmann Institute, Rehovot, Israel, December 30, 1996.

"Strong Field Quantum Control," invited talk at the Bat Sheva Conference on Coherent Control, Neve Ilan, Israel, March 3-8, 1996.

"Key Opportunities in Femtosecond Physics, 1996-2006," Report to the COSE Workshop on Research and Education, National Academy of Science, Irvine, California, January 4, 1996

1995

"Strong Field Quantum Control," Colloquium at the James Franck Institute, University of Chicago, February, 1995.

"Strong Field Quantum Control," Colloquium at the University of Toledo, March, 1995.

"Strong Field Quantum Control," Rosenthal Lecture, Yale University, March, 1995.

"Observation of Atomic Wavepacket Evolution in a NonSeparable System," poster at the International Conference on Laser Spectroscopy, Capri, June, 1995.

"Coherent Control of Above-Threshold Ionization," Invited talk at the Super-Intense Laser-Atom Physics Conference, on the Volga, Russia, August, 1995.

"Observation of core scattering by Rydberg wavepackets," Workshop on Quantum Control, ITAMP, Cambridge, MA, September 1995.

1994

"Control of Atoms and Molecules with Phase-Coherent 2-color Radiation Fields," P. H. Bucksbaum and D. W. Schumacher, Invited Paper at the ILS-X Conference, Dallas, October 1994.

"Ultrafast Physics and Technology," Invited talk to the Optical Society Executive Forum, Dallas, October 1994.

"Programmable Wavefunction Engineering in Cs Rydberg States," P. H. Bucksbaum, D. W. Schumacher, J. H. Hoogenraad, Jeffrey L. Krause, Kent R. Wilson, Post-Deadline contributed paper, Ultrafast '94, Dana Point, CA, May, 1994.

"Beyond ATI," P.H. Bucksbaum, Invited Talk at ICAP-14, Boulder, August, 1994.

"Rotation of Elliptical Polarization in High Harmonic Generation," invited talk at the OSA Topical Conference on High Field Interactions and Short Wavelength Generation, Saint Malo, France, August, 1994.

"Nonlinear Optics in Fields of  $1\text{v}/\text{angstrom}$ ," Invited Talk at the French-Israeli Nonlinear Optics Conference, Israel, February, 1994.

"High Intensity Atomic Physics," Physics Colloquium at Weizmann Institute, Rehovot, Israel, February, 1994.

"Future Needs for Coherent Light Sources," Briefing lecture to the National Academy Panel on Future Free Electron Lasers, Washington, March, 1994.

"Strong Field Control," P.H. Bucksbaum, Invited Talk at US Japan Workshop on Atomic Physics and Technology, Napa, August, 1994.

"Atoms in Really Intense Light," Physics Colloquium at Georgia Tech, Atlanta, March, 1994.

"Atoms in Really Intense Light," Physics Colloquium at Western Michigan University, Kalamazoo, March, 1994.

"Atoms in Really Intense Light," Physics Colloquium at the University of Illinois at Urbana-Champaign, March 1994.

"Strong field Coherent Control and High Intensity Physics," Chemistry Colloquium at Brookhaven National Lab, March 1994.

1993

"Strong Field Quantum Control," Invited Talk at ITAMP Workshop on Quantum Chaos, Smithsonian Center for Astrophysics, Cambridge, Massachusetts, September 1993.

"Light-Induced structure in atoms and molecules," Invited Talk at the Ninth Interdisciplinary Laser Science Conference, Toronto, Canada, October 1993.

"Interactions of Atoms with High-Field Single-Cycle Infrared Radiation," invited poster at the Eleventh International Conference on Laser Spectroscopy, Hot Springs, Virginia, June 1993.

"Strong Field Coherent Control," ICOMP '93 Invited Talk, Lavall University, Quebec, Canada June 1993.

"Current unsolved experimental issues in electron correlation," invited seminar, Workshop on Super-Intense Laser-Atom Physics, Center for Ultrafast Optical Science, University of Michigan,

July, 1993.

"Atomic Physics with Half-Cycle Pulses", Gordon Conference on Nonlinear Optics and Lasers, Wolfboro, NH, August, 1993

"Atoms in Really Intense Light," General Research Colloquium at NASA Goddard Space Flight Center, February, 1993.

"Atoms in Really Intense Light," General Physics Colloquium at Ohio State University, March, 1993.

"Hot Topics in Optical Science in 1992," Optical Society Leadership Conference, New Orleans, January, 1993.

"Atoms in Really Intense Light," General Physics Colloquim at The University of Michigan, April, 1993.

1992

"Hydrogen in Ultra-Intense Laser Fields," Lecture at the Trieste Summer School on Hydrogen in Strong Fields, Trieste, August, 1992.

"Atomic Stabilization," International Conference on Atomic Physics, Munich, August, 1992.

"Stabilization and trapping of atoms and molecules," Lawrence Livermore National Laboratory, July, 1992.

"Hydrogen in Strong Laser Fields," Gordon Conference on Multiphoton Processes, June, 1992.

"Atoms and Molecules in Intense Laser Fields," Physics Department Colloquium at the University of Colorado, January 15, 1992.

"Atomic and Molecular Stabilization," Ontario Laser and Light-wave Center Colloquium, University of Toronto, February 4, 1992.

"Trapping and Stabilization of Atoms at High Intensities," Joint Physics Department/ Optics Institute Colloquium, University of Rochester, March 24, 1992.

"High Intensity Trapping and Stabilization of Atoms and Molecules," Harvard Physics/Smithsonian Joint Seminar, Harvard University, April 1, 1992.

1991

"Observation of Population Trapping in Intense Laser Fields," Seminar at Lawrence Livermore National Lab, September, 1991.

"Experimental aspects of Atomic Stabilization," FOM Seminar, Amsterdam, The Netherlands, August, 1991.

"Atoms and Molecules in Intense Laser Fields," ILS Conference, Monterey, CA, September, 1991.

"Frontiers in High Intensity Laser-Atom Interactions," Gordon Conference on Atomic Physics, Brewster Academy, July, 1991.

"Calculation vs. Experiments in High Intensity Laser Interactions," Big Sky Workshop on Super-Intense Laser-Atom Physics, Big Sky, Montana, June 22-25, 1991.

"Molecules in short pulse high intensity laser fields," NATO Advanced Research Workshop on Coherence Phenomena in Atoms and Molecules in Laser Fields," McMaster College, Hamilton, Ont., Canada, May 5-10, 1991.

1990

"Bond softening," International Laser Spectroscopy Conference (ILS), Minneapolis,

Minn., September, 1990

"Bond Softening in Molecular Hydrogen," International Conference on Multiphoton Processes (ICOMP VI), Paris, France, September, 1990.

"Physics of Atoms and Free Electrons in Very High Intensity Light," Temple University, Philadelphia, PA, March 26, 1990.

Above-Threshold Dissociation in Molecular Hydrogen," University of Notre Dame, South Bend, IN, April 4, 1990.

"Frontiers in High Intensity Laser-Matter Interactions," Ultrafast Science Seminar, University of Michigan, Ann Arbor, MI, April 2, 1990.

High intensity laser matter interactions, Department colloquium, University of Illinois at Chicago, Nov. 14, 1990.

"Above-Threshold Ionization with a 2-Color Laser Field," Meeting of the Division of Atomic, Molecular, and Optical Physics of the American Physical Society, Monterrey, CA, May 21-23, 1990.

1989

"Molecular Bonds in Intense Laser Fields", High Optical Field Physics Symposium, Quantum Electronics and Laser Science Conference (QELS), Baltimore, MD, April 24-28, 1989.

"The Hydrogen Molecule in Intense Laser Light", Conference on Super-Intense Laser-Atom Physics, Rochester, NY, June 30, 1989.

"Polarization in ATI", Gordon Conference - Atomic Physics, Wolfeboro, NH, July 4, 1989.

"The Hydrogen Molecule in Intense Laser Light", International Conference on Photon, Electron, and Atomic Collisions (ICPEAC), New York, NY, July 31, 1989.

"Plasmas in the Low-Density, High-Intensity Limit: Above Threshold Ionization and Ponderomotive Forces", 7th APS Topical Conf., Gaithersburg, MD, Oct 2-5, 1989.

"Strange Properties of Atoms and Electrons in High Intensity Light", Stanford University, Stanford, CA, January 10, 1989.

"Ionization and dissociation of Molecular Hydrogen in Intense Laser Fields", Lawrence Livermore Lab., Livermore, CA., January 11, 1989.

"Scattering of Electrons from a Periodic Lattice of Light", Atomic Beams Seminar, Univ. of California, Berkeley, CA, January 12, 1989.

"Molecules in Really Intense Light: Dissociation and Ionization of Molecular Hydrogen in Intense Optical Fields", Inst. of Physical Science and Technology, Univ. of Maryland, College Park, MD, February 8, 1989.

"Above-threshold Ionization and Molecular Dissociation in Intense Laser Fields", Physics Department seminar, University of Michigan, Ann Arbor, MI, March 14, 1989.

"Above-threshold Ionization and the Scattering of Electrons by Intense Coherent Light", Physics Department Colloquium, Yale University, New Haven, CT, March 29, 1989.

"Dissociation and Ionization of Molecular Hydrogen in Intense Laser Fields", NIST, Gaithersburg, MD, April 12, 1989.

"Ionization and Dissociation of H<sub>2</sub> in an Intense Laser Field", SUNY Physics Colloquium, Stony Brook, NY, Sept. 26, 1989.

"Polarization and Coherence in Laser Field Photoionization" Univ. of Toronto, Laser and Lightwave Research Centre, Toronto, Ontario, Dec. 5, 1989.

"Above-Threshold Ionization and Ponderomotive Forces" Univ. of Washington, Physics Dept. Colloquium, Seattle, WA, Oct. 31, 1989.

"Atoms and Electrons in High Intensity Light" Univ. of California Physics Dept. Colloquium Berkeley, CA, Nov. 1, 1989.

"Electrons in Intense Light," Columbia Applied Physics Dept., Undergrad. Seminars, New York, NY, Nov. 9 & 16, 1989.

"ATI and the Quantum Mechanics of Wiggling Electrons", Physics Department Colloquium, University of Rochester, NY, (November 18, 1987).

"Solid Phase Epitaxy of Laser Amorphized Silicon (Abstract)", MRS Annual Meeting, Boston, MA, (December 2, 1987.)

1988

"Above-Threshold Ionization and Interactions of Atoms and Free Electrons in Intense Laser Fields", O-E LASE88, Los Angeles, CA, January 12, 1988.

"Calculating ATI Rates and Angular Distributions", Seminar, Lawrence Livermore Lab, Livermore, CA, January 19, 1988.

"Above-Threshold Ionization and the Quantum Mechanics of Wiggling Electrons", seminar, University of California at Berkeley Physics Dept, Berkeley, CA, January 21, 1988.

"Solid Phase Epitaxial Growth of Laser Quenched and Ion Implanted Silicon", APS Meeting, New York, NY, (March 1988).

"Strange Properties of High Intensity Light", Physics Colloquium, Harvard University, Cambridge, MA, April 4, 1988.

"Latest Results in High Intensity Physics", Physics Dept. Seminar, Univ. of Rochester, Rochester, NY, April 6, 1988.

"ATI and Electron Scattering in Intense Light", ELICAP (11<sup>th</sup> Int. Conf. on Atomic Physics) Meeting, Paris, France, July 7, 1988.

"Observation of Asymmetries in Above-Threshold Ionization", Topical Meeting of Short Wavelength Coherent Radiation: Generation and Applications, Falmouth, Mass., Sept. 26-29, 1988.

"Observation of the High Intensity Kapitza-Dirac Effect", Topical Meeting of Short Wavelength Coherent Radiation: Generation and Applications, Falmouth, Mass., Sept. 26-29, 1988.

"High Intensity Atomic Physics", Princeton University General Physics Colloquium, Princeton, NJ, October 6, 1988.

"Above Threshold Ionization", NATO Advanced Study Institute: Atoms in Strong Fields, Kos, Greece, October 10-21, 1988.

"Electrons in Intense Light", NATO Advanced Study Institute: Atoms in Strong Fields, Kos, Greece, October 10-21, 1988.

"Electrons in Really Intense Light", NATO Advanced Study Institute: Atoms in Strong Fields, Kos, Greece, October 10-21, 1988.

"ATI with Short Pulses", NATO Advanced Study Institute: Atoms in Strong Fields, Kos, Greece, October 10-21, 1988.

"Electrons in Intense Light: Ponderomotive Scattering and the High Intensity Kapitza-Dirac Effect", Columbia University Plasma Physics Colloquium, New York, NY, October 28, 1988.

1987

"Ponderomotive Forces on Atoms and Electrons in Intense Laser Beams," National Bureau of Standards, Gaithersburg, MD (1/15/87)

"Ponderomotive Forces on Atoms and Electrons in Intense Laser Beams," Modern Optics &

Spectroscopy Seminar, M.I.T., Cambridge, MA (2/10/87).

"Kinetic Theory of Melting" American Physical Society March meeting, New York, NY (3/16-20/87)

"Above-Threshold Ionization and Ponderomotive Forces in Intense Laser Beams," International Quantum Electronics Conference, Baltimore, MD, (4/27/87-5/1/87)

"Angular Distributions from Above-Threshold Ionization by Elliptically Polarized Light," Div. of Atomic, Molecular & Optical Physics Meeting, Cambridge, MA (5/18-20/87).

"Above-Threshold Ionization by Elliptically Polarized 1.06  $\mu$ m laser light", Div. of Atomic, Molecular & Optical Physics Meeting, Cambridge, MA, (5/18-20/87).

"ATI and Wiggling Electrons", Princeton Plasma Physics Lab. Seminar, Princeton, NJ, (6/8/87).

"Above Threshold Ionization and Ponderomotive Forces", IBM Watson Laboratory, Yorktown Hts, NY, (6/26/87).

"ATI Polarization Experiments and Calculations for Xenon and Krypton", International Conf. on Multiphoton Processes, Boulder, CO, (7/14/87).

"ATI and Ponderomotive Forces", NATO Advanced Workshop in Atomic and Molecular Processes with Short Intense Laser Pulses, Bishop's University, Lennoxville, Quebec, Canada (7/21/87).

"ATI in Strong Optical Fields", Atomic Spectra & Collisions in External Fields 2, Royal Holloway & Bedford New College, Egham, Surrey, England (7/31/87).

"Above-Threshold Ionization and the Quantum Mechanics of wiggling Electrons", Atomic physics Seminar, Univ. of Maryland, College Park, MD, (9/16/87).

"The Quantum Mechanics of Atoms and Electrons in Intense Laser Fields", Colloquium, Amherst College, Amherst, MA, (10/8/87).

"Comparing Above-Threshold Ionization Calculations to Experiments", Optical Society of America Annual Meeting, Rochester, NY (10/19/87).

"The Quantum Mechanics of Atoms and Electrons in Intense Laser Fields", P. H. Bucksbaum, State University of New York, Stony Brook, NY, (10/23/87).

1986

"An Equation for Melting and Freezing Transition Rates", Materials Research Society Symposium on 'Beam-Slide Interactions & Transient Processing', Boston, Mass., (12/1-4/86)

"Ponderomotive Forces on Atoms and Electrons in Intense Laser Beams," Brookhaven National Laboratories, Upton, NY, (12/8/86)

"Scattering and Acceleration of Free Electrons by Light", Seminar at the University of Rochester, NY (12/16/86).

"Time and Angle Resolved VUV Photoemission Spectroscopy", Third Topical Meeting on Short Wavelength Coherent Radiation: Generation & Applications, Monterey, CA (March 24-27, 1986)

"Nonlinear Interaction of Intense Laser Fields with Atoms and Free Electrons", University of California at Berkeley, Berkeley, CA (March 27, 1986)

"Multiphoton Ionization and Ponderomotive Forces", Louisiana State University, Baton Rouge, LA (April 18, 1986)

"Ponderomotive Suppression of Threshold Multiphoton Ionization in Xenon with 1064 nm Coherent Light", Workshop on High Intensity Multiphoton Ionization, Orsay, France (April 28, 1986)



"Multiphoton Ionization and Ponderomotive Forces", Gordon Conference on Multiphoton Ionization, Colby-Sawyer College, New London, NH (June 9-13, 1986)

"Study of Ponderomotive Forces and Above-Threshold Multiphoton Ionization by Angle Resolved Photoelectron Spectroscopy," Conference on Multiple Excitations of Atoms, Seattle, WA (October 28, 1986)

Before 1986, I kept no records of invited talks.

**Ph.D. Students: list of past and present thesis committee chairmanships and memberships (This list is complete for chairmanships, but I have incomplete records of my thesis committee memberships.)**

Chairman and/or Principal Advisor:

M. Bashkansky, Columbia University Physics, Ph.D. 1988

A. Zavriyev, Columbia University Applied Physics, Ph.D. 1993

U. Mohideen, Columbia University Physics, Ph.D. 1993

Douglass Schumacher, University of Michigan, Ph.D. 1995

Donne You, University of Michigan, Ph.D. 1996

Chandra Raman, University of Michigan, Ph.D. 1997

Michael Lim, University of Michigan, Ph.D. 1999

Frederick Weihe, University of Michigan, Ph.D. 1999

Marcus Hertlein, University of Michigan, Ph.D. 2000

Thomas C. Weinacht, University of Michigan, Ph.D. 2000

Matt DeCamp, University of Michigan, Ph. D. 2002

Madelyn Naudeau, University of Michigan, Ph.D. 2002

Brett Pearson, University of Michigan, Ph.D 2004

Jaewook Ahn, University of Michigan, Ph.D 2004

Emily Peterson, University of Michigan, Ph.D. 2005

John Caraher, University of Michigan, Ph.D. 2005

Haidan Wen, University of Michigan, Ph.D. 2006

Joel Murray, University of Michigan, Ph.D. 2006

Catherine Herne, University of Michigan, Ph.D. 2007

Andrei Florean, University of Michigan, Ph.D. 2008

Brian McFarland, Stanford University, Ph.D. in Applied Physics, 2009

James Cryan, Stanford University, Ph.D. in Physics, 2011.

Joseph Farrell, Stanford University Ph.D. in Physics, 2012

James White, Stanford University, Ph.D. in Applied Physics, 2012

James Michael Glowia, Stanford University, Ph.D. in Applied Physics, 2012.

Limor Spector, Stanford University, Ph.D. in Applied Physics, 2013

Jaehee Kim, Stanford University, Ph.D. in Applied Physics, 2014

Lucas Zipp, Stanford University, Ph.D. in Physics, 2016

Song Wang, Stanford University Physics, left the program in 2018.

Kenneth Ferguson, Stanford University, Ph.D. in Physics, 2016

Julien Devin, Stanford University, left the Ph.D. program, now a lab services manager.

Raymond Sierra, Stanford University, Ph.D. in Mechanical Engineering, 2017

Chelsea Liekhus-Schmaltz, Stanford University, Ph.D. in Applied Physics, 2018

Gregory McCracken, Stanford University, Ph.D. in Applied Physics, 2018

Matthew Ware, Stanford University, Ph.D. in Physics, 2019

Kareem Hegazy, Stanford University Physics

Anna Wang, Stanford University Applied Physics

Jordan O'Neal, Stanford University Physics

Andrei Kamalov, Stanford University Applied Physics

Nicholas Werby, Stanford University Applied Physics

Andrew Howard, Stanford University Applied Physics

Ian Gabalski, Stanford University Applied Physics

***Chairmanships or memberships on thesis committees (2015-2018)***

Zhao (Joe) Chen

Nicholas Ward

Robert Hartssock

Aaron Sisto

Jaehee Kim

Mason Jiang

Crystal Bray

George Ndabashimiye

Helen Craig

Jenny Wang

Rajiv Krishnakumar

Hardeep Sanghera

Raymond Sierra

***Other student or Postdoctoral advisees:***

Emily Link

Anton Lindahl

Markus Koch

Yeong Dae Kwon

Christopher Watson

Thomas Wolf

Karl Twelker

Jacob Chamoun

Zhuoyu Chen

Yu He

Jakob Grilj

Anthony Ho

Corbin Foucart

Zach Ellison

Other Doctoral Committees:

Kathryn Ledbetter  
Siqi Li, Stanford Ph.D. in Physics, 2019  
Katherine Kealhofer, Stanford University, Ph.D. in Physics, 2013  
Mason Jiang, Stanford University, Ph.D. in Physics, 2014  
Jaehee Kim (2015)  
Mason Jiang (2015)  
Crystal Bray (2015)  
George Ndabashimiye (2015)  
Jenny Wang (2014)  
Rajiv Krishnakumar  
Helen Craig (2014)  
Yeong Dae Kwon (2013)  
Jian Chen (2012)  
Julien Bertrand (Ottawa, 2012)  
Hongli Tao (2011)  
Yeong Dae (2011)  
Jason Randel (2011)  
Minbiao Ji (2010)  
Ken Takase (2007)  
Ling Fu (2007)  
Grant Biedermann (2007)  
Tara Cubel (2007)  
Bill Schlotter (2007)  
Mingchan Liu (2007)  
Adam Cohen (2006)  
Beth Carroll (2006)  
Alexei Varganov (2004)  
Igor Teper (2006)  
Jae-Hoon Choi (2006)  
David Fritz (2006)  
Jason Taylor (MIT, 2006)  
Louis Deslauriers (2006)  
Tim Meade (2006)  
Alisa Waltz-Flannigan (2004)  
Adrian Cavelieri (2004)  
David Feldbaum (2003)  
Randy Bartels (EECS, 2001)  
Subrata Dutta  
Yuan Wang Liao (EECS)  
Charles Leggett  
Gerald L. Vossler (EECS)  
Ali H. Al-Ramadhan (1994)  
Ofer Rind (1998)  
Chinguyan Chien (EECS) (1994)  
Thomas Sosnowski (EECS) (1997)  
R. Garisto (1993)

T. Steiger (1993)  
Ali Al-Ramadhan (1994)  
Xingbing Liu (1994)  
Heewon Lee (Chemistry) (1995)  
Scott Cheng (Appl. Phys.) (1995)  
Szu-yuan Chen (App. Phys.) (1998)  
D. Du (1996)  
Jayson Cohen (1999)

Other pre-doctoral research directed at Bell Laboratories:

Jonathan Custer, Cornell Materials Science, Ph.D. 1990.  
John LaWall, Harvard Physics, Ph.D. 1993.  
Ernest Glover, University of California at Berkeley Physics, Ph.D 1993.

### **Postdoctoral associates, Research Associates, SLAC Staff mentoring**

Mathew Britton, 2020-  
Ruaridh Forbes, 2018-2020  
Taryn Driver, 2017-  
Elio Chamenois, 2017-  
Andreas Kaldun, 2015-2018, now in private industry  
Andreas Battistoni, 2014-2016  
Markus Ilchen, 2014-2016  
Thomas Wolf, 2014, now a SLAC Staff Scientist  
James Cryan, from Stanford and LBNL, 2014, SLAC Staff Scientist  
Adi Natan, from Weizmann Institute, 2011, SLAC Staff Scientist  
Heng Li, from Cornell, 2012-2013  
Benjamin Barbrel, from Saclay, 2011-2013  
Brian McFarland, from Stanford, 2009-2013  
Vladimir Petrovic, from MIT, 2009-2013  
Fenglin Wang, from Hamburg, 2012-2014  
David Cardoza, from Stony Brook University, 2006-2008, now at Aerospace Corp.  
Ryan Coffee, from U. Conn., 2006-2008, now a SLAC Staff Scientist  
Markus Guehr, from Berlin Frei University, 2005-2007. Markus is now a Staff Scientists at SLAC  
Santosh Pisharody, from the University of Virginia, 2003-2006, now in industry  
Brett Pearson, from Michigan, 2004-2005. Brett is now a postdoc at Stony Brook University.  
Svetlana Malinovskaya, from the University of Florida, 2002-2004. Svetlana is now an Assistant Professor at Stevens Institute.  
Frederick Weihe, from Palaiseau, formerly from Michigan, 2002-2003.  
Matthew DeCamp, from Michigan, 2002-2003. Matt is now an Assistant Professor at the University of Delaware.  
Chitra Rangan, from Louisiana State University, 2000-2004. Chitra is now a tenured Professor at the University of Windsor.  
David Reis, from the University of Rochester, 1999-2001. David is now an Associate Professor

at Stanford.

John Yukich, of the University of Virginia, 1995-8. John is now a Professor at Davidson University.

Charles Sukenik, of Yale University, 1993-95. Charles is now a Professor at Old Dominion University.

Robert R. Jones, of the University of Virginia, 1991-93. Bob is now a Collegiate Professor at the University of Virginia.

### **Stanford University courses taught:**

Fall 2020: Physics 290: Introduction to Research at Stanford

Spring 2020: Stanford in Washington Seminar: Federal Science Policy (cancelled due to pandemic)

Fall 2019: Physics 290: Introduction to Research at Stanford

Winter 2019: Applied Physics 383: Strong-Field Quantum Electrodynamics

Fall 2018: Physics 290: Introduction to Research at Stanford

Fall 2016: Physics 45N Freshman Seminar: Heat and Light

Spring 2016: Applied Physics 383: Introduction to Atomic Processes

Fall 2015: Physics 45N Freshman Seminar: Heat and Light

Spring 2015: Applied Physics 203: Atomic Physics and Quantum Optics

*Fall 2014: Physics 45N Freshman Seminar: Heat and Light*

*Spring 2014: Applied Physics 203 Atomic Physics and Quantum Optics*

*Fall 2013: Applied Physics 201 Lasers and Photons*

*Spring 2013: Applied Physics 203 Atomic Physics and Quantum Optics*

*Fall 2012: Applied Physics 201 Lasers and Photons*

*Spring 2012: Applied Physics 203 Atomic Physics and Quantum Optics*

*Spring 2012: Applied Physics 201 Lasers and Photons*

*Winter 2011: Physics 131 Introduction to Quantum Mechanics*

*Fall 2010: Applied Physics 383, Introduction to atomic Processes*

*Winter 2010: Physics 131 Introduction to Quantum Mechanics*

*Winter 2009: Applied Physics 383 Introduction to Atomic Processes*

*Fall 2008: Applied Physics 68N: Freshman Seminar: Lasers and Photons*

*Fall 2007: Applied Physics 68N: Freshman Seminar: Lasers and Photons*

*Spring 2007: Applied Physics 483 Optics and Electronics Seminar*

*Winter 2007: Applied Physics 383 Introduction to Atomic Processes*

### **University of Michigan courses taught:**

*Winter 2006: Physics 644 Quantum Control*

*Winter 2004: Physics 341 Optics and Waves Laboratory*

*Physics 553 Introduction to FOCUS research*

*Winter 2003: Physics 140 Intro Mechanics*

*Fall 2002: Physics 522 Advanced Atomic Physics*

*Winter 2002: Physics 140 Elementary Mechanics*

*Fall 2001: Physics 341 Intermediate Undergraduate Laboratory, Waves and Thermodynamics*

*Winter 2001: Physics 341: Intermediate Undergraduate Laboratory, Waves and Thermodynamics*

*Fall 2000: Physics 522.* Advanced Atomic Physics

*Winter 2000: Physics 460.* Second semester undergraduate non-relativistic quantum mechanics, with applications in atomic and molecular physics.

*Fall 1999: Physics 453:* Undergraduate non-relativistic quantum mechanics, at the level of Griffiths, Quantum Mechanics.

*Fall 1997,8: Physics 511:* Graduate-level non-relativistic quantum mechanics, taught at the level of Sakurai, Modern Quantum Mechanics.

*Fall 1998: Physics 644.* This was a team-taught course on advanced topics in Laser Physics.

*Winter 1998,9: Physics 512:* continuation of 511, with introduction to relativistic quantum mechanics (Klein Gordon Equation and Dirac Equation), at the level of Sakurai, Advanced Quantum Mechanics.

*Winter 1993,1994,1995,1996 Physics 460, Atomic Physics.* This is a second semester undergraduate quantum mechanics course, with emphasis on atomic theory. The main topics are atomic structure and light-matter interactions at the level of Merzbacher. Students study Perturbation Theory, quantization of the electromagnetic field, Fermi's Golden Rule, matrix formulations of eigenvalue problems, all in the context of learning about the Zeeman effect, Stark effect, and absorption and emission of light by atoms. In 1996 I supplemented the lectures, problems sets and textbook assignments with written lecture notes.

*Fall 1995: Physics 140,* three discussion sections.

*Fall 1993,1994: Physics 522, Atomic Physics*

Physics 522 is a new 500-level course meant to fill a third semester quantum mechanics requirement. The initial offering of this course attracted 13 students taking the course for credit, and approximately 10 additional auditors. The course covers atomic structure and basic light-matter interactions, and is intended to prepare students for research in atomic physics, molecular physics, quantum optics, or laser physics or engineering. Special emphasis is placed on building analytical tools necessary to carry out modern research, including calculating wavefunctions and transition

moments, and applying techniques such as multichannel quantum defect theory, hartree fock calculations, Floquet analysis, and the like.

*Fall 1992: Physics 640 Section II, Weak Interactions*

This course followed my book on Weak Interactions, with some updates to incorporate the past 10 years of progress in this field.

*Winter 1992: Physics 644, Advanced Atomic Physics*

This is the prototype for a 500 level course that can be taught as part of a main AMO sequence, following the suggestions of the department's curriculum review committee. The course is designed to complement the Quantum Optics course taught last fall by Duncan Steel. Students must have a solid foundation in nonrelativistic quantum mechanics, and some exposure to relativistic quantum mechanics and quantum electrodynamics. Approximately-one third of the course is on atomic structure; one third is on atom-light interactions; and one third is on advanced topics. This year the advanced topics are above-threshold ionization and quantum chaos, but in future years I expect this to change, depending on the interests of the students.

*Fall 1991: Physics 140,* three sections.

*Winter 1991: Physics 126* section.

Not for credit: research seminar on time-reversal.

**Independent study students: honors thesis, graduate and undergraduate special problems**

2015: Katherine Hughes, Undergrad in Physics

2014: Rex Garland, Undergrad in Physics

2013: Ian Tenney, Undergrad in Physics

2003: Matt Ross, Undergrad Research in Atomic Physics

2000: David Huchinson, Undergraduate Research in Atomic Physics.

1997-8: Brett Pearson, David Feldbaum, Introduction to Graduate Research

1995-6: Stephen Fenwick, Undergraduate research on High Intensity Physics

Victor David, Undergraduate research on High Intensity Physics

Pete Peterson, Undergraduate Research on Time Reversal Experiment.

1994-5: Nathan Tielking, Senior Thesis on Time Reversal Violation in Atoms

Pete Peterson, Undergraduate Research on Time Reversal Experiment.

Steve Koch, Undergraduate Research on Time Reversal.

Todd Chaney, Undergraduate Research on Pulse Shaping.

1991: Donne You "Single-Cycle Optical Pulses"

David Jenkins "Parity Conserving Time Reversal Violation in Atoms"

***Undergraduate pre-major advisor (2015)***

Adam Rami

Keino William Davis

Lawrence Conley

Sang Ngo

Taryn Fitzgerald