Robert W. Schoenlein

SLAC National Accelerator Laboratory (SLAC)
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Research and Professional Experience

Deputy Director for Science, Linac Coherent Light Source, SLAC *2015-present*

Interim Director, SLAC Office of Strategic Planning *2022-present*

Scientific Lead, Next Generation Light Source Initiative *2011-2013*
Lawrence Berkeley National Laboratory (LBNL)

Deputy Director for Science, Advanced Light Source, LBNL *2009-2011*

Senior Staff Scientist, Principal Investigator

Ultrafast X-ray Science Laboratory - LBNL Chemical Sciences Division *2005-2015*

Ultrafast Materials Program Leader - LBNL Materials Sciences Division *2006-2013*

Ultrafast laser and x-ray studies of atomic and electronic structural dynamics in condensed matter, correlated electron materials, nanocrystals, and molecular systems

Development of femtosecond x-ray science and novel ultrafast measurement techniques, generation of femtosecond x-rays from the Advanced Light Source via laser modulation of relativistic electron beam, development of femtosecond x-ray beamlines at the Advanced Light Source

Staff Scientist, Principal Investigator - LBNL Materials Sciences Division *1991-2006*

Ultrafast x-ray diffraction studies of non-thermal melting in semiconductors; generation of femtosecond x-rays via Thomson scattering; photon-echo studies of electronic dephasing and coherent vibrational dynamics in semiconductor nanocrystals; reaction dynamics of visual pigment analog isorhodopsin

Postdoctoral Fellow - LBNL Materials Sciences Division *1989-1991*

Ultrafast spectroscopy of the first step in vision (*cis-trans* isomerization in rhodopsin)

Education

Ph.D., Electrical Engineering, Massachusetts Institute of Technology (1989)
S.M., E.E., Electrical Engineering, Massachusetts Institute of Technology (1987)
S.B., Electrical Engineering, Massachusetts Institute of Technology (1984)

Publications

more than 140 peer-reviewed publications, *h*-index = 56 (Google Scholar)
more than 90 invited lectures and colloquia

Honors

American Physical Society Fellow
Citation: “for seminal contributions to ultrafast science using lasers and synchrotron radiation"

Klaus Halbach Award – Advanced Light Source, LBNL (2000)

Klaus Halbach Award – Advanced Light Source, LBNL (1996)

Adolph Lomb Medal – Optical Society of America (1994)
Honoring noteworthy contribution to optics before reaching the age of 30
Citation: “for development of elegant femtosecond spectroscopic methods and their application to fundamental studies of metals, semiconductors, and molecules"

Newport Research Award (1988)

NCAA Postgraduate Scholarship (1984-1985)

Hertz Foundation Scholarship (1980-1984)

Professional Service: International Review/Advisory Committees

European XFEL Scientific Advisory Committee – Hamburg	*2021-present*
Pohang Accel. Lab. International Advisory Committee – PAL Pohang	*2016-present*
FERMI@Elettra Proposal Review Committee – Trieste	*2016-present*
FLASH X-ray FEL Proposal Review Panel – DESY Hamburg	*2014-2022*
Scientific Advisory Committee – FERMI X-ray FEL, Elettra Synchrotron Trieste	*2011-2022*
Scientific Advisory Committee – Advanced Photon Source, Argonne	*2014-2017*
Laser Advisory Committee – European XFEL, Hamburg	*2012-2017*
Facility Advisory Committee – SLAC Linac Coherent Light Source II	*2012-2014*
Scientific Advisory Committee – Cornell University Energy Recovery Linac	*2010-2014*
Scientific Advisory Committee – SLAC Linac Coherent Light Source	*2006-2011*
Machine Advisory Committee – FERMI X-ray FEL, Elettra Synchrotron Trieste	*2005-2011*

Professional Service: Government Committees

DOE/BES Facilities Review Committee – Advanced Photon Source, Argonne	*2014*
DOE/BES Facilities Review Committee – NSLS-II, Brookhaven	*2012*
DOE/BES Facilities Review Committee – Advanced Photon Source, Argonne	*2011*
DOE/BES MSE Review Committee – Brookhaven National Lab, Condensed Matter Physics and Materials Science Program	*2011*
DOE/BES Facilities Review Committee – Advanced Photon Source, Argonne	*2007*
DOE/BES Lehman Review Committee – Linac Coherent Light Source, SLAC	*2005*
NIH Site Review Committee – University of Michigan, Center for Ultrafast Optical Sciences	*2000*

Professional Service: Professional Societies & Major Conference Committees

Program Committee – International Science@FELs Conference	2020
Chair – APS Physics Next Workshop: X-ray Laser Science - A New Frontier	*2019*
Chair – Gordon Res. Conference on Ultrafast Phenomena in Cooperative Systems	*2018*
Executive Committee – American Physical Society Division of Laser Science	*2015-2018*
Vice Chair – Gordon Res. Conference on Ultrafast Phenomena in Cooperative Systems	*2016*
Co-General Chair – XVIIth International Conf. on Ultrafast Phenomena	*2008-2010*
Co-Chair, Program Committee – XVIth International Conf. on Ultrafast Phenomena	*2006-2008*
Program Committee – Quantum Electronics and Laser Science Conference	*2007*
Optical Society of America – Awards Committee for the Adolph Lomb Medal	*2004-2006*
Co-Organizer – Ultrafast X-ray Science Workshop, American Physical Society	*2003*
Program Committee - Workshop on the Generation and Uses of VUV and Soft X-Ray Coherent Radiation Pulses, Lund Sweden	*2000-2001*
Program Committee – Conference on Applications of High Field and Short Wavelength Sources IX	*2000-2001*
Program Committee – Quantum Electronics and Laser Science Conference	*2003*
Program Committee – XIIIth International Conference on Ultrafast Phenomena	*2001-2002*
Program Committee – XIIth International Conference on Ultrafast Phenomena	*1999-2000*

Program Committee – OSA Annual Meeting/ILS-XVI *2000*
Program Committee – XIth International Conference on Ultrafast Phenomena *1997-1998*
Program Committee – International Conference on Lasers and Electro-Optics *1995*

Educational Activities

University of Pusan, Korea, Department of Chemistry, Doctoral Thesis Committee *2013*
Aarhus University, Denmark, Department of Physics, Doctoral Thesis Committee *2008*
Lund University, Sweden, Department of Physics,
Faculty Opponent for Doctoral Dissertation Defense *2005*
LBNL Science Undergraduate Laboratory Internship Program – mentor *2005, 2010*
LBNL High School Student Research Participation Program – mentor *2004*

Society Memberships

American Physical Society, American Chemical Society, Optical Society of America, American Association for the Advancement of Science, IEEE, Sigma Xi, Eta Kappa Nu

Principal Publications:

R. W. Schoenlein, L. A. Peteanu, R. A. Mathies, and C. V. Shank, "The first step in vision: Femtosecond isomerization of rhodopsin," *Science*, **254**, 412 (1991).
Citations to date: 1103

R. W. Schoenlein, W. Z. Lin, J. G. Fujimoto, and G. L. Eesley, "Femtosecond studies of nonequilibrium electronic processes in metals," *Phys. Rev. Lett.* **58**, 1680 (1987).
Citations to date: 980

R. W. Schoenlein, S. Chattopadhyay, H. H. W. Chong, T. E. Glover, P. A. Heimann, C. V. Shank, A. Zholents, and M. Zolotorev, "Generation of Femtosecond Pulses of Synchrotron Radiation," *Science*, **287**, 2237-2240 (2000).
Citations to date: 904

A. Cavalleri, Th. Dekorsy, H.W. Chong, J.C. Kieffer, and R.W. Schoenlein "Evidence for a structurally-driven insulator-to-metal transition in VO_2: A view from the ultrafast timescale," *Phys. Rev. B.*, **70**, *161102* (2004).
Citations to date: 879

Q. Wang, Q., R. W. Schoenlein, L. A. Peteanu, R. A. Mathies, and C. V. Shank, "Vibrationally coherent photochemistry in the femtosecond primary event of vision," *Science*, **266**, 422 (1994).
Citations to date: 819

M. Rini, R.I. Tobey, N. Dean, J. Itatani, Y. Tomioka, Y. Tokura, R.W.Schoenlein, and A. Cavalleri, "Control of the electronic phase of a manganite via mode-selective vibrational excitation," *Nature*, **449**, 72-74 (2007).
Citations to date: 729

R.W. Schoenlein, W.P. Leemans, A.H. Chin, P. Volfbeyn, T.E. Glover, P. Balling, M. Zolotorev, K.-J. Kim, S. Chattopadhyay, and C.V. Shank, "Femtosecond x-ray pulses at 0.4 Å by 90º Thomson Scattering: A new tool for probing structural dynamics of materials," *Science*, **274**, 236 (1996).
Citations to date: 702

R.W. Schoenlein, D. M. Mittleman, J. J. Shiang, A. P. Alivisatos, and C. V. Shank, "Investigation of femtosecond electronic dephasing in CdSe nanocrystals using quantum-beat-suppressed photon echoes," *Phys. Rev. Lett.*, **70**, 1014 (1993).
Citations to date: 246

R. W. Schoenlein, J.G. Fujimoto, G.L. Eesley, and T.W. Capehart, "Femtosecond studies of image-potential dynamics in metals," *Phys. Rev. Lett.* **61**, 2596 (1988).
Citations to date: 230

M. Khalil, M.A. Marcus, A.L. Smeigh, J.K. McCusker, H.H.W. Chong, and R.W. Schoenlein, "Picosecond x-ray absorption spectroscopy of a photoinduced iron(II) spin crossover reaction in solution," *J. Phys. Chem. A*, **110**, pp. 38-44 (2006).
Citations to date: 227

N. Huse, T.-K. Kim, L. Jamula, J.K. McCusker, F.M.F. de Groot, and R.W. Schoenlein, "Photo-Induced Spin-State Conversion in Solvated Transition Metal Complexes Probed via Time-Resolved Soft X-ray Spectroscopy," *J. Am. Chem. Soc.*, **132**, 6809-6816 (2010)
Citations to date: 1802

A. Cavalleri, S. Wall, C. Simpson, E. Statz, D.W. Ward, K.A. Nelson, M.Rini, and R.W. Schoenlein, "Tracking the motion of charges in a terahertz light field by femtosecond X-ray diffraction," *Nature*, **442**, 664-666 (2006).
Citations to date: 124

Complete Publication List (chronological)

1. R. W. Schoenlein, W. Z. Lin, J. G. Fujimoto, and G. L. Eesley, "Femtosecond studies of nonequilibrium electronic processes in metals," **Ultrafast Phenomena V**, G. R. Fleming and A. E. Siegman, Eds., Springer-Verlag, p.260 (1986).
2. R. W. Schoenlein, W. Z. Lin, J. G. Fujimoto, and G. L. Eesley, "Femtosecond studies of nonequilibrium electronic processes in metals," *Phys. Rev. Lett.* **58**, 1680 (1987).
3. R. Birngruber, C. A. Puliafito, A. Gawande, W. Z. Lin, R. W. Schoenlein, and J. G. Fujimoto, "Femtosecond laser tissue interactions: Retinal injury studies," *IEEE J. Quant. Electron.* **23**, 1836 (1987).
4. R. W. Schoenlein, W. Z. Lin, E. P. Ippen, and J. G. Fujimoto, "Femtosecond hot carrier energy relaxation in GaAs," *Appl. Phys. Lett.* **51**, 1442 (1987).
5. W. Z. Lin, R. W. Schoenlein, J. G. Fujimoto, and E. P. Ippen, "Femtosecond absorption saturation studies of hot carriers in GaAs and AlGaAs," invited paper, *IEEE J. Quant. Electron.* **24**, 267 (1988).
6. R. W. Schoenlein, W. Z. Lin, S. D. Brorson, E. P. Ippen, and J. G. Fujimoto, "Femtosecond hot carrier energy redistribution in GaAs and AlGaAs," *Sol. St. Electron.* **31**, 443 (1988).
7. R. W. Schoenlein, J.G. Fujimoto, G.L. Eesley, and T.W. Capehart, "Femtosecond studies of image-potential dynamics in metals," *Phys. Rev. Lett.* **61**, 2596 (1988).
8. W. Z. Lin, M. J. LaGasse, R. W. Schoenlein, B. Zysset, and J. G. Fujimoto, "Femtosecond studies of excited carrier energy relaxation and intervalley scattering in GaAs and AlGaAs," SPIE - Ultrafast Laser Probe Phenomena in Bulk and Microstructure Semiconductors II, **942**, p. 83 (1988).
9. W. Z. Lin, R. W. Schoenlein, M. J. LaGasse, B. Zysset, E. P. Ippen, and J. G. Fujimoto, "Ultrafast Scattering and Energy Relaxation of Optically Excited Carriers in GaAs and AlGaAs," **Ultrafast Phenomena VI**, T. Yajima, K. Yoshihara, C. B. Harris, and S. Shionoya, Eds., Springer-Verlag, p. 210 (1988).
10. R. W. Schoenlein, J. G. Fujimoto, G. L. Eesley, and W. Capehart, "Femtosecond image-potential dynamics in metals," **Ultrafast Phenomena VI**, T. Yajima, K. Yoshihara, C. B. Harris, and S. Shionoya, Eds., Springer-Verlag, p. 283 (1988).
11. D. Stern, R. W. Schoenlein, C. A. Puliafito, E. T. Dobi, R. Birngruber, and J. G. Fujimoto, "Corneal ablation by nanosecond, picosecond, and femtosecond lasers at 532 and 625 nm," *Archives of Ophthalmology* **107**, 587 (1989).
12. M. J. LaGasse, R. W. Schoenlein, J. G. Fujimoto and P. A. Schulz, "Amplification of Femtosecond Pulses in Ti:Al_20_3 using an Injection Seeded Laser," *Opt. Lett.* **24**, 1347 (1989).
13. R. W. Schoenlein, J. G. Fujimoto, G. L. Eesley, and T. W. Capehart, "Femtosecond dynamics of the n = 2 image-potential state on Ag (100)," *Phys. Rev. B Rapid Commun.* **41**, 5436 (1990).

14 J. M. Huxley, P. Mataloni, R. W. Schoenlein, J. G. Fujimoto, E. P. Ippen, and G. M. Carter, "Femtosecond excited state dynamics of polydiacetylene," *Appl. Phys. Lett.* **56**, 1600 (1990).

15. R. W. Schoenlein, J. -Y. Bigot, M. T. Portella, and C. V. Shank, "Generation of blue-green 10 fs pulses using an excimer pumped dye amplifier," **Ultrafast Phenomena VII**, C. B. Harris, E. P. Ippen, G. A. Mourou, and A. H. Zewail, Eds., Springer-Verlag, p. 63 (1990).
16. J.-Y. Bigot, M. T. Portella, R. W. Schoenlein, C. V. Shank, and J. E. Cunningham, "Two-dimensional carrier-carrier screening studied with femtosecond photon echoes," **Ultrafast Phenomena VII**, C. B. Harris, E. P. Ippen, G. A. Mourou, and A. H. Zewail, Eds., Springer-Verlag, p. 239 (1990).

17. M. T. Portella, J. -Y. Bigot, R. W. Schoenlein, and C. V. Shank, "k-Space carrier dynamics in GaAs," **Ultrafast Phenomena VII**, C. B. Harris, E. P. Ippen, G. A. Mourou, and A. H. Zewail, Eds., Springer-Verlag, p. 285 (1990).

18. J. -Y. Bigot, M. T. Portella, R. W. Schoenlein, and C. V. Shank, "Resonant intervalley scattering in GaAs," *Phys. Rev. Lett.* **65**, 3429 (1990).

19. R. W. Schoenlein, J. G. Fujimoto, G. L. Eesley, and T. W. Capehart, "Femtosecond relaxation dynamics of image-potential states," *Phys. Rev. B II.* **43**, 4688 (1991).

20. R. W. Schoenlein, J. -Y. Bigot, M. T. Portella, and C. V. Shank, "Generation of blue-green 10 fs pulses using an excimer pumped dye amplifier," *Appl. Phys. Lett.* **58**, 801 (1991).

21. J. -Y. Bigot, M. T. Portella, R. W. Schoenlein, C. J. Bardeen, A. Migus, and C. V. Shank, "Non-Markovian dephasing of molecules in solution measured with three-pulse femtosecond photon echoes," *Phys. Rev. Lett.* **66**, 1138 (1991).

22. R. W. Schoenlein and J. G. Fujimoto, "Femtosecond photoemission studies of image-potential and electron dynamics in metals," **Laser Optics of Condensed Matter, Vol. 2**, E. Garmire, A. A. Maradudin, and K. K. Rabane, Eds., Plenum Publishing Corp., p. 71 (1991).

23. J.-Y. Bigot, M.T. Portella, R.W. Schoenlein, J.E. Cunningham, and C.V. Shank, "Two-dimensional carrier-carrier screening in a quantum well," *Phys. Rev. Lett.* **67**, 636 (1991).

24. R. W. Schoenlein, L. A. Peteanu, R. A. Mathies, and C. V. Shank, "The first step in vision: Femtosecond isomerization of rhodopsin," *Science,* **254**, 412 (1991).

25. R. W. Schoenlein, C. V. Shank, L. A. Peteanu, and R. A. Mathies, "Femtosecond photoisomerization of rhodopsin as the primary event in vision," **Ultrafast Processes in Spectroscopy 1991**, A. Laubereau and A. Seilmeier Eds., IOP Publishing Ltd., p. 583 (1992).

26. T. Portella, J. -Y. Bigot, R. W. Schoenlein, J. E. Cunningham, and C. V. Shank, "k-Space carrier dynamics in GaAs," *Appl. Phys. Lett.* **60**, 2123 (1992).

27. D.R. Yankelevich, A. Dienes, A. Knoesen, R.W. Schoenlein, and C.V. Shank, "Generation of 312 nm, femtosecond pulses using a poled copolymer film," *IEEE J. Quant. Electron.*, **28,** 2398 (1992).

28. R. W. Schoenlein, L.A. Peteanu, Q.W. Wang, R.A. Mathies, and C.V. Shank, "Investigation of the primary event in vision using 10 fs blue-green optical pulses," **Ultrafast Phenomena VIII**, J. L. Martin and A. Migus, Eds., Springer-Verlag, p 53 (1993).

29. S. L. Dexheimer, D. M. Mittleman, R. W. Schoenlein, W. Vareka, X.-D. Xiang, A. Zettl, and C.V. Shank, "Ultrafast dynamics of solid C_{60}," **Ultrafast Phenomena VIII**, J. L. Martin and A. Migus, Eds., Springer-Verlag, p 81 (1993).

30. C. V. Shank, R. W. Schoenlein, D.M. Mittleman, J.J. Shiang, and A.P. Alivisatos, "Femtosecond electronic dynamics of CdSe nanocrystals," **Ultrafast Phenomena VIII**, J. L. Martin and A. Migus, Eds., Springer-Verlag, p 438 (1993).

31. R.W. Schoenlein, D. M. Mittleman, J. J. Shiang, A. P. Alivisatos, and C. V. Shank, "Investigation of femtosecond electronic dephasing in CdSe nanocrystals using quantum-beat-suppressed photon echoes," *Phys. Rev. Lett.*, **70**, 1014 (1993).

32. R. W. Schoenlein, L. A. Peteanu, Q. Wang, R. A. Mathies, and C. V. Shank, "Femtosecond dynamics of the *cis-trans* isomerization in a visual pigment analog: Isorhodopsin," *J. Chem. Phys.*, **97**, 12087 (1993).

33. L. A. Peteanu, R. W. Schoenlein, Q. Wang, R. A. Mathies, and C. V. Shank, "Femtosecond red-probe dynamics of the *cis-trans* isomerization in rhodopsin," *Proc. Natl. Acad. Sci. USA,* **90**, 11762 (1993).

34. D. M. Mittleman, R. W. Schoenlein, J. J. Shiang, V. L. Colvin, A. P. Alivisatos, and C. V. Shank, "Quantum size dependence of femtosecond electronic dephasing and vibrational dynamics in CdSe nanocrystals," *Phys. Rev. B15.*, **49**, 14435 (1994).

35. Q. Wang, Q., R. W. Schoenlein, L. A. Peteanu, R. A. Mathies, and C. V. Shank, "Vibrationally coherent photochemistry in the femtosecond primary event of vision," *Science*, **266**, 422 (1994).

36. D. M. Mittleman, S. J. Rosenthal, R. W. Schoenlein, A. T. Yeh, C. V. Shank, J.J. Shiang, V. L. Colvin, R. A. Grubbs, and A.P. Alivisatos, "Ultrafast dynamics in CdSe nanocrystals," **Ultrafast Phenomena IX**, P. F. Barbara, W. H. Knox, G. A. Mourou, A. H. Zewail, Eds., Springer-Verlag, p 351 (1994).

37. Q. Wang, R. W. Schoenlein, L. A. Peteanu, S. J. Rosenthal, R. A. Mathies, and C. V. Shank, "Femtosecond vibrationally coherent photochemistry in the primary event in vision," **Ultrafast Phenomena IX**, P. F. Barbara, W. H. Knox, G. A. Mourou, A. H. Zewail, Eds., Springer-Verlag, p 425 (1994).

38. T. E. Glover, R. W. Schoenlein, A. H. Chin, and C.V. Shank, "Observation of laser assisted photoelectric effect and femtosecond high-order harmonic radiation," *Phys. Rev. Lett.*, **76**, 2468 (1996).

39. R.W. Schoenlein, W.P. Leemans, A.H. Chin, P. Volfbeyn, T.E. Glover, P. Balling, M. Zolotorev, K.-J. Kim, S. Chattopadhyay, and C.V. Shank, "Femtosecond x-ray pulses at 0.4 Å by 90º Thomson Scattering: A new tool for probing structural dynamics of materials," *Science*, **274**, 236 (1996).

40. Q. Wang, G.G. Kochendoerfer, R.W. Schoenlein, P.J.E. Verdegm, J. Lugtenburg, R.A. Mathies, and C.V. Shank, "Femtosecond spectroscopy of a 13-demethylrhodopsin visual pigment analogue - the role of nonbonded interactions in the isomerization process," *J. Phys. Chem.*, **100**, 17388 (1996).

41. W.P. Leemans, R.W. Schoenlein, P. Volfbeyn, A.H. Chin, T.E. Glover, P. Balling, M. Zolotorev, K.-J. Kim, S. Chattopadhyay, and C.V. Shank, "X-ray based sub-picosecond electron bunch characterization using 90 degrees Thomson scattering," *Phys. Rev. Lett.*, **77**, 4182 (1996).

42. T. E. Glover, R. W. Schoenlein, A. H. Chin, and C.V. Shank, "Measurement of high harmonic pulse durations via laser assisted x-ray photoionization," **Ultrafast Phenomena X**, P.F. Barbara, J.G. Fujimoto, W.H. Knox, W. Zinth, Eds., Springer-Verlag, p 111 (1996).

43. R.W. Schoenlein, W.P. Leemans, A.H. Chin, P. Volfbeyn, T.E. Glover, P. Balling, M. Zolotorev, K.-J. Kim, S. Chattopadhyay, and C.V. Shank, "Femtosecond x-rays generated via 90º Thomson scattering," **Ultrafast Phenomena X**, P.F. Barbara, J.G. Fujimoto, W.H. Knox, W. Zinth, Eds., Springer-Verlag, p 122 (1996).

44. G. Cerullo, U. Banin, A.A. Guzelian, C.J. Bardeen, R.W. Schoenlein, A.P. Alivisatos, and C.V. Shank, "Ultrafast dephasing dynamics and multi-level electronic structure of InP nanocrystals," **Ultrafast Phenomena X**, P.F. Barbara, J.G. Fujimoto, W.H. Knox, W. Zinth, Eds., Springer-Verlag, p 429 (1996).

45. W.P. Leemans, R.W. Schoenlein, P. Volfbeyn, A.H. Chin, T.E. Glover, P. Balling, M. Zolotorev, K.-J. Kim, S. Chattopadhyay, and C.V. Shank, "Interaction of relativistic electrons with ultrashort laser pulses: Generation of femtosecond x-rays and microprobing of electron beams," *IEEE J. Quant. Electron.*, **11**, 1925 (1997).

46. T.E. Glover, A.H. Chin, R.W. Schoenlein, and C.V. Shank, "Temporal broadening of femtosecond high harmonic radiation," **Ultrafast Phenomena XI**, T. Elsaesser, J.G. Fujimoto, D.A. Wiersma, and W. Zinth, Eds., Springer-Verlag, p 381 (1998).

47. R.W. Schoenlein, P. Balling, H.H.W. Chong, T.E. Glover, P.A. Heimann, C.V. Shank, A. Zholents, and M. Zolotorev "Generation of 'dark' femtosecond synchrotron pulses from the Advanced Light Source," **Ultrafast Phenomena XI**, T. Elsaesser, J.G. Fujimoto, D.A. Wiersma, and W. Zinth, Eds., Springer-Verlag, p 390 (1998).

48. A.H. Chin, R. W. Schoenlein, T.E. Glover, P. Balling, W.P. Leemans, and C.V. Shank, "Ultrafast structural dynamics in InSb probed by time-resolved x-ray diffraction," **Ultrafast Phenomena XI**, T. Elsaesser, J.G. Fujimoto, D.A. Wiersma, and W. Zinth, Eds., Springer-Verlag, p 401 (1998).

49. A.H. Chin, R. W. Schoenlein, T.E. Glover, P. Balling, W.P. Leemans, and C.V. Shank, "Ultrafast structural dynamics in InSb probed by time-resolved x-ray diffraction*," Phys. Rev. Lett.*, **83**, pp. 336-339 (1999).

50. R. W. Schoenlein, S. Chattopadhyay, H. H. W. Chong, T. E. Glover, P. A. Heimann, C. V. Shank, A. Zholents, and M. Zolotorev, "Generation of femtosecond pulses of synchrotron radiation," *Science*, **287**, 2237-2240 (2000).

51. W. Leemans, S. Chattopadhyay, E. Esarey, A. Zholents, M. Zolotorev, A.H. Chin, R.W. Schoenlein, and C.V. Shank; "Femtosecond x-ray generation through relativistic electron beam-laser interaction*," Comtes Rendus de l'Académie des Sciences IV Physique Astrophysique, **1**,* 279 (2000).

52. R. W. Schoenlein, S. Chattopadhyay, H. H. W. Chong, T. E. Glover, P. A. Heimann, W.P. Leemans, C. V. Shank, A. Zholents, and M. Zolotorev, "Generation of x-ray pulses via laser-electron beam interaction," *Appl. Phys. B*, **71**, 1-10 (2000).

53. R. W. Schoenlein, H.H.W. Chong, T.E. Glover, P.A. Heimann, C.V. Shank, A.A. Zholents, and M.S. Zolotorev, "Femtosecond x-ray pulses from a synchrotron," **Ultrafast Phenomena XII**, T. Elsaesser, S. Mukamel, M.M. Murnane, N.F. Scherer, Eds., Springer-Verlag, p 271 (2000).

54. T.E. Glover, A.H. Chin, and R.W. Schoenlein, "High-order harmonic pulse broadening in an ionizing medium," *Phys. Rev. A*, **63**, pp.1-9 (2001).

55. T.E. Glover, G.D. Ackermann, A. Belkacem, B. Feinberg, P.A. Heimann, Z. Hussain, H.A. Padmore, C. Ray, R.W. Schoenlein, and W.F. Steele, "Measurement of synchrotron pulse durations using surface photovoltage transients," *Nuclear Inst. and Methods A*, **467**, 1438-1440 (2001).

56. P.A. Heimann, A.M. Lindenberg, I. Kang, S. Johnson,T. Missalla, Z. Chang, R.W. Falcone, R.W. Schoenlein, T.E. Glover, and H.A. Padmore, "Ultrafast x-ray diffraction of laser-irradiated crystals," *Nuclear Inst. and Methods A*, **467**, 986-989 (2001).

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149. M. Dunne, R.W. Schoenlein, J.P. Cryan, T.J.A. Wolf, "Chapter 8 Free Electron Lasers for X-ray Scattering and Diffraction," in *Structural Dynamics with X-ray and Electron Scattering* (The Royal Society of Chemistry, 2023)

Invited Conference Presentations and Colloquia

1. "Femtosecond transient electron heating in metals," Technical Digest of the XV International Quantum Electronics Conference, IQEC'87, Baltimore, MD, April 1987, invited paper TuDD4, p. 38.
2. "Femtosecond studies of image-potential dynamics in metals," Technical Digest of the Conference on Quantum Electronics and Laser Science, QELS'89, Baltimore, Maryland, April 24-28, 1989, invited paper ThNN1, p. 184.
3. "Femtosecond photoemission studies of image-potential and electron dynamics in metals," invited paper presented at the 36th National Symposium of the American Vacuum Society, Boston, MA, October 23-27, 1989.
4. "Ultrafast carrier scattering in GaAs," invited paper presented at the High Speed/High Frequency Optoelectronics Conference, Palm Coast, Florida, March 1991
5. "Femtosecond photoisomerization of rhodopsin as the primary event in vision," Technical Digest of the VIIth International Symposium on Ultrafast Processes in Spectroscopy, UPS'91, University of Bayreuth, Bayreuth, Germany, October 1991, invited paper Tu5-1.
6. "Generation of 10-fs laser pulses in the blue-green and their use to determine the time scale for the first step in vision," Program of the 1992 Annual Meeting of the Division of Atomic, Molecular, and Optical Physics, **37**, 1121, May 1992, (DAMOPS invited paper G1-2).
7. "Investigation of the primary event in vision using 10 fs blue-green optical pulses," Program of the Eighth International Conference on Ultrafast Phenomena, Antibes - Juan-les-Pins, France, June 1992 invited paper TuD4.
8. "Generation of femtosecond x-ray pulses via 90º Thomson scattering," SPIE OE/LASE'94, January 1994, invited paper 2116-34.
9. "Femtosecond dynamics of the cis-trans isomerization in a visual pigment analog: isorhodopsin," Technical Digest of the International Quantum Electronics Conference, Anaheim, May 1994, invited paper QMA3
10. "Generation of femtosecond x-ray pulses via 90º Thomson scattering," IQEC'96, Sydney, Australia, July 1996, invited paper ThD2.
11. "Generation of femtosecond x-ray pulses via 90º Thomson scattering," Physics of Quantum Electronics Conference - Snowbird UT, January 1997.
12. “Laser Techniques for Generating Femtosecond X-rays at the ALS,” Satellite Meeting on Crystallographic Applications of Synchrotron Radiation: Time Resolved X-ray Experiments, Tsukuba, Ibaraki, Japan, August 1997.
13. “Femtosecond X-ray Spectroscopy: Ultrafast Diffraction,” Photonics West Conference San Jose, CA, January 1998.
14. “Progress on femtosecond x-ray generation at the Advanced Light Source,” International Symposium on Optical Science, Engineering, and Instrumentation, San Diego, CA, July 1998.
15. “Generation of ‘dark’ femtosecond pulses from the Advanced Light Source,” Advanced Light Source Users’ Meeting, Berkeley, CA, October 1998.
16. “Femtosecond x-ray spectroscopy at the Advanced Light Source,” 11th Annual Meeting of the IEEE Lasers and Electro-Optics Society, Orlando FL, December 1998.
17. “Femtosecond x-ray science at the ALS: Recent results and future plans,” ICFA 17th Advanced Beam Dynamics Workshop on Future Light Sources, Argonne, IL, April 1999.

18. "Generation of femtosecond x-rays via laser-electron beam interaction," Gordon Conference on Nonlinear Optics, New London, NH, July 1999.
19. "Femtosecond x-ray science at the ALS: Recent results and future plans," VI International Conference on X-ray Microscopy, Berkeley, CA, August 1999.
20. "Femtosecond synchrotron pulses from the Advanced Light Source: Recent results and future plans," 2nd International Swiss Light Source Workshop on Synchrotron Radiation, Brunnen, Switzerland, October 1999.
21. "Femtosecond x-ray science at the Advanced Light Source: Recent results and future plans," Workshop on the Science and Instrumentation for the Linac Coherent Light Source, October, 1999.
22. "Ultrafast x-ray science at the Advanced Light Source," Conference on Lasers and Electro-optics/Quantum Electronics and Laser Science (CLEO/QELS) San Francisco, CA, May 2000.
23. "Ultrafast X-ray Science at the Advanced Light Source," at the VIIIth International Conference on Electronic Spectroscopy and Structure, Berkeley, CA, Aug. 8-12, 2000.
24. "Generation of femtosecond pulses of synchrotron radiation: A new tool for ultrafast x-ray science," at the 7th International Conference on Synchrotron Radiation Instrumentation, Berlin, Germany, Aug. 21-25, 2000.
25. "Scientific applications for femtosecond X-ray pulses," at the workshop on Lasers and Short Wavelength Applications – LSWAVE2000, Berlin, Germany, Aug. 26, 2000.
26. "Generation and application of femtosecond x-rays from the Advanced Light Source," at the 25th Annual Meeting of the Quantum Electronics and Atomic Physics Division of the Netherlands Physics Society, Lunteren, Netherlands, Nov. 16-17, 2000.
27. "Generation and Applications of Femtosecond X-rays from the Advanced Light Source," at the 31st Winter Colloquium on the Physics of Quantum Electronics PQEXXXI, Snowbird, Utah, Jan. 7-11, 2001.
28. "Ultrafast science with femtosecond x-ray pulses," at the BES Workshop on Scientific Applications of Ultrafast, Intense, Coherent X-Rays, Washington, D.C., May 4-5, 2001.
29. "Ultrafast X-ray Science at the Advanced Light Source: Recent Results and Future Plans," at Synchrotrone Trieste - Elettra, Trieste, Italy, May 7, 2001.
30. "Generation and application of femtosecond x-rays from the Advanced Light Source," at the International Conference on Synchrotron Radiation: Perspectives and New Technologies, Rome, Italy, May 8-9, 2001.
31. "Generation and Application of Femtosecond X-rays from the Advanced Light Source," at the 21st ICFA Beam Dynamics Workshop on Laser-Beam Interactions, Stony Brook, NY, June 11-15, 2001. (LBNL-48207 Abs)
32. "Ultrafast X-ray Science: A New Frontier for Next Generation Light Sources," SRI2001 Workshop: Energy Recovery Linac Sources of Synchrotron Radiation, Madison, WI, August, 2001.(LBNL-51012 Abs)
33. "Ultrafast X-ray Science at the Advanced Light Source," Vth Femtochemistry Conference, Toledo, Spain, Sept. 2001. (LBNL-48208 Abs)
34. Generation and Application of Femtosecond X-rays from a Synchrotron," IEEE LEOS 2001 Annual Meeting, San Diego, CA, Oct. 2001. (LBNL-51013 Abs)
35. "Ultrafast X-ray Science: Techniques and Applications," invited tutorial at CLEO/QELS 2002, Long Beach, CA, May 2002. (LBNL-51014 Abs)

36. "Generation and Applications of Femtosecond X-Rays from the Advanced Light Source," invited talk at the Nonlinear Optics Conference, Maui, HI, July 2002. (LBNL-48207 Abs.)
37. "Ultrafast X-ray Science at the ALS: Recent Results and Future Plans," invited talk at the ESRF Workshop on XAS at 3rd Generation Sources: Highlights and Future Perspectives, Grenoble, France, June 2002. (LBNL-53346 Abs.)
38. "Ultrafast X-ray from 3rd Generation Synchrotrons," invited lecture at the Ultrafast X-ray Science Summer School, Cargese, Corsica Island, France, July, 2003. (LBNL-53347 Abs.)
39. "Ultrafast X-ray Science at the ALS: Resolving Atomic and Electronic Structural Dynamics," invited talk at the ICTP Workshop on Theoretical Challenges of 4th Generation X-ray Sources, Treiste, Italy, May, 2004.
40. "LUX – A Recirculating Linac/Laser-based Femtosecond Facility for Ultrafast Science," invited talk at the ICTP Workshop on Theoretical Challenges of 4th Generation X-ray Sources, Treiste, Italy, May, 2004.
41. "Ultrafast X-ray Science at the ALS: Resolving Atomic and Electronic Structural Dynamics," invited talk at the APS Workshop on Time Domain Science using X–ray Techniques, Lake Geneva, WI, Aug. 2004.
42. "Ultrafast Spectroscopy of Photo-Induced Phase Transitions in Complex Materials," 14th National Conference on Synchrotron Radiation Instrumentation, Baton Rouge, LA, Sept. 2005.
43. "Ultrafast X-ray Science at the Advanced Light Source: Recent Results and Future Plans," Lund University, MAXLAB, Lund Sweden, Dec. 2005.
44. "Ultrafast X-ray Science at the ALS: Recent Results and Future Plans2005 Advanced Light Source Users' Meeting (plenary talk), Berkeley, CA, Oct. 2005.
45. "Ultrafast Structural Dynamics in Complex Materials using X-ray and Visible Pulses," U.C. Berkeley Physics Department, Condensed Matter Seminar Series, May 2006.
46. "Generation of Femtosecond X-ray Pulses from the Advanced Light Source," invited seminar, LBNL Instrumentation Colloquium Series, Sept. 2006.
47. "Ultrafast Structural Dynamics in Complex Materials using Femtosecond Visible and X-ray Pulses," American Vacuum Society 53rd International Symposium, San Francisco, CA, Nov. 2006.
48. "Ultrafast X-ray Spectroscopy of Transition-metal Complexes," invited lecture at the 54th Annual Western Spectroscopy Association Conference, Asilomar, CA, Jan. 2007
49. "Materials Science at Energetic Flux Extremes: photons, electrons, ions, neutrons," plenary lecture at the BES Workshop on Basic Research Needs for Materials under Extreme Environments, Washington, D.C., June 2007.
50. Lecturer at the Stanford Ultrafast X-ray Summer School, Menlo Park, CA, June 2007
51. "Accelerator-based Ultrafast X-ray Light Sources: New Tools for Probing Correlated Electronic Structure," invited talk at OSA Frontiers in Optics 2007 Laser Science XXIII Conference, San Jose, CA, Sept. 2007.
52. "Ultrafast Structural Dynamics in Solvated Transition-metal Complexes and Oxide Materials," invited talks at the Advanced Photon Source Short Pulse X-ray Workshop, Argonne, Il, May 2008.
53. "Ultrafast Laser Science," two invited lectures at the Stanford Ultrafast X-ray Summer School, Menlo Park, CA, June 2008.

54. "Ultrafast Soft X-ray Spectroscopy of Spin-crossover Dynamics in Solvated Transition-metal Complexes," invited talk at the Photo-induced Phase Transitions and Cooperative Phenomena Conference, Osaka, Japan, Nov. 2008.
55. "Advanced Ultrafast Techniques for Understanding and Controlling Complex Materials," invited talk at the LANL Workshop on Research Frontiers for Controlling and Designing Functional Materials, Los Alamos, NM, Jan. 2009.
56. "Ultrafast X-ray and Visible Spectroscopy of Transition-Metal Oxides," invited lecture, Iowa State University Physics Colloquium, March 2009.
57. "Ultrafast X-ray Spectroscopy: Structural Dynamics in Solvated Transition-metal Complexes and Oxide Materials," invited talk at the Advanced Photon Source Users' Meeting, Argonne, IL, May 2009.
58. "Ultrafast Science: Using Lasers and X-rays to Reveal the Motion of Atoms and Electrons," invited seminar, LBNL Summer Lecture Series, July 2009.
59. "Time-resolved X-ray Absorption Spectroscopy of Photoinduced Insulator-Metal Transition in a Colossal Magnetoresistive Manganite," invited talk at the Nonlinear Optics Conference, Honolulu, HI, July 2009.
60. "Ultrafast X-ray Spectroscopy of Solvated Transition-metal Complexes and Oxide Materials," invited talk at the 441 Wilhelm and Else Heraeus Workshop on Ultrafast X-ray Methods for Studying Transient Electronic Structure and Nuclear Dynamics, Bad Honnef, Germany, Sept. 2009.
61. "Ultrafast Science: Using Lasers and X-rays to Reveal the Motion of Atoms and Electrons," UK New Light Source Seminar, Blackett Laboratory, Imperial College, London UK, Sept. 2009.
62. "Ultrafast Soft X-ray Spectroscopy of Spin-Crossover Dynamics in Solvated Transition-Metal Complexes," invited talk at the OSA Annual Meeting: Frontiers in Optics, San Jose, CA Oct. 2009.
63. "Ultrafast X-ray Spectroscopy: Structural Dynamics in Transition-metal Complexes and Oxide Materials, invited talk at the Ultrafast X-ray Science Workshop 2010 POSTECH, Pohang, Korea, Jan. 2010.
64. "Ultrafast X-ray Spectroscopy: Structural Dynamics of Solvated Transition-metal Complexes," invited talk at the Optical Society of Korea 20th Anniversary and Winter Annual Meeting 2010, KAIST Daejeon Korea, Jan. 2010.
65. "Ultrafast X-ray Spectroscopy of Solvated Transition-metal Complexes and Oxide Materials," invited talk at the Kavli Institute for Theoretical Physics workshop on X-ray Science in the 21st Century, Santa Barbara, CA July 2010.
66. "Using Ultrafast Lasers and X-rays to Understand Correlated Phenomena in Complex Materials," invited talk, Condensed Matter Physics Seminar, U.C. San Diego, Feb. 2010.
67. "Ultrafast Science and the Next Generation X-ray Laser Array at the Berkeley Lab," invited talk, Physics and Applied Physics Department Colloquium, Stanford University, April 2011.
68. "Ultrafast X-ray Studies of Complex Materials: Science Challenges and Opportunities," invited talk, Cornell XDL2011 Workshop, June 2011.
69. "A Next Generation X-ray Laser Array at the Berkeley Lab: Science Drivers and Facility Overview," invited talk, Optical Society of America Annual Meeting – Frontiers in Optics, San Jose, Oct. 2011.
70. "Enabling X-ray Science: The Advanced Light Source, The Next Generation Light Source," invited talk, Conference on Lasers and Electro-optics/Quantum Electronics and Laser Science (CLEO/QELS), San Jose, May 2012.

71. "Science Challenges & Opportunities for an Advanced X-ray Free-electron Laser," invited talk, SLAC Photon Sciences Seminar, Menlo Park, CA, Oct. 2013
72. "Dynamics of Electronic Ordering in Transition-metal Oxides via Time-resolved Resonant Soft X-ray Scattering," invited talk, U. Hamburg SFB/ZOQ Colloquium, Hamburg, Germany, Dec. 2013.
73. "Time-resolved X-ray Spectroscopy of Charge Dynamics in Transition-metal Complexes" invited talk, TRSC Workshop: Breaking and Making Bonds with Light, Telluride Research Center, Colorado July 2014.
74. "Science challenges and opportunities for the LCLS-II X-ray lasers" invited talk, Nobel Symposium on Free Electron Laser Research, Stockholm, Sweden, June 2015.
75. "Revealing Spin Texture Dynamics in Complex Materials via Time-resolved Resonant Soft X-ray Scattering," invited talk, American Vacuum Society 62nd International Symposium, San Jose, CA, Oct. 2015.
76. "LCLS-II Science Opportunities and Prospects for Multicolor X-ray Spectroscopy," invited talk, RESONANCES Workshop (Multicolor FEL Pulses and Coherent Control Opening New Science Perspectives), Trieste, Italy, Dec. 2015.
77. "Science Opportunities for LCLS-II Soft X-ray Lasers," invited talk, Workshop to Define the Science Case for a Soft X-ray Laser Beamline at MAX IV, Stockholm, Sweden, March 2016
78. "Science Opportunities for LCLS-II Soft X-ray Lasers," invited talk, LANL MaRIE Workshop – New X-ray Sources for Mesoscale Functional Materials, Santa Fe, July 2016.
79. "Science Opportunities for High-repetition-rate X-ray Lasers: LCLS-II and LCLS-II-HE," PULSE Institute 10th Anniversary Symposium, Menlo Park, CA, Oct. 2016.
80. "LCLS Recent Developments, Science Opportunities and Plans for LCLS-II and LCLS-II-HE," BioXFEL 4th International Conference, Las Vegas, NV, Jan. 2017.
81. "Chemical Applications for X-ray FELs," Italian Physical Society: International School of Physics – Enrico Fermi, Physics of and Science with X-ray Free-Electron Lasers, Varenna, Italy, June 2017.
82. "Current & Future Research Topics for X-ray FELs," Italian Physical Society: International School of Physics – Enrico Fermi, Physics of and Science with X-ray Free-Electron Lasers, Varenna, Italy, June 2017.
83. "LCLS-II & LCLS-II-HE Science Opportunities," Shanghai Topical Workshop on High Repetition-Rate XFEL Physics & Technology, Shanghai, China, Aug. 2017.
84. "Science Opportunities at LCLS-II and LCLS-II-HE," 7th International Conference on Hard X-Ray Photoelectron Spectroscopy, Berkeley, CA Sept. 2017.
85. "LCLS Recent Developments, Science Opportunities and Plans for LCLS-II and LCLS-II-HE," Advances in Free-electron Laser Science – Workshop of the Peter Paul Ewald Fellows, DESY Hamburg, Germany, Oct. 2017.
86. "LCLS Recent Developments, Science Opportunities and Plans for LCLS-II and LCLS-II-HE," Science@FELs Conference, Stockholm, Sweden, June 2018.
87. "Element-specific View of Molecular Dynamics and future opportunities for Ultrafast Chemical Science at XFELs," American Chemical Society Conference, Boston, MA, Aug. 2018.
88. "XFEL Science Opportunities and Plans for LCLS-II and LCLS-II-HE," Femtosecond Electron Imaging and Spectroscopy – 4, Lincoln, NE, May 2019.
89. "X-ray Free-Electron Lasers are Driving a Revolution in the X-ray Science of Complex Matter," Northwestern University Materials Science and Engineering Symposium, Chicago, IL, April 2021.

90. "LCLS Today & Tomorrow: Recent Science, Future Opportunities & Development Plans," European XFEL Science Seminar Series, Hamburg, Germany, April 2021.
91. "Chemical Dynamics using Ultrafast X-rays from LCLS: Recent highlights, future opportunities & development plans," American Chemical Society Conference, San Diego, CA, March 2022.
92. "XFELs are Driving a Revolution in X-ray Science: LCLS Highlights, Opportunities & Development Plans," 41st International VUVX Conference, Campinas-SP, Brazil, July 2023.
93. "New Insight into Excited-State Chemical Dynamics Using Ultrafast X-Rays: Recent Highlights, Future Opportunities & Development Plans at LCLS," American Vacuum Society 69nd International Symposium, Portland, OR, Nov. 2023.