

## Curriculum Vitae

**Peter Baum**

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### Personal information

Date of birth 27.08.1973, München, Germany  
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### Education

2001 - 2005 PhD, Ludwig-Maximilians-Universität München (summa cum laude / highest distinction).  
1994 - 2001 Diplom-Physiker, Ludwig-Maximilians-Universität München (1.0).  
1993 - 1994 Military Service at air force officer's academy.  
1993 Abitur at Max-Planck-Gymnasium, München (1.1).

### Current and Previous Positions

Since 2018 W3 professor of Physics, Universität Konstanz.  
2008 - 2018 Research Group Leader, Max-Planck-Institute of Quantum Optics and  
Ludwig-Maximilians-Universität München, with Prof. Krausz.  
2006 - 2007 Postdoctoral Scholar, Caltech, USA, with Prof. Zewail.  
2005 - 2006 Postdoctoral Scholar, Universität Wien, Austria, with Prof. Kauffmann.  
2001 - 2005 PhD student, Ludwig-Maximilians-Universität München,  
Chair for BioMolecular Optics, with Prof. Riedle.  
2001 Student Assistant, Ludwig-Maximilians-Universität München, BioMolecular Optics.  
1997 - 2000 Student Assistant, Ludwig-Maximilians-Universität München, Medical Psychology.

### Funding, Prizes and Awards

2015 ERC Consolidator Grant  
2010 wiss. und finanzieller Leiter eines ERC Advanced Grants von Prof. Krausz  
2009 Rudolf-Kaiser Foundation, Project Price  
since 2008 Member of the DFG Excellence Cluster 'Munich Centre for Advanced Photonics'  
2006 Alexander von Humboldt Foundation, Feodor-Lynen Fellowship

### Five key publications (as first or last author)

- *Science* 355, 458 (2017): "Laser-driven nanoparticle motion in liquids"
- *Science* 353, 374 (2016): "Electron microscopy of electromagnetic waveforms"
- *Science* 352, 429 (2016): "All-optical control and metrology of electron pulses"
- *Nature Photonics* 8, 52 (2014): "Laser streaking of free electrons at 25 keV"
- *Science* 318, 788 (2007): "4D Visualization of Transitional Structures in Phase Transformations by Electron Diffraction"

### Invited talks at international conferences

- 19<sup>th</sup> International Microscopy Congress, Sydney, Australia, 2018.
- Gordon Conference on Multi-Photon Processes, Rhode Island, USA, 2018.
- FRIAS Junior Researcher Conference: Beyond Molecular Movies, Freiburg, Germany, 2017.
- 2nd International Workshop on Electron Beam Spectroscopy for Nanophotonics, Barcelona, Spain, 2017.
- ColdBeams conference, Eindhoven, Netherlands, 2017.
- Electron microscopy with high temporal resolution, Strasbourg, France, 2017.
- Banff Meeting on Structural Dynamics, Canada, 2017.
- NanoMeta Conference, Seefeld, Austria, 2017.

- Ahmed Zewail Memorial Symposium, Caltech, Pasadena, USA, 2017.
- Workshop on the Future of Electron Microscopy, Jülich, Germany, 2016.
- EMN Meeting on Terahertz, San Sebastian, Spain, 2016.
- Ultrafast phenomena at nanostructures: attosecond physics meets plasmonics, Les Houches, France, 2016.
- Imaging with Femtosecond Electron and X-ray pulses, Trieste, Italy, 2016.
- 5th International Conference on Attosecond Physics, Montréal, Canada, 2015.
- 16th European Symposium on Gas-phase Electron Diffraction, Frauenchiemsee, 2015.
- DFG Schwerpunktsprogramm-Workshop „Ultrafast Electron Diffraction“, Göttingen, 2014.
- Femtochemistry XI, Copenhagen, Denmark, 2013.
- Frontiers in Optics, Rochester, USA, 2012.
- Coldbeams conference, Nîmes, France, 2012.
- Microscopy Conference, German Society for Electron Microscopy, Kiel, Germany, 2011.
- 3<sup>rd</sup> International Conference on Attosecond Physics, Sapporo, Japan, 2011.
- International Symposium on Ultrafast Intense Laser Science, Eisenach, Germany 2011.
- First International Conference on Ultrafast Structural Dynamics, Lausanne, Switzerland, 2010.
- OSA Laser Science Annual Meeting, San Jose, California, USA, 2009.
- Femtochemistry IX, Beijing, China, 2009.
- SPIE Photonics West, San Jose, California, USA, 2009.
- 3<sup>rd</sup> International Conference on Photoinduced Phase Transitions, Osaka, Japan, 2008.
- International Conference on Correlation Effects in Radiation Fields, Rostock, Germany, 2008.

### **Journal Articles / Book Contributions**

- 64 D. Ehberger, A. Ryabov, P. Baum, *Tilted electron pulses*, Phys. Rev. Lett. 121, 094801 (2018).
- 63 D. Ehberger, C. Kealhofer, P. Baum, *Electron energy analysis by phase-space shaping with THz field cycles*, Struct. Dyn. 5, 044303 (2018).
- 62 B.-H. Chen, T. Nagy, P. Baum, *Efficient middle-infrared generation in LiGaS<sub>2</sub> by simultaneous spectral broadening and difference-frequency generation*, Opt. Lett. 43, 1742 (2018).
- 61 Y. Morimoto and P. Baum, *Attosecond control of electron beams at dielectric and absorbing membranes*, Phys. Rev. A 97, 033815 (2018).
- 60 Y. Morimoto and P. Baum, *Diffraction and microscopy with attosecond electron pulse trains*, Nature Physics 14, 252-256 (2018).
- 59 M. Tsarev and P. Baum, *Characterization of non-relativistic attosecond electron pulses by transition radiation from tilted surfaces*, New J. Phys. 20, 033002 (2018).
- 58 P. Baum and F. Krausz, *Capturing atomic-scale carrier dynamics with electrons*, Chem. Phys. Lett. 683, 57-61 (2017).
- 57 P. Baum, *Quantum dynamics of attosecond electron pulse compression*, J. Appl. Phys. 122, 223105 (2017).
- 56 Y. Morimoto, I. Roland, S. Rennesson, F. Semond, P. Boucaud, P. Baum, *Laser damage of free-standing nanometer membranes*, J. Appl. Phys. 122, 215303 (2017).
- 55 P. Baum, *Laser-driven nanoparticle motion in liquids*, Science 355, 458 (2017).
- 54 A. Ryabov and P. Baum, *Electron microscopy of electromagnetic waveforms*, Science 353, 374 (2016).
- 53 C. Kealhofer, W. Schneider, D. Ehberger, A. Ryabov, F. Krausz, P. Baum, *All-optical control and metrology of electron pulses*, Science 352, 429 (2016).
- 52 D.-S. Yang, P. Baum, A. H. Zewail, *Ultrafast electron crystallography of the cooperative reaction path in vanadium dioxide*, Struct. Dyn. 3, 034304 (2016).
- 51 A. Gliserin, M. Walbran, P. Baum, *A high-resolution time-of-flight energy analyzer for femtosecond electron pulses at 30 keV*, Rev. Sci. Instrum. 87, 033302 (2016).
- 50 M. V. Tsarev, D. Ehberger, P. Baum, *High-average-power, intense THz pulses from a LiNbO<sub>3</sub> slab with silicon output coupler*, Appl. Phys. B 122, 30 (2016).
- 49 A. Gliserin, M. Walbran, F. Krausz, P. Baum, *Sub-phonon-period compression of electron pulses for atomic diffraction*, Nature Comm. 6, 8723 (2015).
- 48 M. Walbran, A. Gliserin, K. Jung, J. Kim, P. Baum, *5-fs laser-electron synchronization for pump-probe crystallography and diffraction*, Phys. Rev. Appl. 4, 044013 (2015).
- 47 V. Yakovlev, M. Stockman, F. Krausz, P. Baum, *Atomic-scale diffractive imaging of sub-cycle electron dynamics in condensed matter*, Scientific Reports 5, 14581 (2015).
- 46 C. Kealhofer, S. Lahme, T. Urban, P. Baum, *Signal-to-noise in femtosecond electron diffraction*, Ultramicroscopy 159, 19-25 (2015).
- 45 L. Kasmi, D. Kreier, M. Bradler, E. Riedle, P. Baum, *Femtosecond single-electron pulses generated by two-photon photoemission close to the work function*, New J. Phys. 17, 033008 (2015).
- 44 W. Schneider, A. Ryabov, C. Lombosi, T. Metzger, Z. Major, J. A. Fülöp, P. Baum, *800-fs, 330- $\mu$ J pulses from a 100-W regenerative Yb:YAG thin-disk amplifier at 300 kHz and THz generation in LiNbO<sub>3</sub>*, Opt. Lett. 39, 6604-6607 (2014).
- 43 S. Lahme, F. Krausz, P. Baum, *Femtosecond single-electron diffraction*, Struct. Dyn. 1, 034303 (2014).
- 42 F. O. Kirchner, S. Lahme, E. Riedle, P. Baum, *All-reflective UV-VIS-NIR transmission and fluorescence spectrometer for  $\mu$ m-sized samples*, AIP Advances 4, 077134 (2014).
- 41 D. Kreier, D. Sabonis, P. Baum, *Alignment of magnetic solenoid lenses for minimizing temporal distortions*, J. Opt. 16, 075201 (2014).
- 40 P. Baum, *Towards ultimate temporal and spatial resolutions with ultrafast single-electron diffraction*, J. Phys. B. 47, 124005 (2014).
- 39 P. Dombi, P. Rácz, L. Veisz, P. Baum, *Conversion of chirp in fiber compression*, Opt. Lett. 39, 2232-2235 (2014).

- 38 J. Hoffrogge, J. P. Stein, M. Krüger, M. Förster, J. Hammer, D. Ehberger, P. Baum, P. Hommelhoff, *Tip-based source of femtosecond electron pulses at 30 keV*, J. Appl. Phys. 115, 094506 (2014).
- 37 F. O. Kirchner, A. Gliserin, F. Krausz, P. Baum, *Laser streaking of free electrons at 25 keV*, Nature Photonics 8, 52 (2014).
- 36 P. Baum, On the physics of ultrashort single-electron pulses for time-resolved microscopy and diffraction, Chem. Phys. 423, 55-61 (2013).
- 35 A. Gliserin, M. Walbran, P. Baum, *Passive optical enhancement of laser-microwave synchronization*, Appl. Phys. Lett. 103, 031113 (2013).
- 34 F. O. Kirchner, S. Lahme, F. Krausz, P. Baum, *Coherence of femtosecond single-electrons exceeds biomolecular dimensions*, New J. Phys. 15, 063021 (2013).
- 33 A. Gliserin, A. Apolonski, F. Krausz, P. Baum, *Compression of single-electron pulses with a microwave cavity*, New J. Phys. 14, 073055 (2012).
- 32 D. Kreier and P. Baum, *Avoiding temporal distortions in tilted pulses*, Opt. Lett. 37, 2373 (2012).
- 31 T. Ganz, V. Pervak, A. Apolonski, P. Baum, *16 fs, 350 nJ pulses at 5 MHz repetition rate delivered by chirped pulse compression in fibers*, Opt. Lett. 36, 1107 (2011).
- 30 C. Weninger and P. Baum, *Temporal Distortions in Magnetic Lenses*, Ultramicroscopy 113, 145 (2011).
- 29 M. Aidelsburger, F. O. Kirchner, F. Krausz, P. Baum, *Single-Electron Pulses for Ultrafast Diffraction*, PNAS 107, 19714 (2010).
- 28 P. Baum, J. Manz, A. Schild, *Quantum Model Simulations of Attosecond Electron Diffraction*, Science China 53, 987 (2010).
- 27 P. Baum and A. Zewail, *4D attosecond imaging with free electrons: Diffraction methods and potential applications*, Chem. Phys. 366, 2-8 (2009).
- 26 M. Bradler, P. Baum, E. Riedle, *Femtosecond continuum generation in laser host materials*, Appl. Phys. B 97, 561 (2009).
- 25 P. Baum and A. Zewail, *Femtosecond Diffraction with Chirped Electron Pulses*, Chem. Phys. Lett. 462, 14 (2008).
- 24 C. Homann, C. Schriever, P. Baum, E. Riedle, *Octave wide tunable UV-pumped NOPA: pulses down to 20 fs at 0.5 MHz repetition rate*, Opt. Express 16, 5746 (2008).
- 23 F. Carbone, P. Baum, P. Rudolf, A. H. Zewail, *Structural Preablation Dynamics of Graphite Observed by Ultrafast Electron Crystallography*, Phys. Rev. Lett. 100, 035501 (2008).
- 22 J. Sperling, K. Matuszna, P. Baum, A. Nemeth, F. Sanda, E. Riedle, H. F. Kauffmann, S. Mukamel, F. Milota, *Exciton Dynamics in a Disordered Conjugated Polymer: Three-Pulse Photon-Echo and Transient Grating Experiments*, Chem. Phys. 349, 244 (2008).
- 21 P. Baum and A. H. Zewail, *Attosecond Electron Pulses for 4D diffraction and microscopy*, PNAS 104, 18409 (2007).
- 20 P. Baum, D.-S. Yang, A. H. Zewail, *4D Visualization of Transitional Structures in Phase Transformations by Electron Diffraction*, Science 318, 788 (2007).
- 19 P. Baum and A. H. Zewail, *Breaking resolution limits in ultrafast electron diffraction and microscopy*, PNAS 103, 16105 (2006).
- 18 P. Baum, M. Breuer, E. Riedle, Günter Steinmeyer, *Chirped mirrors without dispersion oscillations by Brewster's angle incidence*, Ultrafast Phenomena XV (Springer, Berlin Heidelberg 2007), 163 – 165.
- 17 F. Milota, P. Baum, J. Sperling, E. Riedle, K. Matuszna, and H. F. Kauffmann, *2D optical spectroscopy of a conjugated polymer with tunable visible 15 fs-pulses from a 200 kHz NOPA*, Ultrafast Phenomena XV (Springer, Berlin Heidelberg 2007), 359 – 361.
- 16 P. Baum, E. Riedle, G. Steinmeyer, *Brewster-angled chirped mirrors for broadband pulse compression without dispersion oscillations*, Opt. Lett. 31, 2220 (2006).
- 15 P. Baum and E. Riedle, *Design and calibration of zero-additional-phase SPIDER*, J. Opt. Soc. B 22, 1875 (2005).
- 14 M. Greve, B. Bodermann, H. R. Telle, P. Baum, E. Riedle, *High-contrast chemical imaging with gated heterodyne coherent anti-Stokes Raman scattering microscopy*, Appl. Phys. B 81,875 (2005).
- 13 P. Baum, E. Riedle, M. Greve, H. R. Telle, *Phase-locked ultrashort pulse trains at separate and independently tunable wavelengths*, Opt. Lett. 30, 2028 (2005).
- 12 M. Greve, B. Bodermann, H. R. Telle, P. Baum, E. Riedle, *Gated heterodyne coherent anti-Stokes Raman scattering for high-contrast vibrational imaging*, Proc. SPIE 5856, 41 (2005).
- 11 P. Baum, S. Lochbrunner, E. Riedle, *Achromatic second harmonic generation: tunable ultraviolet pulses with sub-10 fs duration*, Ultrafast Phenomena XIV (Springer, Berlin, 2005), 79-81.
- 10 P. Baum, S. Lochbrunner, E. Riedle, *Full characterization of ultraviolet and visible 10-fs pulses with zero-additional-phase SPIDER*, Ultrafast Phenomena XIV (Springer, Berlin, 2005), 130-132.
- 9 P. Baum, S. Lochbrunner, E. Riedle, *Generation of tunable 7-fs ultraviolet pulses: achromatic phase matching and chirp management*, Appl. Phys. B 79, 1027 (2004).
- 8 P. Baum, S. Lochbrunner, E. Riedle, *Tunable sub-10-fs ultraviolet pulses generated by achromatic frequency doubling*, Opt. Lett. 29, 1686 (2004).
- 7 I. Z. Kozma, P. Baum, U. Schmidhammer, S. Lochbrunner, E. Riedle, *Compact autocorrelator for the online measurement of tunable 10-femtosecond pulses*, Rev. Sci. Instrum. 75, 2323 (2004).
- 6 P. Baum, S. Lochbrunner, E. Riedle, *Zero-additional-phase SPIDER: full characterization of visible and sub-20 fs ultraviolet pulses*, Opt. Lett. 29, 210 (2004).
- 5 I. Z. Kozma, P. Baum, S. Lochbrunner, E. Riedle, *Widely tunable sub-30 fs ultraviolet pulses by chirped sum frequency mixing*, Opt. Express 11, 3110 (2003).
- 4 R. Huber, F. Adler, A. Leitenstorfer, M. Beutler, P. Baum, E. Riedle, *12-fs pulses from a continuous-wave-pumped 200 nJ Ti:sapphire amplifier at a variable repetition rate as high as 4 MHz*, Opt. Lett. 28, 2118 (2003).
- 3 P. Baum, S. Lochbrunner, E. Riedle, *Carrier-envelope phase fluctuations of amplified femtosecond pulses: Characterization with a simple spatial interference setup*, Appl. Phys. B 77, 129 (2003).
- 2 P. Baum, S. Lochbrunner, J. Piel, E. Riedle, *Phase coherent generation of tunable visible femtosecond pulses*, Opt. Lett. 28, 185 (2003).
- 1 P. Baum, S. Lochbrunner, L. Gallmann, G. Steinmeyer, U. Keller, E. Riedle, *Real-time characterization and optimal phase control of tunable visible pulses with a flexible compressor*, Appl. Phys. B 74, S219 (2002)

#### Patents

DE 10 2016 012 724, *Vorrichtung zur Beobachtung mit Ladungsteilchen, Elektronenmikroskop sowie Verfahren zur zeit-aufgelösten Beobachtung*