

## Education

**2003–2009**      **Massachusetts Institute of Technology**      *Cambridge, MA*  
**PhD, EECS, Thesis: Methods for Engineering Sub-Two-Cycle Mode-Locked Lasers**  
Minor: Computational Methods in Applied Physics  
**SM, Computation for Design and Optimization, Thesis: A Preconditioned Newton-Krylov Method for Computing Steady-State Pulse Solutions of Mode-Locked Lasers**

**1996–1999**      **University of Colorado**      *Boulder, CO*  
**MS, Electrical Engineering**

**1992–1996**      **Swarthmore College**      *Swarthmore, PA*  
**BS, Engineering (Multidisciplinary)**

## Experience

**2017–Present**      **MIT Lincoln Laboratory**  
**Asst. Group Leader, Space Systems Analysis & Test** – Manage space hardware prototyping portfolio, overseeing \$20M in annual execution. Responsible for business development and regular briefings to senior Pentagon leadership.

**2011–2017**      **MIT Lincoln Laboratory**  
**Program Manager, Space System Analysis Group** – Manage multiple hardware, software and systems analysis programs.

**2010–2011**      **Idesta Quantum Electronics**  
**Research Manager (Consulting)** – Managed development of a commercial product based on thesis research. Principle Investigator of DoD SBIR program to develop parallel computational methods for optimizing optical filters.

**2009–2010**      **MIT**  
**Postdoctoral Associate**

**2003–2009**      **Dr. Franz Kärtner**      **MIT**  
**Graduate Research Assistant**

**1998–2002**      **Dr. Gary Sharp**      **Real-D**  
**Project Manager** – Developed synthesis algorithms for optical polarization transformation devices

## Patents

1. H. Crespo, **J. R. Birge**, M. Sander, F. X. Kärtner, “Compact and nonintrusive nonlinear interferometry for carrier-envelope phase control,” US patent application, filed 2007.
2. **J. R. Birge**, R. Ell, F. X. Kärtner, “Two-dimensional Spectral Shearing Interferometry for Ultrafast Pulse Characterization,” US patent 7,433,043. *Licensed to Menlo Systems, Inc. (Now Idesta Quantum Electronics)*
3. J. Chen, M. Robinson, G. D. Sharp, **J. R. Birge**. “Three-panel color management systems and methods,” US patent 7,154,667.
4. **J. R. Birge** and G. Sharp. “Birefringent Networks,” US patent 7,154,667.
5. J. Chen, M. Robinson, G. Sharp, **J. R. Birge**. “Compensated Color Management Systems and Methods,” US patents 6,186,309; 6,961,181; 6,961,179.
6. G. Sharp, M. Robinson, **J. R. Birge**, “Optical system for producing a modulated color image,” US patent 6,704,065.

## Awards

Elected Full Member to Sigma Xi, 2008

## Activities

Private Pilot (350 hours). Former Associate Editor for *Pilot Getaways* magazine (5 published articles).

## Clearance

Current TS//SCI

1. S-W Huang, G. Cirmi, J. Moses, K-H Hong, S. Bhardwaj, **J. R. Birge**, L-J Chen, I. V. Kabakova, E. Li, B. Eggleton, G. Cerullo, F. X. Kärtner, "Optical waveform synthesizer and its application to high-harmonic generation," *Journal of Physics B*, 2012.
2. S-W Huang, G. Cirmi, J. Moses, K-H Hong, S. Bhardwaj, **J. R. Birge**, L-J Chen, E. Li, B. Eggleton, G. Cerullo, F. X. Kärtner, "High-energy pulse synthesis with sub-cycle waveform control for strong-field physics," *Nature Photonics*, 2011.
3. **J. R. Birge**, F. X. Kärtner, O. Nohadani, "Improving thin film manufacturing yield with robust optimization," *Applied Optics*, 2011.
4. A. J. Benedick, G. Chang, **J. R. Birge**, L-J Chen, A. G. Glenday, C-H Li, D. F. Phillips, A. Szentgyorgyi, S. Korzenik, G. Furesz, R. L. Walsworth, F. X. Kärtner, "Visible wavelength astro-comb," *Opt. Express* **18**, 2010.
5. **J. R. Birge**, F. X. Kärtner, "Phase distortion ratio: alternative to group delay dispersion for analysis and optimization of dispersion compensating optics," *Optics Letters* **35**, 2010.
6. (\*) **J. R. Birge**, F. X. Kärtner, "Design and analysis of two-dimensional spectral shearing interferometry," *J. Opt. Soc. Amer. B*, **27**, 2010. (Invited for inclusion in the Virtual Journal of Ultrafast Optics.)
7. D. Li, U. Demirbas, **J. R. Birge**, G. S. Petrich, L. A. Kolodziejski, A. Sennaroglu, F. X. Kärtner, J. G. Fujimoto, "Diode-pumped passively mode-locked GHz femtosecond Cr:LiSAF laser with kW peak power," *Optics Letters* **35**, 2010.
8. U. Demirbas, D. Li, **J. R. Birge**, A. Sennaroglu, G. S. Petrich, L. A. Kolodziejski, F. X. Kärtner, and J. G. Fujimoto, "Low-cost, single-mode diode-pumped Cr:Colquirite lasers," *Opt. Express* **17**, 2009.
9. (\*) **J. R. Birge**, F. X. Kärtner, "Novel 2DSI method measures sub-two-cycle laser pulses," *Laser Focus World*, March, 2009.
10. M. Y. Sander, **J. R. Birge**, A. Benedick, H. M. Crespo, and F. X. Kärtner, "Dynamics of dispersion managed octave-spanning titanium:sapphire lasers," *J. Opt. Soc. Am. B* **26**, 2009.
11. L-J. Chen, A. J. Benedick, **J. R. Birge**, M. Y. Sander, and F. Kärtner, "Octave-spanning, dual-output 2.166 GHz Ti:sapphire laser," *Opt. Express* **16**, 20699-20705, 2008.
12. (\*) **J. R. Birge**, F. X. Kärtner, "Analysis and mitigation of systematic errors in spectral shearing interferometry for few cycle pulse measurement," *J. Opt. Soc. Amer. B*, **25**, 2008.
13. H. Crespo, **J. R. Birge**, E. Filcao, M. Sanders, A. Benedick, F. X. Kärtner, "Phase stabilization of sub-two-cycle pulses from a prismless octave-spanning Ti:sapphire lasers," *JOSA B*, **25**, 2008.
14. O. Nahadani, **J. R. Birge**, F. X. Kärtner, D. Bertsimas, "Robust Chirped Mirrors," *Applied Optics* **47**, 2008.
15. H. Crespo, **J. R. Birge**, E. Filcao, M. Sanders, A. Benedick, F. X. Kärtner, "Non-intrusive phase stabilization of sub-two-cycle pulses from a prismless octave-spanning Ti:sapphire laser," *Optics Letters* **33**, 2008.
16. **J. R. Birge**, F. X. Kärtner, "Efficient optimization of multilayer coatings for ultrafast optics using analytic gradients of dispersion," *Appl. Opt.* **46**, 2007.
17. (\*) F. X. Kaertner, A. Benedick, R. Ell, O. D. Mücke, **J. Birge**, and M. Sander, "Octave Spanning Ti:Sapphire Lasers," in *Advanced Solid-State Photonics*, OSA Technical Digest, 2007.
18. **J. R. Birge**, "Designing Phase-Sensitive Mirrors by Minimizing Complex Error Energy in the Frequency Domain," in *Optical Interference Coatings*, OSA Technical Digest, 2007.
19. (\*) **J. R. Birge**, R. Ell, F. X. Kärtner, "Two-dimensional spectral shearing interferometry (2DSI) for ultrashort pulse characterization," *Optics Letters*, 2006. (Invited for inclusion in Virtual Journal of Ultrafast Optics.)
20. R. Ell, **J. R. Birge**, M. Araghchini, F. X. Kärtner, "Carrier-envelope phase control by a composite glass plate," *Optics Express* **14**, 5829-36, 2006.
21. R. Ell, G. Angelow, W. Seitz, M. Lederer, H. Huber, D. Kopf, **J. R. Birge**, F. X. Kaertner, "Quasi-synchronous pumping of mode-locked few-cycle Titanium Sapphire lasers," *Optics Letters*, 2006.
22. O. D. Mücke, R. Ell, A. Winter, J. Kim, **J. R. Birge**, L. Matos, F. X. Kärtner, "Self-reference 200 MHz octave-spanning Ti:sapphire laser with 45 attosecond carrier-envelope phase jitter," *Optics Express*, 2005.
23. **J. Birge**, F. Kaertner, "Efficient Analytic Computation of Dispersion from Layered Media," *Applied Optics* **45**, 1478, 2006.

Refereed  
Conference  
Proceedings  
& Invited  
Talks

24. J. Kim, **J. R. Birge**, V. Sharma, J. G. Fujimoto, F. X. Kaertner, V. Scheuer, and G. Angelow, "Ultrabroadband beam splitter with matched group-delay dispersion," *Opt. Lett.* **30**, 1569, 2005.
25. (\*) G. Sharp, M. Robinson, J. Chen, **J. Birge**, "LCOS Projection Color Management Using Retarder Stack Technology," *Displays*, 2002.
1. M. Rhodes, M. Mukhopadhyay, J. Birge, G. Steinmeyer, and R. Trebino, "The Coherent Artifact in Interferometric Pulse-Measurement Techniques," in *CLEO: 2014*, OSA Technical Digest (online) (Optical Society of America, 2014), paper SF1E.5.
2. U. Demirbas, G. Petrich, D. Li, J. Wang, S. Nabanja, J. R. Birge, P. Fendel, A Sennaroglu, L Kolodziejski, F. X. Kärtner, J. G. Fujimoto, "Mode-locked tuning of diode-pumped femtosecond Cr:LiSAF and Cr:LiCAF lasers using AlGaAs-based saturable Bragg reflectors," *Advances in Optical Materials*, OSA Technical Digest, 2011.
3. H. Chen, T. Sosnowski, C. Liu, L. Chen, J. Birge, A. Galvanauskas, F. Kärtner, and G. Chang, "High-energy chirally-coupled-core Yb-fiber laser with high-dispersion mirror compressor to achieve 1W-level, sub-100fs pulses with diffraction-limited beam quality," in *Advances in Optical Materials*, OSA Technical Digest (CD) (Optical Society of America, 2011), paper ATuC5.
4. Hung-Wen Chen, Tom Sosnowski, Chi-Hung Liu, Li-Jin Chen, Jonathan R. Birge, Almantas Galvanauskas, Franz X. Kärtner, and Guoqing Chang, "Chirally-coupled-core Yb-fiber laser delivering 80-fs pulses with diffraction-limited beam quality warranted by a high-dispersion mirror based compressor," *Opt. Express* **18**, 24699-24705 (2010)
5. S. Huang, G. Cirmi, K. Hong, J. Moses, J. Birge, S. Bhardwaj, V. Gkortsas, A. Benedick, L. Chen, E. Li, B. Eggleton, G. Cerullo, and F. Kärtner, "Scalable High-Energy Sub-Cycle Waveform Synthesis for High-Field Physics," in *Advances in Optical Materials*, OSA Technical Digest (CD) (Optical Society of America, 2011), paper JWC4.
6. **J. R. Birge**, F. X. Kärtner, O. Nohadani, "Designing coatings in the presence of manufacturing errors," *Optical Interference Coatings*, OSA Technical Digest, 2010.
7. J. G. Fujimoto, U. Demirbas, D. Li, A. Benedick, G. S. Petrich, **J. R. Birge**, J. Wang, S. Nabanja, L. A. Kolodziejski, A. Sennaroglu, and F. X. Kärtner, "Compact and Low-Cost Fs Diode-Pumped Cr:Colquirite Laser Technology," *International Conference on Ultrafast Phenomena*, OSA Technical Digest, 2010.
8. L. Chen, G. Chang, **J. R. Birge**, and F. X. Kärtner, "Complementary Chirped-Mirror Pair for Broadband Dispersion-Free Cavities," *Optical Interference Coatings*, OSA Technical Digest, 2010.
9. (\*) E. Ippen, A. Benedick, **J. Birge**, H. Byun, L. -. Chen, G. Chang, D. Chao, J. Morse, A. Motamedi, M. Sander, G. Petrich, L. Kolodziejski, and F. Kärtner, "Optical Arbitrary Waveform Generation," *Quantum Electronics and Laser Science Conference*, OSA Technical Digest, 2010.
10. W. P. Putnam, G. Abram, E. L. Falcão-Filho, **J. R. Birge**, and F. X. Kärtner, "High-Intensity Bessel-Gauss Beam Enhancement Cavities," *Conference on Lasers and Electro-Optics*, OSA Technical Digest, 2010.
11. W. P. Putnam, G. Abram, E. L. Falcão-Filho, **J. R. Birge**, and F. X. Kärtner, "High-Intensity Bessel-Gauss Beam Enhancement Cavities," *Conference on Lasers and Electro-Optics*, OSA Technical Digest, 2010.
12. G. Chang, A. J. Benedick, **J. R. Birge**, A. Glenday, C. Li, D. F. Phillips, R. L. Walsworth, and F. X. Kärtner, "Tunable Blue Astro-Comb," *Conference on Lasers and Electro-Optics*, OSA Technical Digest, 2010.
13. D. Li, U. Demirbas, **J. R. Birge**, G. S. Petrich, L. A. Kolodziejski, A. Sennaroglu, F. X. Kärtner, and J. G. Fujimoto, "Diode-Pumped Gigahertz Repetition Rate Femtosecond Cr:LiSAF Laser" *Conference on Lasers and Electro-Optics*, OSA Technical Digest, 2010.
14. U. Demirbas, G. S. Petrich, S. Nabanja, **J. R. Birge**, L. A. Kolodziejski, F. X. Kärtner, and J. G. Fujimoto, "Widely-Tunable Femtosecond Operation of Cr:LiSAF Lasers Using Broadband Saturable Bragg Reflectors," *Conference on Lasers and Electro-Optics*, 2010.
15. **J. R. Birge**, F. X. Kärtner, "Design of Optimal Dispersive Mirrors for Femtosecond Enhancement Cavities and Compressors by Minimizing Phase Distortion Power," *Conf. on Lasers and Electro-Optics*, Baltimore, 2009.
16. J. Moses, O. D. Mucke, S. Huang, A. Benedick, E. Falcao-Filho, K. Hong, A. Siddiqui, **J. R. Birge**, F. Ilday, F. X. Kärtner, "Optimized 2-micron optical parametric chirped pulse amplifier for high harmonic generation," *Ultrafast Phenomena XVI*, Springer, 2008.

17. M. Y. Sander, H. M. Crespo, **J. R. Birge**, F. X. Kärtner, "Modeling of octave-spanning sub-two-cycle Titanium:sapphire lasers: simulation and experiment," *Ultrafast Phenomena XVI*, Springer, 2008.
18. (\*) S. J. Spector, T. M. Lyszczarz, M. W. Geis, D. M. Lennon, J. U. Yoon, M. E. Grein, R. T. Schulein, R. Amataya, **J. Birge**, J. Chen, H. Byun, F. Gan, C. W. Holzwarth, J. L. Hoyt, E. P. Ippen, F. X. Kärtner, A. Khilo, O. O. Olubuyide, J. S. Orcutt, M. Park, M. Perrott, M. A. Popović, T. Barwicz, M. Dahlem, R. J. Ram, and H. I. Smith, "Integrated Optical Components in Silicon for High Speed Analog-to-Digital Conversion," SPIE Proceedings Photonics West, San Jose, 2008.
19. **J. R. Birge**, H. Crespo, F. X. Kärtner, "Non-intrusive sub-two-cycle carrier-envelope stabilized pulses using engineered chirped mirrors," Conf. on Lasers and Electro-Optics, San Jose, 2008.
20. J. Moses, O. Mucke, A. Benedick, E. Falcao-Filho, S. Huang, K. Hong, A. Siddique, **J. R. Birge**, F. Ilday, F. X. Kärtner, "2-micron optical parametric chirped pulse amplifier for long-wavelength driven high harmonic generation," Conf. on Lasers and Electro-Optics, San Jose, 2008.
21. A. Khilo, **J. R. Birge**, F. X. Kärtner, "Adaptive error compensation for photonic analog-to-digital converters," Conf. on Lasers and Electro-Optics, San Jose, 2008.
22. (\*) F. X. Kaertner and **J. Birge**, "Two-Dimensional Spectral Shearing Interferometry (2DSI) of Few-Cycle Laser Pulses," in *Frontiers in Optics*, OSA Technical Digest, 2007.
23. **J. R. Birge**, F. X. Kärtner, "A preconditioned Newton-Krylov method for computing stationary pulse solutions of mode-locked lasers," Conf. on Lasers and Electro-Optics, Baltimore, 2007.
24. Benedick, **J. R. Birge**, R. Ell, O. D. Mücke, M. Sander, F. X. Kärtner, "Octave Spanning 1GHz Ti:Sapphire Oscillator For HeNe CH<sub>4</sub> Based Frequency Combs and Clocks," CLEO Europe, Munich, Germany, June 18-22, 2007.
25. (\*) S. J. Spector, T. M. Lyszczarz, M. W. Geis, D. M. Lennon, J. U. Yoon, M. E. Grein, R. T. Schulein, R. Amataya, **J. Birge**, J. Chen, H. Byun, F. Gan, C. W. Holzwarth, J. L. Hoyt, E. P. Ippen, F. X. Kärtner, A. Khilo, O. O. Olubuyide, J. S. Orcutt, M. Park, M. Perrott, M. A. Popović, T. Barwicz, M. Dahlem, R. J. Ram, and H. I. Smith, "Integrated Optical Components in Silicon for High Speed Analog-to-Digital Conversion," SPIE Proceedings Photonics West, San Jose, Jan. 21-26, 2007.
26. (\*) F. X. Kärtner, A. Benedick, R. Ell, O. Mucke, **J. Birge**, M. Sander, "Octave-spanning lasers and carrier-envelope phase control," Conference on Advanced Solid-State Photonics (ASSP), Vancouver, 2007.
27. (\*) F. X. Kaertner, A. Benedick, **J. Birge**, and M. Sander, "Carrier-Envelope Phase Controlled Ultrashort Light Pulses for Nonlinear Optics," in *Nonlinear Optics: Materials, Fundamentals and Applications*, OSA Technical Digest, 2007.
28. **J. R. Birge**, R. Ell, F. X. Kärtner, "Two-dimensional spectral shearing interferometry (2DSI) for ultrafast laser optimization," *Ultrafast Phenomena XV*, Springer, 2006.
29. R. Ell, **J. R. Birge**, F. X. Kärtner, "Carrier-envelope phase control by a composite glass plate," CLEO, 2006.
30. **J. R. Birge**, R. Ell, F. X. Kärtner, "Two-dimensional spectral shearing interferometry (2DSI) for ultrashort pulse characterization," CLEO, 2006.
31. O. D. Mucke, R. Ell, A. Winter, J. Kim, **J. R. Birge**, L. Matos, F. X. Kärtner, "Self-Referenced 200 MHz Octave-Spanning Ti:Sapphire Laser With 0.10 Radian Carrier-Envelope Phase Error," ESA International Workshop on Optical Clocks, 2005.
32. **J. Birge**, C. Jirauschek, F. Kaertner, "Efficient Analytic Computation of Group Delay Dispersion from Optical Interference Coatings," Proc. OSA OIC Top. Mtg., Tucson, 2004.
33. G. Sharp, J. Chen, M. Robinson, **J. Birge**, "Skew Ray Compensated Retarder-Stack Filters for LCOS Projection," SID Symposium, Vol. 33, 2002.
34. G. Sharp, **J. Birge**, J. Chen and M. Robinson. "High Throughput Color Switch for Sequential Color Projection," SID Symposium, Vol. 31, 2000.
35. M. Robinson, J. Korah, G. Sharp and **J. Birge**. "High Contrast Color Splitting Architecture Using Color Polarization Filters," SID Symposium, Vol. 31, 2000.
36. G. Sharp and **J. Birge**. "Retarder Stack Technology for Color Manipulation," SID Symposium, Vol. 30, 1999.
37. E. Cheever, **J. Birge**, D. Thomson, W. Santamore and D. George. "A Microprocessor-Based Multi-Channel Muscle Stimulator for Skeletal Muscle Cardiac Assist," Proc. IEEE EMBS 17<sup>th</sup> Annual Conf. & 21<sup>st</sup> Can. Med. & Biol. Eng., Montreal, Canada, 1995.