

CURRICULUM VITAE

Timothy D. Scarborough

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EDUCATION

Ph. D.	University of Nebraska – Lincoln , AMOP Physics, 05/2012 Dissertation advisor: Prof. Cornelis Uiterwaal
M. S.	University of Nebraska – Lincoln , AMOP Physics, 12/2009
B. S.	University of Nebraska – Lincoln , Physics and Astronomy, 12/2006

APPOINTMENTS

09/2015 – present	Post Doctoral Researcher , Prof. Louis DiMauro, The Ohio State University Investigation of attosecond-scale charge migration dynamics in complex molecules using high harmonic spectroscopy
08/2012 – 07/2015	Postdoctoral Research Scholar , Prof. Ahmed Zewail (Nobel Prize 1999), Caltech Studying dynamic laser-induced surface charge transients with scanning ultrafast electron microscopy.
05/2012 – 07/2012	Postdoctoral Research Associate , Prof. Cornelis Uiterwaal, UNL Implementation and characterization of UV-IR ultrafast optical parametric amplifier (OPA) laser.
01/2007 – 05/2012	Graduate Research Assistant , Prof. Cornelis Uiterwaal, UNL Investigation of femtosecond-scale ionization and fragmentation dynamics of organic molecules.
01/2007 – 05/2010	Graduate Teaching Assistant , Dept. of Physics, UNL Taught undergraduate physics labs and mentored graduate students in preparation for teaching.

HONORS, AWARDS AND SERVICE

2016	Referee to Physical Review Letters	
2015	Public outreach: "Research science with lasers," Geneva NE Rotary Club	
2013	Public outreach: "Why science and math matter," Fillmore Central High School	
2011	Referee to <i>AIP Advances</i>	
2010-2011	Student representative to the Graduate Recruitment Committee	
2009-2010	Graduate Assistance in Areas of National Need (GAANN) Fellowship	\$19k
2008-2009	"Inside a Focused Laser Beam: Molecular Dynamics" NSF supplement	\$30k
2007-2008	GAANN Fellowship	\$19k
2005-2006	"Inside a Focused Laser Beam: Molecular Dynamics" NSF-REU	\$5k
2002-2006	University of Nebraska Regents Scholarship,	\$18k
2002-2006	University of Nebraska Honors Program Book Scholarship,	\$3k
2002-2006	Stowell Fund Physics Scholarship,	\$4k
2002-2005	Eastman Memorial Mathematics Scholarship,	\$2500
2003	U. S. and Doris Harkson Scholarship,	\$500
2002	Jaswal Scholarship Fund,	\$700

TEACHING AND MENTORING

Teaching

1. PHYS222, laboratory, calculus-based introduction to electromagnetism
3 sections: Fall 2007, Spring 2008 (2)
2. PHYS142, laboratory, algebra-based introduction to electromagnetism
6 sections: Spring 2007 (2), Summer 2007, Fall 2007, Summer 2008, Summer 2009
3. Laboratory Mentoring for PHYS222 (supervising fellow graduate students prior to them teaching, enrollment 2-5)
2 semesters: Fall 2008, Fall 2009
4. Laboratory Mentoring for PHYS142 (supervising fellow graduate students prior to them teaching, enrollment 2-5)
4 semesters: Fall 2008, Spring 2009, Fall 2009, Spring 2010

Mentoring

Helped guide the research efforts of three undergraduate research students and three REU students in the research group of Prof. Cornelis Uiterwaal. Guided students in experimental work, programming, computational analysis and construction of experiments. Research performed by students has resulted in multiple refereed publications and the completion of a University Honors Program thesis project. In the Agostini-DiMauro Group, currently mentoring a graduate student on a joint project which is expected to produce multiple publications and form the basis of a dissertation in 2018.

PUBLICATIONS IN REFEREED JOURNALS

Previously published materials

12. P. Sándor, A. Sissay, F. Mauger, P. M. Abanador, T.T. Gorman, T.D. Scarborough, M. B. Gaarde, K. Lopata, K.J. Schafer, and R.R. Jones, "Angle-dependence of strong-field single and double ionization of carbonyl sulfide," (accepted to *Phys. Rev. A*).
11. T. D. Scarborough, T. T. Gorman, F. Mauger, M. Gaarde, K. Schafer, P. Agostini, and L. F. DiMauro, "Full characterization of a molecular Cooper minimum through high harmonic spectroscopy," *Appl. Sci.* **8**(7), 1129 (2018).
10. E. Najafi, B. Liao, T. D. Scarborough, and A. H. Zewail, "Imaging Surface Acoustic Wave Dynamics in Semiconducting Polymers by Scanning Ultrafast Electron Microscopy," *Ultramicroscopy* **184**, 46 (2018).
9. J. Beck, C. J. McAcy, T. D. Scarborough, C. J. G. J. Uiterwaal, "Intense-Field Photoionization of Molecules using Ultrashort Radiation Pulses: REMPI in Toluene, Aniline, Phenol, and Fluorobenzene" *J. Phys.: Conference Series* **875** (2017).
8. E. Najafi, T. D. Scarborough, J. Tang, and A. H. Zewail, "Four-dimensional imaging of carrier interface dynamics in p-n junctions," *Science* **347**, 164 (2015).
7. T. D. Scarborough, J. Strohaber, D. B. Foote, C. J. McAcy, and C. J. G. J. Uiterwaal, "Intense-Field Ionization of Monoaromatic Hydrocarbons using Radiation Pulses of Ultrashort Duration: Monohalobenzenes and Azabenzenes," *J. Phys.: Conference Series* **488**, 032033 (2014).
6. T. D. Scarborough and C. J. G. J. Uiterwaal, "Simulating the focal volume effect: a quantitative analysis," *Laser Phys.* **23**(12), 125302 (2013).
5. D. B. Foote, T. D. Scarborough, and C. J. G. J. Uiterwaal, "Observation and identification of metastable excited states in ultrafast laser-ionized pyridine," *J. Am. Soc. Mass Spec.* **23**(5), 834 (2012).
4. T. D. Scarborough, D. B. Foote, and C. J. G. J. Uiterwaal, "Ultrafast resonance-enhanced multiphoton ionization in the azabenzenes: pyridine, pyridazine, pyrimidine, and pyrazine," *J. Chem. Phys.* **136**, 154309 (2012).
3. T. D. Scarborough, J. Strohaber, D. B. Foote, C. J. McAcy, and C. J. G. J. Uiterwaal, "Ultrafast REMPI in benzene and the monohalobenzenes without the focal volume effect," *Phys. Chem. Chem. Phys.* **13**, 13783 (2011).
2. T. D. Scarborough, C. Petersen, and C. J. G. J. Uiterwaal, "Measurement of the GVD of water and methanol and laser pulse characterization using direct imaging methods," *New J. Phys.* **10**(10), 103011 (2008).
1. J. Strohaber, T. D. Scarborough, and C. J. G. J. Uiterwaal, "Ultrashort intense-field optical vortices produced with laser-etched mirrors," *Appl. Opt.* **46**(36), 8583 (2007).

PRESENTATIONS AND TALKS

Invited Lectures

2014 May	Caltech Center for Ultrafast Science and Technology Seminar, "Ultrafast silicon pn junction dynamics on surfaces: control using bias voltage"
2013 May	Caltech Center for Ultrafast Science and Technology Seminar, "Progress in attosecond science"
2012 May	The Ohio State University AMO Physics Seminar, "Photoionization and photofragmentation of substituted organic molecules"
2012 April	UNL Physics Colloquium and Dissertation Defense, "Photoionization and photofragmentation of substituted organic molecules"
2011 December	UNL Physics Colloquium, "Intense-field Photodynamics of Astatine-substituted Organic Molecules"
2011 January	UNL AMOP Physics Seminar, "Intense-field dynamics of substituted benzene derivatives"
2010 November	Texas Lutheran University Physics Colloquium, "Laser-driven excitation and ionization of aromatic molecules"

Conference Presentations

6. C. McAcy, J. Beck, T. D. Scarborough, and C. J. G. J. Uiterwaal, "Ultrafast photoionization of toluene and the di- and trimethylbenzene isomers: the effects of orbital symmetry on intense-field stability," *DAMOP 2013, Quebec City, Canada, 5 June 2013*.
5. T. D. Scarborough, C. J. McAcy, D. B. Foote, and C. J. G. J. Uiterwaal, "Intense-field Ionization and Fragmentation of Heterocyclic Organic Molecules: the Azabenzenes," *DAMOP 2012, Orange County, CA, USA, 8 June 2012*.
4. T. D. Scarborough, D. B. Foote, and C. J. G. J. Uiterwaal, "Effects of Symmetry on Intense-field Ionization of Heterocyclic Organic Molecules," *2012 March Meeting of the APS Division of Chemical Physics, Boston, MA, USA, 27 February 2012*.
3. T. D. Scarborough, D. B. Foote, and C. J. G. J. Uiterwaal, "Intense-field Dynamics of Substituted Benzene Derivatives: the Azabenzenes," *2011 WildCorn Conference (joint meeting of UNL and Kansas State University), Lincoln, NE, USA, 15 October 2011*.
2. T. D. Scarborough, J. Strohaber, D. B. Foote, C. J. McAcy, and C. J. G. J. Uiterwaal, "Resonant photodissociation in substituted benzenes," *DAMOP 2011, Atlanta, GA, USA, 16 June 2011*.
1. T. D. Scarborough, D. B. Foote, J. Strohaber, and C. J. G. J. Uiterwaal, "Resonance-enhanced multiphoton ionization of benzene-like molecules in focused femtosecond radiation with three-dimensional spatial resolution," *DAMOP 2009, Charlottesville, VA, USA, 23 May 2009*.

Conference Posters

6. T. D. Scarborough, T. T. Gorman, P. Agostini, L. F. DiMauro, “Attosecond Delays in Aligned and Antialigned Molecules,” *Erice Attosecond School, Erice, Sicily, Italy, 20 March 2017*.
5. T. T. Gorman, T. D. Scarborough, D. Kiewewetter, P. Agostini, L. F. DiMauro, “Attosecond Photoionization Delays around Autoionizing Resonances in Argon using Tunable Mid-infrared Drivers,” *Erice Attosecond School, Erice, Sicily, Italy, 20 March 2017*.
4. J. Beck, C. J. McAcy, S. Marsh, R. Karnemaat, T. D. Scarborough, and C. J. G. J. Uiterwaal, “Characterization of Focused Ultrashort Pulses as a Function of Wavelength,” *DAMOP 2013, Quebec City, Canada*.
3. D. B. Foote, T. D. Scarborough, and C. J. G. J. Uiterwaal, “Intense-field ionization of heterocyclic organic molecules: fragmentation and metastable states,” *2012 APS March Meeting, Boston, MA, USA*.
2. T. D. Scarborough, J. Strohaber, D. B. Foote, and C. J. G. J. Uiterwaal, “Intense-Field Ionization of Cyclic Hydrocarbon Molecules Measured with Spatial Resolution of Focal Ion Distributions,” *2nd International Conference on Attosecond Physics (ATTO 2009), Manhattan, KS, USA*.
1. T. D. Scarborough, J. Strohaber, C. Petersen, and C. J. G. J. Uiterwaal, “Measuring the GVD of Transparent Solvents and Creation of Laser-Etched Holographic Mirrors,” *DAMOP 2008, State College, PA, USA*.

ADDITIONAL SKILLS

Laboratory Experience

- Thorough experience in alignment, calibration, maintenance and repair of a variety of ultrafast optical systems
- Maintaining and modifying ultrahigh vacuum equipment
- Automation and motorized control of equipment
- High harmonic generation and high harmonic spectroscopy
- Scanning electron microscopy (both standard and ultrafast)
- Ion mass spectrometry

Programming and Software

Proficient: MATLAB, NI LabVIEW, Maple, OriginPro,

Capable: POV-Ray, Mathematica, Gaussian, IDL, Python