

# Curriculum Vitae of John Nicholas Yukich

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## Education

- [University of Virginia](#), experimental atomic/molecular/optical physics. Ph.D. January 1996: “Electron Wave Packets and Ramsey Interference in a Magnetic Field”, Daniel J. Larson, advisor.
- [Kenyon College](#), physics and mathematics. B.A., Summa Cum Laude, May 1990.

## Teaching Experience

[Davidson College](#) (1998-2004) Assistant and (2004-present) Associate Professor of Physics:

- Taught general-education physics for non-science majors ([Physics 110](#))
- Taught algebra-based introductory physics ([Physics 120](#) and [Physics 220](#))
- Taught calculus-based introductory physics ([Physics 230](#))
- Taught computer-based laboratory courses ([Physics 120/130](#) and [Physics 220/230](#))
- Taught upper-level electronics for physics majors ([Physics 310](#))
- Taught upper-level electricity and magnetism for majors ([Physics 350](#))
- Taught upper-level Optics and Lasers for majors ([Physics 415](#))
- Employ a variety of teaching methods, including live demonstrations, [Physlets](#), peer instruction, in-class exercises, and traditional lecture.
- Developed new hands-on laboratory exercises for *The Physics Around You* ([Physics 110](#))
- Developed all new laboratory curricula for *Electronics and Instrumentation*, ([Physics 310](#)) making extensive use of PSpice (state-of-the-art professional circuit simulation software) and some use of LabVIEW (instrumentation interface software).

[University of Michigan](#) (1995-1998):

- Delivered a series of public multimedia lectures on atomic physics: “Atoms in a New Light” (Fall 1997), part of the [Saturday Morning Physics](#) program, drew audiences over 300 from southeast Michigan.
- Guest-lectured for a graduate atomic physics course, Fall 1996.

[University of Virginia](#) (1990-1995):

- Instructed over 380 engineering and pre-medical students and physics majors.
- Substitute lectured for a physics majors' course in modern physics.
- Supervised seven graduate laboratory teaching assistants.

## Research Experience

[University of Virginia](#) (Summer/Fall 2004): Visiting scientist in the [Ultrafast Laser/Atomic Physics Laboratory](#). Host: Professor Bob Jones.

[Davidson College](#) (1998-present):

- [Atomic, Molecular and Optical Physics](#) Engaged seven Davidson physics majors in studies of the dynamics of photodetachment from negative ions. Results presented at national research meetings and published in *Physical Review*. Work supported externally by Research Corporation, the Petroleum Research Fund, the MacArthur Foundation, the University of Virginia and the University of Michigan.
- [Biophysics](#) Engaged three Davidson CIS biophysics majors in studies of physical properties of unicellular green algae *Chlamydomonas* in collaboration with Dr. Karen Bernd. Results presented at national meetings and published in *Cell Motility and the Cytoskeleton*. Project supported by funds from the Duke Foundation, Howard Hughes Medical Institute, and Davidson College.

[University of Michigan](#) (1995 - 1998) Post-doctoral Research Fellow in the [Bucksbaum Laboratory](#): Directed new research program in molecular physics. Designed, constructed, and tested free-jet molecular beam apparatus. Initiated first study of Rydberg wavepackets in sodium dimmers.

[University of Virginia](#) (1990-1995) Graduate Research Assistant: Designed and initiated novel laboratory research program in fundamental atomic and optical physics. Designed, constructed, and maintained experimental apparatus. Acquired and analyzed data in three experiments in photodetachment from negative ions.

## Grants, Awards and Honors

- National Science Foundation Research Opportunity Award, \$15,000, for sabbatical research in atomic physics at University of Virginia, 2004.
- Grant from American Chemical Society Petroleum Research Fund: *Motional Stark Effect on Photodetachment from Trapped Negative Ions* \$35,000, plus \$11,000 matching funds from Davidson College, awarded 2002.
- Grant from Research Corporation: *Photodetachment Dynamics in Electric and Magnetic Fields* \$35,000, plus \$6,000 matching funds from Davidson College, awarded 2000.
- MacArthur Assistant Professor of Physics, Davidson College, August 1999 - August 2001.
- Equipment grant from University of Virginia, \$55,350.
- Equipment grant from University of Michigan, \$24,200.
- Sigma Pi Sigma, elected to membership by Hillsdale College Physics Department, 1998.
- Dean's Reserve Fellowship, 1990-1991, University of Virginia.
- Phi Beta Kappa (1989), Sigma Xi (1990), Kenyon College.

## Academic Outreach

- Member of Charlotte-Mecklenburg Schools Science Research Internship program committee, 2000.
- Science fair judge at Brawley Middle School and Southlake Christian Academy, 2000.
- Guest speaker at Statesville Christian School, 1999.
- Guest lecturer, Stuarts Draft High School, Stuarts Draft, VA, 1995.
- Judge, Piedmont Regional Science Fair, Charlottesville, VA, 1995.
- Host for over fifteen laboratory tours for elementary and secondary school students, Univ. of Virginia, 1993-1995.

## Leadership/Professional Service

### Davidson College:

- Physics Department: Faculty Advisor to Society of Physics Students (1998-present), departmental faculty search committees (1999, 2000, 2003), organizer for department research open house (February 2001), co-organizer of Dana Science Building renovation open house (with Karen Bernd, October 1999), academic advisor to physics majors (2000-present), session chair of North Carolina – American Association of Physics Teachers Spring Meeting (March 2001), organizer for departmental purchase and installation of \$110,000 Titanium-sapphire laser system (2001).
- Human Subjects/Institutional Review Board committee member, 1999-2003, committee vice-chair, 2002-2003.
- College representative member of Charlotte Area Science Network, January 2006 – present.
- Pre-Medical Advisory Committee, 2003-present.
- Committee on Campus and Religious Life, 2000-2003.
- Religious Life Council, 2002-present.
- Faculty advisor to Campus Outreach, 2000-present.
- Faculty advisor to YoungLife, 2005 – present.
- Advisor to first-year students, sophomores, and physics majors, 1999-present.
- Research advisor to James Wells '07, departmental honors in physics.
- Research advisor to Rachel McCord '04, Mona Shaban '08, and Catherine Clodfelter '09, Center for Interdisciplinary Studies biophysics majors.

### University of Michigan:

- Supervised research laboratory, including eight graduate and undergraduate students. Managed general business of the lab, including \$270,000 annual budget and student recruitment, December 1995 - July 1998.
- Local Organizing Committee, American Physical Society Division of AMO Physics meeting, Ann Arbor, MI, May 1996.

## Invited Talks

- “Detachment in External Fields”, University of Virginia atomic physics seminar, 12/6/04.
- “Optical Tweezers and Cell BioPhysics”, College of William and Mary Physics Department Colloquium, 11/19/04.
- “Photodetachment in External Fields: When Negative Ions See the Light”, College of William and Mary atomic physics seminar, 11/19/04.
- “Optical Tweezers: Shining Laser Physics on Cell Biology”, North Carolina Academy of Sciences Research Workshop keynote address, Sigma Xi, Research Triangle Park, 11/6/04.

The following invited talks have all been given on the experimental physics of negative ions: Appalachian State University (2002), Albion College (1998), Hillsdale College (1998), Randolph-Macon Women's College (1998), SUNY-Geneseo (1998), Davidson College (1998), Kenyon College (1997), Transylvania University (1997), Ohio Wesleyan University (1997), Otterbein College (1997), University of Michigan (1995, 1997), Naval Research Laboratory (1995).

## Talks/Presentations Given By Students from the AMO Laboratory

- “Photodetachment spectroscopy from the  $^2P_{1/2}$  state of the  $S^-$  ion,” **James E. Wells '07**, joint meeting of the Society of Physics Students and Southeastern Section of the American Physical Society, Williamsburg, VA, November 10, 2006. Awarded 2<sup>nd</sup>-place award for best student talk.
- “Improving optical trap calibration techniques for *Chlamydomonas* cells,” **Mona Shaban '08**, North Carolina Section of the American Association of Physics Teachers, Elon University, Elon, NC, September 30, 2006.

- “Photodetachment spectroscopy from the  $^2P_{1/2}$  state of the  $S^-$  ion,” **James E. Wells '07**, North Carolina Section of the American Association of Physics Teachers, Elon University, Elon, NC, September 30, 2006.
- “Photodetachment spectroscopy from cooled negative ions,” **James E. Wells '07**, North Carolina Academy of Sciences, Bennett College, Greensboro, NC, March 25, 2006
- “Photodetachment spectroscopy of evaporatively cooled negative ions,” **James E. Wells '07**, meeting of the Society of Physics Students/Southeastern Section of the American Physical Society, Gainesville, Florida, November 10-12, 2005
- “Using Optical Tweezers to Measure the Force Exerted by Original and Regenerated Flagella of *Chlamydomonas reinhardtii*,” **Rachel McCord '04**, NC Academy of Science Annual meeting, Catawba College, Salisbury, NC, 2004. Awarded First Place in oral presentation division.
- “Optical Tweezers and Biological Forces: Using a Laser Trap to Measure the Swimming Force Exerted by the Flagella of *Chlamydomonas reinhardtii*,” **Rachel McCord '04**, Biophysical Society Annual Meeting, Baltimore, MD, February, 2004.
- “Measured Zeeman Photodetachment Transition Strengths,” **Anders Langworthy '04**, Southeastern Section of the American Physical Society, Wilmington, NC, November 6, 2003.
- “The Design and Construction of Optical Tweezers to Measure Piconewton Scale Biological Forces,” **Rachel McCord '04**, Southeastern Section of the APS, November 6, 2003, won second place for Marsh White Award.
- “Evaporative Cooling in a Penning Ion Trap”, **Anders Langworthy '04**, 7<sup>th</sup> Annual Fall Meeting of the NCS-AAPT, UNC-Asheville, NC, November 2, 2002.
- “Photodetachment from Negative Ions”, **Anders Langworthy '04**, Davidson College Physics seminar, July 11, 2002.
- “Photodetachment from  $O^-$  in a Magnetic Field”, **Diana Pendergrast '02**, Davidson College Physics seminar, December 5, 2001.
- “Experimental Physics of Negative Ions”, **Phillip Stewart '01**, Davidson Summer Physics seminar series, July 11, 2000.
- “An optical wavemeter for atomic physics”, **Cabell Fisher '99**, Davidson Student Research Symposium, May 1999.

### Peer-Reviewed Publications

(Undergraduate student author names in bold print)

- **Rachel Patton McCord**, John N. Yukich and Karen K. Bernd, “Analysis of Force Generation During Flagellar Assembly Through Optical Trapping of Free-Swimming *Chlamydomonas reinhardtii*,” *Cell Motility and the Cytoskeleton*, **61**: 137-144 (2005).
- **A.K. Langworthy**, **D.M. Pendergrast** and J.N. Yukich, “Zeeman transition strengths in photodetachment from  $O^-$  and  $S^-$ ,” *Phys. Rev. A*, **69**, 025401 (2004).
- J.N. Yukich, T. Kramer, and C. Bracher, “Observed photodetachment in parallel electric and magnetic fields”, *Phys. Rev. A* **68**, 033412 (2003).
- **D.M. Pendergrast** and J.N. Yukich, “Observed Landau structure in photodetachment from  $O^-$ ”, *Phys. Rev. A* **67**, 062721 (2003).
- J.N. Yukich, C.T. Butler, and D.J. Larson, “Observation of Ramsey Interference in a One-Dimensional Continuum: Short-Pulse Photodetachment in a Magnetic Field”, *Phys. Rev. A* **55**, 3303 (1997).
- J.N. Yukich, C.T. Butler, and D.J. Larson, “Coherence in Photodetachment from Negative Ions in a One-Dimensional Continuum,” in *Laser Spectroscopy XII*, edited by M. Inguscio, M. Allegrini, A. Sasso, p. 189, World Scientific (1996).
- J.D. Rudmin, L.P. Ratliff, J.N. Yukich, and D.J. Larson, “Structure of the Photodetachment Cross Section in a Magnetic Field: An Experiment with  $OH^-$ ” *J. Phys. B*, **29**, L881 (1996).
- M.J. Jamieson, A. Dalgarno, and J.N. Yukich, “Elastic scattering of hydrogen atoms at low temperatures”, *Phys. Rev. A* **46**, 6956 (1992).

### Selected Conference Presentations

(Undergraduate student co-author names in bold print)

- “Photodetachment spectroscopy near the lowest threshold of the  $S^-$  ion,” John N. Yukich and **James E. Wells**, Southeastern Section of the American Physical Society, Williamsburg, VA, November 9, 2006.
- “Photodetachment spectroscopy of evaporatively cooled negative ions,” John N. Yukich, **James E. Wells** and Craig Butler, Division of Atomic, Molecular, and Optical Physics of the American Physical Society, Knoxville, TN, May 17, 2006.
- “Biophysical analysis of swimming force by *Chlamydomonas* flagella,” John N. Yukich, Karen K. Bernd, **Rachel Patton McCord**, meeting of the Southeastern Section of the American Physical Society, Gainesville, Florida, November 10-12, 2005.
- **R.P. McCord**, J.N. Yukich, K.K. Bernd, “Optical Trap Analysis Reveals *Chlamydomonas reinhardtii* Exhibit Complex Patterns of Swimming Force Increase During...,” 44<sup>th</sup> Annual Meeting of the American Society for Cell Biology, Washington, DC, December 4-8, 2004.
- J.N. Yukich, **A.K. Langworthy** and **D.M. Pendergrast**, “Zeeman transition strengths in photodetachment from negative ions,” OISE2003 Optical Society of America meeting, Nov. 2003.
- John N. Yukich, Tobias Kramer, Christian Bracher, “Photodetachment from  $S^-$  in Parallel Electric and Magnetic Fields,” Southeastern Section of the APS, Wilmington, NC, November 7, 2003.
- **D.M. Pendergrast** and J.N. Yukich, “Observed Landau structure in photodetachment from  $O^-$ ”, Bull. Amer. Phys. Soc. **47 #3**, May 2002.
- **D.M. Pendergrast** and J.N. Yukich, “Near-threshold photodetachment from  $O^-$  in a magnetic field,” meeting of the Southeastern Section of the American Physical Society, November 6, 2001.
- J.N. Yukich, “Photodetachment in Parallel Electric and Magnetic Fields,” Bulletin of the American Physical Society **46 #3**, p. 38 (May 2001).
- “Optical and NIR photodetachment spectroscopy in external fields,” J.N. Yukich, Charlotte chapter meeting of the Optical Society of America, March 15, 2001.
- J.N. Yukich, J.M. Caraher, S. Ruhman, P.H. Bucksbaum, “Creating and Observing Stroboscopic Molecular Wave Packets,” Proceedings of the International Quantum Electronics Conference (1998).
- J.M. Caraher, J.N. Yukich, B.J. Pearson, P.H. Bucksbaum, “Stroboscopic Wavepackets in  $Na_2$ ”, Proceedings of the International Conference on Atomic Physics (1998).
- J.N. Yukich, J.M. Caraher, **J.M. Dertouzos**, P.H. Bucksbaum, and R.J. Gordon, “Ramsey Interference of Stroboscopic Rydberg States of Diatomic Molecules”, Bull. Amer. Phys. Soc. **42**, May 1997.
- J. N. Yukich, R.J. Gordon, J.M. Caraher, P.H. Bucksbaum, “Evolution of entangled wave packets in diatomic molecules”, Conference of the Optical Society of America, October 1996.
- C.T. Butler, J.N. Yukich, D.J. Larson, “Observation of electron wave packet interference in a magnetic field”, Bull. Amer. Phys. Soc. **41**, May 1996.
- L.P. Ratliff, J.N. Yukich, J.D. Rudmin, and D.J. Larson, “Photodetachment from  $OH^-$  in a Magnetic Field”, Bull. Amer. Phys. Soc. **38 #3**, 1124 (May 1993).

### Web Publications

- “Atomic, Molecular and Optical Physics at Davidson”, August 2001. Web address: <http://webphysics.davidson.edu/faculty/jny/research/Researchpage.htm>

### Conference Attendance

- November 2006: Southeastern Section of the American Physical Society, Williamsburg, VA.
- May 2006: American Physical Society Division of Atomic, Molecular and Optical Physics, Knoxville, TN.
- March 2006: North Carolina Academy of Sciences, Bennett College, Greensboro, NC.
- November 2005: Southeastern Section of the American Physical Society, Gainesville, FL.
- November 2003: Southeastern Section of the American Physical Society, Wilmington, NC.
- November 2003: Optics in the Southeast meeting of the Optical Society of America, Orlando, FL.
- May 2002: American Physical Society Division of Atomic, Molecular and Optical Physics, Williamsburg, VA
- November 2001: Southeastern Section of the American Physical Society, Charlottesville, VA.
- May 2001: American Physical Society Division of Atomic, Molecular and Optical Physics, London, Ontario.
- March 2001: Charlotte chapter of the American Physics Society, Davidson, NC.
- September 2000: International Society for Optical Engineering/OPTO-Southeast Conference, Charlotte, NC.
- March 2000: North Carolina Section of the American Physical Society 5<sup>th</sup> Annual Spring Meeting, Davidson, NC.
- January 2000: Introduction to LabVIEW Programming seminar, Greensboro, NC.
- March 1999: Centennial Meeting of the American Physical Society, Atlanta GA.
- May 1997: American Physical Society Division of Atomic, Molecular and Optical Physics, Washington, DC.
- 1996: Optical Society of America, Rochester, NY.
- 1996: American Physical Society Division of Atomic, Molecular and Optical Physics, Ann Arbor, MI.
- 1995: American Physical Society Division of Atomic, Molecular and Optical Physics, Toronto, CA
- 1995: Optical Society of America, Portland, Oregon.
- 1995: Conference on Lasers and Electro-Optics, Baltimore, MD.
- 1994: American Physical Society Division of Atomic, Molecular and Optical Physics, Crystal City, VA.
- 1993: American Physical Society Division of Atomic, Molecular and Optical Physics, Reno, NV.
- 1992: American Physical Society Division of Atomic, Molecular and Optical Physics, Chicago, IL.

### Technical Background/Experimental Skills

- Argon ion lasers, ring and standing-wave single-mode dye lasers, Ti:sapphire ultra-fast lasers, optical parametric amplifiers, related electro-optics, chirped-pulse amplifiers, Hansch-style dye lasers, YAG lasers, single-mode tunable diode lasers, MOPA lasers, diode-pumped solid-state lasers.
- Design and construction of optical/laser tweezers, applications in cell biology.
- Frequency doubling and autocorrelation techniques, optical spectroscopy.
- Short-pulse and cw optical interferometry, including wavelength measurement to  $0.02 \text{ cm}^{-1}$ .
- Ultra-high and high vacuum systems, cryogenics, Penning ion traps, free-jet molecular beams.
- Heterodyne detection systems, phase-locked-loop frequency synthesis, radio frequency amplification and transmission, micro-channel plate detectors, machine-shop experience.
- FORTRAN, FORTH, Pascal, LabVIEW, Mathematica, PSpice, data acquisition, analysis and curve fitting, computer interfacing, IBM-PC and IBM-RISC workstations, LaTeX, DOS, VMS, and UNIX operating systems.