

CURRICULUM VITAE

DOUGLAS TODD PETKIE

CONTACT INFORMATION

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EDUCATION

Doctor of Philosophy in Physics, August 1996.

The Ohio State University, Columbus, Ohio.

Thesis Title: *Millimeter and Submillimeter Wavelength Studies of Atmospheric Molecules*

Thesis Advisor: Frank C. De Lucia

Bachelor of Science in Physics, May 1990.

Carnegie Mellon University, Pittsburgh, Pennsylvania.

EXPERIENCE

Assistant Professor of Physics, September 2002 – present.

Wright State University, Department of Physics, Dayton, Ohio.

Visiting Assistant Professor/Scholar, Summers of 1997, 1999-04.

The Ohio State University, Microwave Laboratory, Department of Physics, Columbus, Ohio.

Assistant Professor of Physics, September 1998 – May 2002.

Ohio Northern University, Department of Physics and Astronomy, Ada, Ohio.

NASA/ASEE Summer Faculty Fellowship, Summer 1998.

Caltech/Jet Propulsion Laboratory, Molecular Spectroscopy Team, Pasadena, California.

Assistant Professor of Physics, September 1996 – May 1998.

Bluffton College, Science Department, Bluffton, Ohio.

Graduate Research Associate, September 1992 – August 1996.

The Ohio State University, Department of Physics, Columbus, Ohio.

Graduate Teaching Assistant, September 1990 - August 1992.

The Ohio State University, Department of Physics, Columbus, Ohio.

RESEARCH INTERESTS AND SPECIALTIES

- Laboratory spectroscopy of atmospheric and interstellar related molecules; Atmospheric physics and chemistry and laboratory astrophysics.
- Vibration-rotation analysis of molecular energy levels to model and predict experimentally observed spectra and analyze fundamental molecular interactions.
- Remote and in-situ sensing; Molecular recognition of gases.
- Microwave, millimeter-wave, submillimeter-wave and terahertz technology development.
- Terahertz imaging.

AWARDS AND GRANTS

National Science Foundation, March 2004 – March 2007, \$249,391.

REU/ASSURE Site in Physics at WSU and WPAFB

DARPA, Microsystems Technology Office, May 2004 – August 2005, \$1,190K.

Terahertz Imaging Focal-Plane Technology Program

Terahertz Imaging Model for Concealed Weapon Identification

Co-Investigator with Frank De Lucia at Ohio State University in collaboration with the U.S. Army Night Vision and Electronic Sensors Directorate

DARPA, Microsystems Technology Office, May 2004 – April 2005, \$75,000.

DARPA Seedling Grant

Terahertz Technology and Molecular Interactions

Co-Principle Investigator with Frank De Lucia at Ohio State University in equal collaboration with Nomadics (Stillwater, OK company)

Ohio Board of Regents, January 2004 – May 2005, \$201,877.

Mathematics & Physical Science Professional Development Project for Grades 7-11 Teachers

Co-Principle Investigator with Beth Basista

Ohio Board of Regents, March 2003 – May 2004, \$97,607.

Algebra and Physical Science Professional Development Project

Co-Principle Investigator with Beth Basista

Smart Transitions, Inc., January – May 2003, \$8,464.

Terahertz Spectroscopy Demonstration for the Detection and Quantification of Molecular Gases

Subcontract through Ohio State University.

Smart Transitions, Inc., January – May 2003, \$5,236.

Terahertz Spectroscopy Demonstration for the Detection and Quantification of Molecular Gases

Scientific consultant through Ohio State University.

National Aeronautics and Space Administration, February – August 2003, \$13,650.

Spectroscopic Analysis of Atmospheric Molecules

Scientific consultant on a research grant through Ohio State University.

DARPA, Microsystems Technology Office, April 2000 – December 2003, \$300,000.

Terahertz Technology Sensing and Satellite Communications Program

Terahertz Technology and Molecular Interactions

Co-Principle Investigator with Frank De Lucia at Ohio State University

ONU Undergraduate Faculty Development Grant, Summer 2001, \$1,500.

Molecular Spectroscopy of Nitric Acid

Ohio Northern University, Ada, Ohio.

ONU Undergraduate Faculty Development Grant, Summer 2000, \$1,500.

Designing Laboratory Instrumentation and Experiments for Physics Courses
Ohio Northern University, Ada, Ohio.

NASA/ASEE Summer Faculty Fellowship, Summer 1998, \$10,000.

Molecular Spectroscopy of Atmospheric and Interstellar Molecules
Caltech/Jet Propulsion Laboratory, Molecular Spectroscopy Team, Pasadena, California.

FACULTY DEVELOPMENT

Interdisciplinary Workshop:

Math across the Curriculum Workshop, Indiana University, July 9-10, 1999.

NSF Chautauqua Short Courses:

The Polar Regions: Role in Global Change Studies, Columbus, Ohio, June 23-26, 1997.

Teaching Introductory Astronomy, Green Bank, West Virginia, May 22-24, 1997.

COURSES TAUGHT

Integrated Laboratory Science: Physics
Physics for Liberal Art Students
Algebra-based Introductory Physics Sequence
Calculus-based Introductory Physics Sequence
Introductory Physics Laboratories
Analytical Mechanics I and II
Intermediate/Applied Optics with Laboratory
Modern Physics with Laboratory
Electronics with Laboratory

Introduction to Sensors with Lab
Health Physics
Advanced Physics Laboratory
Independent Study in Physics
Freshman Seminar/Advising Program
Organizational Management Program:
 Research and Statistical Methods
 Independent Research
Cross Cultural Experience

PROFESSIONAL SOCIETIES AND ACTIVITIES

American Physical Society
American Association of Physics Teachers
Council on Undergraduate Research
Sigma Xi, The Scientific Research Society
Sigma Pi Sigma National Honorary Society

GRADUATE AND UNDERGRADUTE STUDENT ADVISEES

M.S. Physics Thesis Advisor

Greg Pitz, "Singlet Oxygen Kinetics in and around a Double Microwave Discharge", 2004.

M.S.T. Committee Member

Kathleen Bledsoe, "Science Is not a Spectator Sport", 2004.

Senior Projects

Change Madison, "Computer Analysis of Diffraction Patterns and of Gaussian Laser Beam Profiles", 2004

PUBLICATIONS AND PRESENTATIONS

Refereed Journals

D. T. Petkie, I. Medvedev, M. Behnke, P. A. Helminger, and F. C. De Lucia, "The Rotational Spectra of the $7^1_9^1$, $6^1_9^1$ and 7^2 Vibrational States of Nitric Acid," *Journal of Molecular Spectroscopy*, in preparation.

E. Ye, R. P. A. Bettens, S. Albert, F. C. De Lucia, D. T. Petkie, "Millimeter and Submillimeter Wave Rotational Spectrum of Pyridine in the Ground and Excited Vibrational States," *Journal of Molecular Spectroscopy*, submitted.

S. L. Widicus-Weaver, R. A. Bulter, B. J. Drouin, D. T. Petkie, K. A. Dyl, F. C. De Lucia, & G. A. Blake "Millimeter-wave and Vibrational State Assignments for the Rotational Spectrum of Glycoaldehyde," 2005, *Astrophysical Journal. Supplement series*, in press.

D. T. Petkie, P. A. Helminger, B. P. Winnewisser, M. Winnewisser, K. W. Jucks, and F. C. De Lucia, "The Simulation of Infrared Bands from the Analyses of Rotational Spectra: The 22μ Bands $2\nu_9$ - ν_9 and ν_5 - ν_9 of HNO_3 ," *Journal of Quantitative Spectroscopy and Radiative Transfer*, **92**(2), 129-141 (2005).

D. T. Petkie, R. A. H. Butler, P. A. Helminger and F. C. De Lucia, "Molecular Structure, Spectral Constants, and Fermi Resonances in Chlorine Nitrate," *Journal of Molecular Structure*, **695-6**, 287-293 (2004).

R. A. H. Butler, D. T. Petkie, P. A. Helminger, and F. C. De Lucia, "The Millimeter-wave Spectrum of Chlorine Nitrate (ClONO_2): The $3\nu_9$ and $\nu_7\nu_9$ Vibrational States," *Journal of Molecular Spectroscopy* **220**, 150-152 (2003).

D. T. Petkie, P. A. Helminger, R. A. H. Butler, S. Albert, and Frank C. De Lucia, "The Millimeter and Submillimeter Spectra of the Ground State and Excited ν_9 , ν_8 , ν_7 , and ν_6 Vibrational States of HNO_3 ," *Journal of Molecular Spectroscopy* **218**, 127-130 (2003).

-----The above articles have WSU as DTP's affiliation-----
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R. A. H. Butler, S. Albert, D. T. Petkie, P. A. Helminger, and Frank C. De Lucia, "The Millimeter-wave Spectrum of Chlorine Nitrate (ClONO_2): The $2\nu_9$ and ν_7 Vibrational States," *Journal of Molecular Spectroscopy* **213**, 8-14 (2002).

S. G. Chou[#], D. T. Petkie, R. A. H. Butler, and C. E. Miller, "Rotational Spectroscopy of DNO_3 ," *Journal of Molecular Spectroscopy* **211**, 284-285 (2002). [#] Undergraduate Students.

D. T. Petkie, T. M. Goyette, S. Albert, R. A. H. Butler, H. M. Pickett, P. A. Helminger, and Frank C. De Lucia, "The Energy Levels of the $2\nu_9/\nu_5$ Dyad of HNO_3 from Millimeter and Submillimeter Rotational Spectroscopy," *Journal of Molecular Spectroscopy* **208**, 121-135 (2001).

R. A. H. Butler, D. T. Petkie, H. Mollendal, A. Horn, F. C. De Lucia, E. Herbst, "The Millimeter- and Submillimeter-Wave Spectrum of Glycolaldehyde (CH_2OHCHO)," *Astrophysical Journal Supplement Series* **134**, 319-321 (2001).

D. T. Petkie, T. M. Goyette, P. A. Helminger, and Frank C. De Lucia, "Millimeter and Submillimeter-Wave Spectrum of Hydrogen Peroxide in the Ground and $\nu_3 = 1$ Vibrational States," *Journal of Molecular Spectroscopy* **192**, 25-31 (1998).

S. Albert, D. T. Petkie, R. Bettens, S. P. Belov and F.C. De Lucia, "A New Gas-Phase Analytical Tool", *Analytical Chemistry News and Features* **70**, No. 21, 719A – 721A (1998).

D. T. Petkie, T. M. Goyette, R. Bettens, S. P. Belov, S. Albert, P. Helminger and F. C. De Lucia, "A Fast Scan Submillimeter Spectroscopic Technique," *Review of Scientific Instruments*, **68**, 1675-1683 (1997).

T. M. Goyette, L. C. Oesterling, D. T. Petkie, Paul Helminger, and Frank C. De Lucia, "Rotational Spectrum of HNO₃ in the ν_5 and $2\nu_9$ Vibrational States," *Journal of Molecular Spectroscopy* **175**, 395-410 (1996).

D. T. Petkie, T. M. Goyette, J. Jerome Holton, Frank C. De Lucia, and Paul Helminger, "Millimeter/Submillimeter-Wave Spectrum of the First Excited Torsional State in HOOH", *Journal of Molecular Spectroscopy* **171**, 145-159 (1995).

Published Proceedings and Presentations

F.C. De Lucia and D. T. Petkie "THz gas sensing with submillimeter techniques," (Invited Paper) Proceedings of SPIE: Terahertz For Military And Security Applications III, **5790**, 528-535 (Orlando, FL, 28-29 March 2005).

F. C. De Lucia, D. T. Petkie, R. K. Shelton, S. L. Westcott, B. N. Strecker , "THz +'X': a search for new approaches to significant problems," Proceedings of SPIE: Terahertz For Military And Security Applications III, **5790** (Orlando, FL, 28-29 March 2005).

Eddie Jacobs, Ronald G. Driggers, Keith A. Krapels, Frank C. De Lucia, Douglas T. Petkie, "Terahertz imaging performance model for concealed weapon identification," Proceedings of SPIE: Passive Millimetre-Wave and Terahertz Imaging and Technology, **5619**, 98-107 (London, UK, 25-28 October 2004).

D. T. Petkie, P. A. Helminger, Ivan Medvedev, Markus Behnke and Frank C. De Lucia, "The Millimeter and Submillimeter-Wave Spectrum of Nitric Acid: The $7^1_9^1$, $6^1_9^1$, and 7^2 Excited Vibrational States," *59th Ohio State University International Symposium on Molecular Spectroscopy*, June 21-25, 2004, Columbus, Ohio.

D. T. Petkie, P. A. Helminger, H. Lichau and Frank C. De Lucia, "Rotational Spectroscopy of Peroxynitric Acid," *58th Ohio State University International Symposium on Molecular Spectroscopy*, June 16-20, 2003, Columbus, Ohio.

R. A. H. Butler, D. T. Petkie, P. A. Helminger and Frank C. De Lucia, "Perturbations, Mixings, and Spectral Constants as a Function of Vibrational State," *58th Ohio State University International Symposium on Molecular Spectroscopy*, June 16-20, 2003, Columbus, Ohio.

D. T. Petkie, P. A. Helminger, B. P. Winnewisser, M. Winnewisser, R.A.H. Butler, F. C. De Lucia, "Rotational Spectroscopy and Infrared Band Simulations of Nitric Acid and Chlorine Nitrate," *7th Biennial HITRAN Conference*, Harvard-Smithsonian Center for Astrophysics, June 12-14, 2002, Cambridge, Massachusetts.

D. T. Petkie, P. A. Helminger, B. P. Winnewisser, M. Winnewisser, and Frank C. De Lucia, "Simulation of the 22 μ Infrared Hot Bands of Nitric Acid from the Analyses of Rotational Spectra," *57th Ohio State University International Symposium on Molecular Spectroscopy*, June 17-21, 2002, Columbus, Ohio.

D. T. Petkie, P. A. Helminger, S. H. Young, R. A. H. Butler, and Frank C. De Lucia, "Recent Progress in the Rotational Spectroscopy of Nitric Acid," *57th Ohio State University International Symposium on Molecular Spectroscopy*, June 17-21, 2002, Columbus, Ohio.

-----The above proceedings and presentations have WSU as DTP's affiliation-----

R. A. H. Butler, M. Winnewisser, D. Petkie, P. A. Helminger, F. C. De Lucia, "The Rotation-Vibration Spectrum of ClONO₂," *57th Ohio State University International Symposium on Molecular Spectroscopy*, June 17-21, 2002, Columbus, Ohio.

M. Behnke, I. Medvedev, R. A. H. Butler, M. Winnewisser, D. T. Petkie, and F. C. De Lucia, "Extension and Enhancements to the Fast Scan Submillimeter Spectroscopy Technique (FASSST)," *57th Ohio State University International Symposium on Molecular Spectroscopy*, June 17-21, 2002, Columbus, Ohio.

R. A. H. Butler, U. Fuchs, I. Medvedev, F. C. De Lucia, E. Herbst D. T. Petkie, "The Millimeter- and Submillimeter-wave Spectra of Known and Likely Interstellar Molecules," *56th Ohio State University International Symposium on Molecular Spectroscopy*, June 11-15, 2001, Columbus, Ohio.

D. T. Petkie, J. L. Gottfried[#], J. L. Powell[#], "Millimeter-wave Rotational Spectra of Small Asymmetric Molecules," 109th Annual Meeting of the Ohio Academy of Science, April 1-2, 2000, Ohio Northern University, Ada, Ohio. [#] Undergraduate Students.

D. T. Petkie, T. M. Goyette, P. A. Helminger, and F.C. De Lucia, "The Rotational-Torsional Spectrum of Hydrogen Peroxide in the $v_3=1$ Vibrational State," *Joint APS/AAPT Meeting*, April 18-21, 1998, Columbus, Ohio.

D. T. Petkie, T. M. Goyette, P. A. Helminger, and F.C. De Lucia, "Fast Scan Backward Wave Oscillator Spectrometer," *51st Ohio State University International Symposium on Molecular Spectroscopy*, June 10-14, 1996, Columbus, Ohio.

T. M. Goyette, L. H. Coudert, L. C. Oesterling, D. T. Petkie, R. A. Booker, P. A. Helminger, And F.C. De Lucia, "Rotational Spectra Of The Excited Vibrational States Of Nitric Acid," *51st Ohio State University International Symposium on Molecular Spectroscopy*, June 10-14, 1996, Columbus, Ohio.

D. T. Petkie, T. M. Goyette and F.C. De Lucia, "Experimental Techniques Using Backward Wave Oscillators," *50th Ohio State University International Symposium on Molecular Spectroscopy*, June 12-16, 1995, Columbus, Ohio.

D. T. Petkie, T. M. Goyette, P. A. Helminger, and F.C. De Lucia, "The Millimeter and Submillimeter-wave Spectrum of the Torsional States of HOOH in the Ground, v_3 , and v_6 Vibrational States," *49th Ohio State University International Symposium on Molecular Spectroscopy*, June 13-17, 1994, Columbus, Ohio.

D. T. Petkie, T. M. Goyette, P. A. Helminger, and F.C. De Lucia, "The Millimeter and Submillimeter-wave Spectrum of the Torsional States of HOOH," *48th Ohio State University International Symposium on Molecular Spectroscopy*, June 14-18, 1993, Columbus, Ohio.

D. T. Petkie, T. M. Goyette, F.C. De Lucia and P.A. Helminger, "Microwave Spectroscopy of Hydrogen Peroxide," *Bull. Am. Phys. Soc.* **38**, 1162 (1993).

Unpublished Proceedings and Presentations***Colloquia and Seminars***

D. T. Petkie, *Atmospheric Spectroscopy*, Department of Biological Sciences seminar, Wright State University, February 26, 2003.

D. T. Petkie, *Terahertz Spectroscopy*, Electro-Optics and Physics Departments seminar, University of Dayton, April 16, 2003.

D. T. Petkie, *Millimeter and Submillimeter-wave Rotational Spectroscopy*, Department of Engineering Physics Colloquium, Air Force Institute of Technology, November 19, 2003.

Posters

D. T. Petkie, *Chemical Identification of Gases Using Terahertz Spectroscopy, Ecosystem Stressors Symposium*, Wright State University, May 15, 2003.

D. T. Petkie, J. L. Gottfried[#], J. L. Powell[#], "Millimeter-wave Rotational Spectra of Small Asymmetric Molecules," 109th Annual Meeting of the Ohio Academy of Science, April 1-2, 2000, Ohio Northern University, Ada, Ohio. [#] Undergraduate Students.