



STATE OF NORTH CAROLINA
COUNTY OF WAKE

IN THE GENERAL COURT OF JUSTICE
SUPERIOR COURT DIVISION
10-CVS-019930

BRIAN CECCARELLI,
individually and as class representative,

Plaintiffs,

v.

TOWN OF CARY

Defendant.

AFFIDAVIT OF ELIZABETH GEORGE

ELIZABETH GEORGE, being first duly sworn, deposes and says:

1. Based on my education, training, and work experience, I have knowledge of the facts hereinafter stated and am competent to testify as a sworn witness to the matters contained herein. I am over the age of 18 years.
2. I received a Ph.D. in Physics in 1993 from the University of Wisconsin – Madison.
3. I am currently employed by Wittenberg University as an Associate Professor and Chair of the Physics Department and have been with the university since 1998.
4. My Curriculum Vitae, including a list of publications, is attached to this Affidavit as Exhibit "A."
5. Based on my education and training in physics, I am qualified to testify regarding the dilemma zones created by the yellow light duration formula used by traffic engineers.
6. My conclusions are based on basic principles that I teach in my physics courses.
7. When a traffic light changes from green to yellow, a vehicle traveling at a given speed requires a certain distance to stop safely. If the vehicle is closer to the intersection than this critical distance, the driver cannot safely stop short of the intersection and has to continue through the intersection instead of stopping. When the yellow light duration is too short for a vehicle traveling at this speed to clear the intersection before the light turns red, a Type I dilemma zone is created, in which a driver cannot stop safely, but also cannot get through the intersection before the light turns red without speeding up.
8. When the yellow light duration is set to the ITE yellow light change interval based on a design speed lower than the speed limit, Type I dilemma zones are created for vehicles traveling between the design speed and the speed limit. Drivers in a dilemma zone do not have enough room to stop safely, and also do not have enough time to clear the intersection before the light turns red without speeding.
9. The eastbound Cary Towne Blvd. and Convention Drive intersection under the 1991

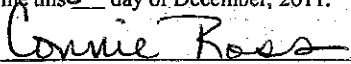
signal plan is an intersection with such a dilemma zone. With a yellow light duration of 4.0 seconds and a speed limit of 45 mph, a driver needs to be at least 293 feet from the intersection to perceive that the light has turned yellow and stop safely. Drivers closer than this distance must continue through the intersection, but at 45 mph a driver can travel only 264 feet in the 4.0 seconds that the light is yellow. (Standard NCDOT values for perception time and deceleration rate have been used in this calculation.) Thus, drivers traveling at the speed limit between 264 and 293 feet from the intersection at the instant the light turns yellow can neither stop safely nor reach the intersection at the speed limit before the light turns red. If drivers are required to completely clear the intersection before the light turns red, the dilemma zone is even larger.

10. When the yellow light duration in a turn lane is set to the ITE yellow light change interval based on the speed limit for vehicles traveling straight through, a similar Type I dilemma zone is created. Drivers in this zone are too close to the intersection to stop safely, but because they have to slow down below the speed limit in order to turn safely, the yellow light interval is not long enough to allow drivers to clear the intersection while making a turn before the light turns red.
11. Such a dilemma zone exists at the northbound Cary Parkway and Kildaire Farms intersection with the yellow light duration set to 3.0 seconds in the left turn lane. Drivers approaching at the speed limit of 45 mph who are closer than 293 feet from the intersection at the instant the light turns yellow cannot stop safely and must continue through the intersection, but even if they do not need to slow to make the turn they can travel only 198 ft at the speed limit before the light turns red. Slowing to make the turn makes the distance that can be traveled in 3.0 seconds even shorter than 198 feet, so there is a very large dilemma zone for drivers who plan to turn left at this intersection. Even for drivers who have already slowed to 30 mph when the light turns yellow there is still a dilemma zone in the region between 132 and 152 feet from the intersection.

This the 5th day of December, 2011.


Elizabeth George

STATE OF OHIO
COUNTY OF Clark
Sworn to and subscribed before
me this 5th day of December, 2011.

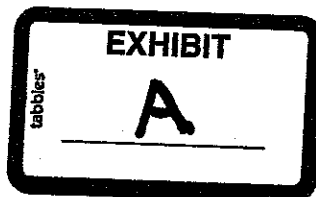


Notary Public

My Commission Expires: Connie S. Ross

Notary Public, State of Ohio
My Commission Expires 1/29/2016

11/23/2011; last update 11/22/11



Elizabeth A. George

Work:

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Springfield, OH 45504
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Education:

Ph.D. Physics, University of Wisconsin—Madison, 1993

Minor: Distributed (Mathematics and Computer Science)

Thesis: "A New Determination of the Asymptotic D -state to S -state Ratio of the ${}^3\text{H} \rightarrow n+d$ Cluster Wavefunction Using Sub-Coulomb (\vec{d}, t) Reactions"

Thesis advisor: Lynn Knutson

M.S. (Radiology [Medical Physics]) University of Colorado, 1986

Thesis: "Application of Fractal Geometry to the Evaluation of Lung Airway Morphology and Anatomy"

B.S. Physics, University of Arizona, 1983 (With Highest Distinction)

Minor: Mathematics

Professional experience:

2010- Interim Assistant Provost (part-time), Wittenberg University
2003- Chair, Physics Department, Wittenberg University
2002- Associate Professor, Wittenberg University
1998-2002 Assistant Professor, Wittenberg University
1995-8 Assistant Professor, University of Wisconsin—Whitewater
1993-5 Visiting Assistant Professor, Richard Stockton College of New Jersey
1987-93 Research Assistant, University of Wisconsin—Madison (Physics)
1986-7 Teaching Assistant, University of Wisconsin—Madison (Physics)
1982-4 (summers) Undergraduate Research Assistant, University of Missouri Research Reactor

Professional affiliations, offices held:

- American Physical Society
Secretary, Ohio-Region Section 2004-10
- American Association of Physics Teachers
Executive Committee, Southern Ohio Section, 2000-
- Project Kaleidoscope Faculty for the 21st Century, class of 1997
- Advanced Lab Physics Association (ALPhA)
Board member, 2011-

Academic honors and awards:

- Finalist, Sigma Xi Graduate Research Award, University of Wisconsin, 1993
- Phi Beta Kappa, elected 1982 (Alpha of Arizona)
- Outstanding Student, Faculty of Sciences, University of Arizona, 1983

Peer-reviewed publications:

"A superconducting beta spectrometer," L.D. Knutson, G.W. Severin, S.L. Cotter, L. Zhan, P.A. Voytas, and E.A. George, *Rev. Sci. Instrum.* **82**, 073302 (2011)

"The half-life of ^{66}Ga ," G.W. Severin, L.D. Knutson, P.A. Voytas, and E.A. George, Phys. Rev. C **82**, 067301 (2010)

"Scattering lengths for p - ^3He elastic scattering from an effective-range phase shift analysis," E.A. George and L.D. Knutson, Phys. Rev. C **67**, 027001 (2003)

"The A_y problem for p - ^3He elastic scattering," M. Viviani, A. Kievsky, S. Rosati, E.A. George, and L.D. Knutson, Phys. Rev. Lett. **86**, 3739 (2001)

"Determination of the $^6\text{Li} \rightarrow \alpha + d$ D - to S -state ratio by a restricted phase-shift analysis," E.A. George and L.D. Knutson, Phys. Rev. C **59**, 598 (1999)

"Cross section and analyzing powers for ^6Li - ^4He elastic scattering at 5.5 and 19.6 MeV," E.A. George, D.D. Pun Casavant, and L.D. Knutson, Phys. Rev. C **56**, 270 (1997)

"Measurement of the longitudinal analyzing power for noncoplanar p - d breakup," E.A. George, J. Frandy, M.K. Smith, Y. Zhou, L.D. Knutson, J. Golak, H. Witała, W. Glöckle, and D. Hüber, Phys. Rev. C **54**, 1523 (1996)

"New determination of the asymptotic D -state to S -state ratio of the triton using (\vec{d}, t) reactions at sub-Coulomb energies," E.A. George and L.D. Knutson, Phys. Rev. C **48**, 688 (1993)

"Neutron interferometric search for quaternions in quantum mechanics," H. Kaiser, E.A. George, and S.A. Werner, Phys. Rev. A **29**, 2276 (1984)

"Direct measurement of the longitudinal coherence length of a thermal neutron beam," H. Kaiser, S.A. Werner, and E.A. George, Phys. Rev. Lett. **50**, 560 (1983)

b) Peer-reviewed and invited publications in conference proceedings:

"Observing students' use of computer-based tools during collision experiments," Elizabeth A. George, Maan J. Broadstock, and Jesús Vázquez-Abad, Proceedings of the 2001 Physics Education Research Conference, Rochester, NY, July 2001

"Learning energy, momentum, and conservation concepts with computer support in an undergraduate physics laboratory," Elizabeth A. George, Maan Jiang Broadstock, and Jesús Vázquez Abad, International Conference of the Learning Sciences, Ann Arbor, MI, June 2000

Selected Conference Presentations (* denotes undergraduate student):

"Investigation of Light-Induced Atom Desorption," Timothy Uher*, Paul Voytas, and Elizabeth George, Ohio-Region Section APS meeting, Flint, MI, April 2010

"Upper-level lab sequence at Wittenberg University: paths to student independence," Elizabeth George, Paul Voytas, and Jeremiah Williams, Topical Conference on Advanced Laboratories, Ann Arbor, MI, July 2009 (peer-reviewed)

"Determining the half-life of ^{40}K from the activity of salt substitute," Elizabeth George and Paul Voytas, Topical Conference on Advanced Laboratories, Ann Arbor, MI, July 2009 (peer-reviewed)

"Investigating Tangential Acceleration in the Laboratory with a Rotation Wheel," Elizabeth George and Paul Voytas, Summer AAPT meeting, Ann Arbor, MI, July 2009

"Buck Creek River Flow Analysis," Yasas Dhanapala*, Elizabeth George, and John Ritter, Ohio-Region Section APS meeting, Ada, OH, April 2009

- "Achieving Nanosecond Timing with the Vernier Method," Rebecca Cooper*, Elizabeth George, Paul Voytas, Ohio-Region Section APS meeting, Ada, OH, April 2009
- "Calibration of a superconducting beta spectrometer using ^{66}Ga ," Gregory Severin, Lynn Knutson, Elizabeth George, Paul Voytas, Sean Cotter, APS Division of Nuclear Physics meeting, Oakland, CA, October 2008
- "Recent Results on the Branching Ratio in the Beta Decay of Oxygen-14," Matthew Kowalski*, Elizabeth George, Paul Voytas, Lynn Knutson, Gregory Severin, Sean Cotter, Ohio-Region Section APS meeting, Miami University, Oxford, OH, October 2007
- "Modeling a new superconducting beta spectrometer for a CVC test in ^{14}O beta decay," P.A. Voytas, E.A. George, L.D. Knutson, and S.L. Cotter, APS Division of Nuclear Physics meeting, Chicago, IL, October 2004
- "Design and Calibration of a Superconducting Beta Spectrometer," S.L. Cotter, L.D. Knutson, E.A. George, and P.A. Voytas, APS Division of Nuclear Physics meeting, Chicago, IL, October 2004
- "Properties of Biological Media Determined from Polarization Properties of Backscattered Light," Landon Locke*, Ohio Section APS meeting, Athens, OH, April 2004
- "Studying the Motion of Rising Bubbles with Video Capture," E.A. George, Ryan Greer*, P.A. Voytas, Summer AAPT meeting, Madison, WI, August 2003
- "Adapting RealTime Physics," Elizabeth A. George, Daniel A. Fleisch, Paul A. Voytas, William E. Dollhopf, Ohio Section APS/Southern Ohio Section AAPT Joint Meeting, Columbus, OH, October 2001
- "Observing students' use of computer-based tools during collision experiments," Elizabeth A. George, Maan J. Broadstock, and Jesús Vázquez-Abad, Summer AAPT meeting, Rochester, NY, July 2001 (invited talk)
- "Student understanding of momentum, mechanical energy, and conservation principles in a computer-supported undergraduate physics laboratory," Jesús Vázquez-Abad, Elizabeth A. George, and Maan J. Broadstock, AERA annual meeting, Seattle, WA, April 2001 (peer-reviewed)
- "Learning momentum and energy conservation principles with computer support in an undergraduate physics laboratory," Maan J. Broadstock, Elizabeth A. George, and Jesús Vázquez-Abad, NARST annual meeting, St. Louis, MO, March 2001 (peer-reviewed)
- "Learning momentum and energy conservation in a computer-based laboratory," Elizabeth A. George, Maan J. Broadstock, and Jesús Vázquez-Abad, NSTA annual meeting, St. Louis, MO, March 2001 (peer-reviewed)
- "Student learning in motion detector- and video-based collision laboratories," Elizabeth A. George, Maan J. Broadstock, and Jesús Vázquez-Abad, Summer AAPT meeting, Guelph, Ontario, August 2000
- "Learning momentum and energy conservation principles with motion detectors and video," Elizabeth A. George, Theresa Conway*, Maan Jiang Broadstock, and Jesús Vázquez-Abad, Winter AAPT meeting, Kissimmee, FL, January 2000
- "Four Strategies for Exploiting Computers in a Science Core Course," D. Waechter-Brulla, E. Drexler, L. Urven, F. Luther, R. Helwig, E. George, and J. Bak, 162nd National Meeting of the AAAS, Washington, DC, Jan. 1996 (peer-reviewed)

Other presentations:

"Nuclear beta decay and the weak interaction," Wright State University Physics Department seminar, May 5, 2006

"Phase shift analyses and scattering lengths for $p\text{-}^3\text{He}$," seminar at Institute for Nuclear and Particle Physics, Ohio University, January 27, 2004

"Using spinning nucleons to investigate the strong force," Physics Department seminar at Denison University, Jan. 31, 2002

Grant proposals funded:

Co-principal investigator (lead investigator: Paul Voytas) for "A mono-energetic neutron facility for investigating radiation damage to Si and SiC devices," submitted to Analex, a support service contractor to NASA Glenn Research Center, funded August 2004-September 2005

Principal investigator for "Computer-aided active engagement learning in an introductory physics sequence for science majors," National Science Foundation, Division of Undergraduate Education, CCLI-A&I program, funded 2000-2003 (co-principal investigators: W.E. Dollhopf, P.A. Voytas)

Principal investigator for "Effects of instructional technologies on student learning in the undergraduate physics laboratory," National Science Foundation, Division of Research, Evaluation and Communication, REPP program, funded 1998-2001 (co-principal investigator: Jesús Vázquez-Abad, Université de Montréal)

Courses taught at Wittenberg:

General education courses: Physics Through Experimentation; Chaos and Fractals (first-year seminar); Patterns in Nature (first-year seminar)

Honors course: Chaos and Fractals (team-taught)

Introductory physics courses: Mechanics and Waves; Topics in Contemporary Physics (algebra-based course); Thermodynamics and Optics; Intermediate Physics Lab; Special Relativity and Applications; Modern Physics

Upper-level physics courses: Wave Phenomena; Electronics; Digital Electronics; Nuclear Physics; Particle Physics; Junior/Senior Seminar

Community and professional service contributions:

- Reviewer, American Journal of Physics (2005-)
- Reviewer, Europhysics Letters (2011-)
- Reviewer for nine chapters of third edition of Knight, Physics for Scientists and Engineers, 2010
- Reviewer, U.S. Civilian Research and Development Foundation 2005 Cooperative Grants Program
- National Science Foundation review panels: Division of Research, Evaluation and Communication CAREER program, October 1999; Information Technology Research program, February 2001; Assessing Student Achievement program, July 2001 and January 2002
- Steering Committee, 2009 and 2012 Advanced Labs Topical Conferences, American Association of Physics Teachers
- Member of Audit Panel for K-12 science education review, Oakwood School District, 2010-11
- Coordinated and led physics activities for Girl Scout Science Night at Wittenberg, 2001-4, 2007-9
- Helped organize SOS/AAPT meeting at Wittenberg, March 2002

University committees and task forces:

- Diversity Advisory Committee, 2011-
- Strategic Planning Implementation Task Group A, 2008-10
- Provost's Advisory Committee, 2009-10
- Hearing Board on Academic Freedom and Tenure, 2002-5; 2008- (Chair, 2003-2005, 2009-11)

- Faculty Executive Board, Fall 2007 (sabbatical replacement)
- Curriculum Review Committee, 2006-7
- Task group on the Mission Statement, 2004-6
- Strategic Planning task groups on Attracting High-Performing Students and on Promoting Student Excellence, Persistence and Success, 2003-4
- Committee on Admissions/Financial Aid, 2001-3
- Facilities and Environment Committee, 2001-3 (Chair, 2002-3)
- Library Policies Committee, 1999-2001 (Chair, Spring 2000)

Other contributions to the University:

- Chief Information Officer search committee, 2009
- Panelist/ co-presenter for the following Wittenberg Faculty Development events: "Keys to a successful sabbatical," 2007; "The arc of a teaching career," 2009; "Radical pedagogies," 2010; "How Do We Respond? A Collection of Response Strategies for Papers and Oral Presentations," 2010; "3 principles and 9 strategies for the bimodal classroom," 2011
- Faculty Retreat planning group and co-presenter of session on "Research-based teaching strategies," 2008; co-organizer of session on "Faculty Workload," 2011
- Academic advising: Advised four groups of 6-18 first-year students; currently major advisor for 10 students

Responsibilities as Interim Assistant Provost (2010-11)

- Led faculty groups developing new Environmental Science major and investigating the feasibility of an Environmental Sustainability major
- Supervised International Education office
- Responsible for departmental non-staffing budget requests
- Provost's office liaison for grant administration; Grant administrator (Fall 2011)
- Interim Director for Computational Science minor program
- Ex-officio member of Facilities and Environment Committee