

Dennis E. Krause

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Education

Ph.D., Physics, Purdue University, December 1994
Dissertation: *The Zel'dovich Electric Dipole Moment in Atoms*
Advisor: Ephraim Fischbach

M.S., Physics, University of Wisconsin-Milwaukee, May 1987

B.A., Physics, Saint Olaf College, May 1984

Teaching Positions

Associate Professor, Wabash College (July 2004—Present)
Assistant Professor, Wabash College (July 1998—June 2004)
Taught introductory physics and lab, intermediate and advanced mechanics, and advanced quantum mechanics.

Visiting Assistant Professor, Williams College (Fall 1995—Spring 1998)
Taught introductory physics and lab, physics for liberal arts majors, thermal physics, particle physics, and January term course “Confronting the Mysterious.”

Visiting Assistant Professor, Purdue University (Spring 1995)
Taught introductory physics for engineering students.

Graduate Teaching Assistant, Purdue University, (August 1987–1993)
Taught introductory physics recitation sections, introductory lab, lectured for introductory course, was coordinator for help center.

Graduate Teaching Assistant, University of Wisconsin-Milwaukee, (August 1984–May 1987)
Taught introductory physics recitation sections.

Research Positions

Adjunct Assistant Professor, Purdue University (Fall 1998—Summer 2004)
Adjunct Associate Professor, Purdue University (Fall 2004—present)

Awards

Purdue University Special Initiative Dissertation Year Fellowship (1993)
Purdue University Physics Department Edward S. Akeley Prize honoring outstanding physics graduate students in theoretical physics (1994)
Wabash College McLain-McTurnan-Arnold Research Scholar (2004)

Professional Memberships

American Physical Society
American Association of Physics Teachers
Council on Undergraduate Research

Service to the College

Chair, Physics Department (2002–2004, 2005–2011)
Committees Served: Academic Policy, Safety (co-chair), Pre-engineering, Committee on Committees, Science Building, Lilly Grant, Technology Advisory, Computer Advisory
Physics Top 10 Day and Honor Scholar Exam Coordinator

Recently Taught Courses

Freshman Tutorial

- Confronting the Mysterious (2010)

Physics 111 General Physics I (2006–2009)
Physics 112 General Physics II (2010–2011)
Physics 113 Thermal and Relativity Physics (2006–2009)
Physics 210 Modern Physics (2010)
Physics 277/278 Special Topics

- Introduction to Cosmology (2011)

Physics 314 Electrodynamics (2007-2009)
Physics 315 Quantum Mechanics (2005–2010)
Physics 287/288/387/388 Independent Study

- Astrophysics (2007)
- Particle Physics (2011)

July 12, 2011

Research Students

July 12, 2011

Wabash College

Zachary Rohrbach ('12)

- Project: Quantum Unstable Particles (Summer 2010, 2011)

Yifei Sun ('13)

- Project: Problems with Pulley Problems (2010-2011)
- Publication:
 - “Can a String’s Tension Exert a Torque on a Pulley?” D. E. Krause and Y. Sun, *The Physics Teacher* **49**, 234–235 (2011).

Diego Aliaga ('11)

- Project: 1-Dimensional Casimir Force (Summer 2009)

Sabir Shrestha ('09)

- Project: Energy Conservation in a Massive Spring System (Summer 2008)

Prasanna Pokhrel ('07)

- Project: Simulating Waves in Negative Index Materials (Summer 2005)
- Project: Yukawa and Inverse-Power-Law Forces for the Cylinder-Plate Geometry (Summer 2006)

Walter Keeley ('03)

- Project: Anomalous Results from the Adiabatic Gas Law Apparatus (Summer 2002)
- Publication:
 - “Determining the Heat Capacity Ratio of Air from ‘Almost Adiabatic’ Compressions,” D. E. Krause and W. Keeley, *The Physics Teacher* **42**, 481-483 (2004).

Suniti Karuntillake ('01) and Michael West ('02)

- Project: Search for New Short-Ranged Forces (Summer 2000)
- Publications:
 - “Gravity Experiments in the Casimir Regime,” D. E. Krause, E. Fischbach, S. W. Howell, S. Karuntillake, and M. West, in *Proceedings of the Ninth Marcel Grossmann Meeting on General Relativity*, edited by R. T. Jantzen, V. Gurzadyan, and R. Ruffini (World Scientific, Singapore, 2002), 1822–1824.
 - “Experimental Search for New String-Inspired Forces using Atomic Force Microscopy,” E. Fischbach, S. W. Howell, S. Karuntillake, D. E. Krause, and M. West, in *Proceedings of the Ninth Marcel Grossmann Meeting on General Relativity*, edited by R. T. Jantzen, V. Gurzadyan, and R. Ruffini (World Scientific, Singapore, 2002), 1817–1821.
 - “Testing gravity in space and at ultrashort distances,” E. Fischbach, S. W. Howell, S. Karuntillake, D. E. Krause, R. Reifenberger, and M. West, *Classical and Quantum Gravity* **18**, 2427–2434 (2001).

Chris Deufel ('00)

- Project: Search for New Short-Ranged Forces (1999-2000)

Williams College

Kathryn Schaffer ('98, Bard College) and Sarah Donnelly ('99, University of Connecticut)

- Project: Zel’dovich Moment in Atoms (Summer 1997)

Allegra Martin ('99)

- Project: Video Analysis for the Introductory Physics Laboratory (Summer 1997)

Joe Reiner ('97, Rochester Institute of Technology)

- Project: New Phenomena in Hydrogen with Parity and Time Reversal Violation (Summer 1996)

Andy Stortz ('98) and Zoë Leinhardt ('98, Carleton College)

- Project: The Lamb Model of Open Systems (Summer 1996)

Publications

July 12, 2011

49. “Can a String’s Tension Exert a Torque on a Pulley?” D. E. Krause and Y. Sun, *The Physics Teacher* **49**, 234–235 (2011).
48. “Possibility of measuring the thermal Casimir interaction between a plate and a cylinder attached to a micromachined oscillator,” R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. López, and V. M. Mostepanenko, *Physical Review A* **82**, 052515 (2010).
47. “Study of the dependence of ^{198}Au half-life on source geometry,” R. M. Lindstrom, E. Fischbach, J. B. Buncher, G. L. Greene, J. H. Jenkins, D. E. Krause, J. J. Mattes, and A. Yue, *Nuclear Instruments and Methods A* **622**, 93–96 (2010).
46. “On the validity of constraints on light elementary particles and extra-dimensional physics from the Casimir effect,” E. Fischbach, G. L. Klimchitskaya, D. E. Krause, and V. M. Mostepanenko, *European Journal of Physics* **68**, 223–226 (2010).
45. “Evidence of correlations between nuclear decay rates and Earth-Sun distance” J. H. Jenkins, E. Fischbach, J. B. Buncher, J. T. Gruenwald, D. E. Krause, and J. J. Mattes, *Astroparticle Physics* **32**, 42–46 (2009).
44. “Time-Dependent Nuclear Decay Parameters: New Evidence for New Forces?” E. Fischbach, J. B. Buncher, J. T. Gruenwald, J. H. Jenkins, D. E. Krause, J. J. Mattes, and J. R. Newport, *Space Science Reviews* **145**, 285–335 (2009).
43. “Application of the proximity force approximation to gravitational and Yukawa-type forces,” R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. López, U. Mohideen, and V. M. Mostepanenko, *Physical Review D* **79**, 124021 (2009).
42. “Comment on ‘Contribution of Drifting Carriers to the Casimir-Lifshitz and Casimir-Polder Interactions with Semiconductor Materials,’ ” R. S. Decca, E. Fischbach, B. Geyer, G. L. Klimchitskaya, D. E. Krause, D. López, U. Mohideen, and V. M. Mostepanenko, *Physical Review Letters* **102**, 189303 (2009).
41. “Comment on ‘Anomalies in electrostatic calibrations for the measurement of the Casimir force in a sphere-plane geometry,’ ” R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. López, U. Mohideen, and V. M. Mostepanenko, *Physical Review A* **79**, 026101 (2009).
40. “Why screening effects do not influence the Casimir force,” V. M. Mostepanenko, R. S. Decca, E. Fischbach, B. Geyer, G. L. Klimchitskaya, D. E. Krause, D. López, and U. Mohideen, *International Journal of Modern Physics A* **24**, 1721–1742 (2009).
39. “Stronger constraints on non-Newtonian gravity from the Casimir effect,” V. M. Mostepanenko, R.S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, and D. Lopez, *Journal of Physics A* **41** 164054 (2008).
38. “Searching for hypothetical forces in the Casimir regime using a MEMS based force sensor,” R.S. Decca, D. López, D. E. Krause, E. Fischbach, *Smart Sensors, Actuators, and MEMS III*, ed. by T. Becker, C. Cané, N. S. Barker, *Proc. of SPIE*, **6589**, K5890-K5890 (2007).
37. “Novel constraints on light elementary particles and extra-dimensional physics from the Casimir effect,” R.S. Decca, D. López, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, V. M. Mostepanenko, *European Journal of Physics C* **51**, 963–975 (2007).
36. “Tests of new physics from precise measurements of the Casimir pressure between two gold-coated plates,” R.S. Decca, D. López, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, V. M. Mostepanenko, *Physical Review D* **75**, 077101 (2007).
35. “Experimental Investigation of the Casimir Force beyond the Proximity Force Approximation,” D. E. Krause, R. S. Decca, D. López, E. Fischbach, *Physical Review Letters* **98**, 050403 (2007).

34. “Rigorous approach to the comparison between experiment and theory in Casimir force experiments,” G. L. Klimchitskaya, F. Chen, R. S. Decca, E. Fischbach, D. E. Krause, D. López, U. Mohideen, and V. M. Mostepanenko, *Journal of Physics A* **39**, 6485–6493 (2006).
33. “Present status of controversy regarding the thermal Casimir force,” V. M. Mostepanenko, V. B. Bezerra, R. S. Decca, B. Geyer, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. López, and C. Romero, *Journal of Physics A* **39**, 6589–6600 (2006).
32. “Comment on ‘Temperature dependence of the Casimir effect,’ ” V. B. Bezerra, R. S. Decca, E. Fischbach, B. Geyer, G. L. Klimchitskaya, D. E. Krause, D. López, V. M. Mostepanenko, and C. Romero, *Physical Review E* **73**, 028101 (2006).
31. “Prospects for Detecting Gravity at the Nanoscale,” D. E. Krause, E. Fischbach, and R. S. Decca, in *New Views on the Universe*, the Proceedings of the 5th Rencontres du Vietnam, edited by L. Celnikier, Y. Giraud-Héraud, and J. Trân Thanh Vân (The Gioi Publishers, Hanoi, 2005), 91–95.
30. “MEMS-Based Force Sensor: Design and Applications,” D. L. López, R. S. Decca, E. Fischbach, and D. E. Krause, *Bell Labs Technical Journal* **10** (3), 61–80 (2005).
29. “Constraining new forces in the Casimir regime using the isoelectronic technique,” R. S. Decca, D. L. López, H. B. Chan, E. Fischbach, D. E. Krause, and J. R. Jamell, *Physical Review Letters* **94**, 240401 (2005).
28. “Precise comparison of theory and new experiment for the Casimir force leads to stronger constraints on thermal quantum effects and long-range interactions,” R. S. Decca, D. López, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, and V. M. Mostepanenko, *Annals of Physics* **318**, 37–80 (2005).
27. “Casimir effect as a test for thermal corrections and hypothetical long-range interactions,” G. L. Klimchitskaya, R. S. Decca, E. Fischbach, D. E. Krause, D. López, and V. M. Mostepanenko, *International Journal of Modern Physics A* **20**, 2205–2221 (2005).
26. “Limits on New Inverse-Power Law Forces,” D. E. Krause and E. Fischbach, in *Particle Physics and the Universe*, the Proceedings of the 9th Adriatic Meeting, edited by J. Trampetić and J. Wess (Springer, Berlin, 2005), 73–82.
25. “Determining the Heat Capacity Ratio of Air from ‘Almost Adiabatic’ Compressions,” D. E. Krause and W. Keeley, *The Physics Teacher* **42**, 481–483 (2004).
24. “Precise Measurements on the Casimir Regime,” R. S. Decca, D. López, H. B. Chan, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, and V. M. Mostepanenko, in *Quantum Field Theory Under the Influence of External Conditions*, the Proceedings of the Sixth Workshop on Quantum Field Theory under the Influence of External Conditions, edited by K. A. Milton (Rinton Press, Princeton, N.J, 2004), 23–29.
23. “Searching for New Forces and Extra Dimensions using Casimir Force Experiments,” D. E. Krause, R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. López, and V. M. Mostepanenko, in *Quantum Field Theory Under the Influence of External Conditions*, the Proceedings of the Sixth Workshop on Quantum Field Theory under the Influence of External Conditions, edited by K. A. Milton (Rinton Press, Princeton, N.J, 2004), 30–35.
22. “Precise determination of the Casimir force and first realization of a ‘Casimir-less’ experiment,” R. S. Decca, D. López, H. B. Chan, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, and V. M. Mostepanenko, *Journal of Low Temperature Physics* **135**, pp. 63–74 (2004).
21. “Improved tests of extra-dimensional physics and thermal quantum field theory from new Casimir force measurements,” R. S. Decca, E. Fischbach, G. L. Klimchitskaya, D. E. Krause, D. López, and V. M. Mostepanenko, *Physical Review D* **68**, 116003 (2003).
20. “Testing Newtonian Gravity at the Nanometer Distance Scale using the Iso-electronic Effect,” E. Fischbach, D. E. Krause, R. S. Decca, and D. López, *Physics Letters A* **318**, pp. 165–171 (2003).

19. “Constraining the couplings of massive pseudoscalars using gravity and optical experiments,” E. G. Adelberger, E. Fischbach, D. E. Krause, and R. D. Newman, *Physical Review D* **68**, 062002 (2003).
18. “Measurement of the Casimir force between dissimilar metals,” R. S. Decca, D. López, E. Fischbach, and D. E. Krause, *Physical Review Letters* **91**, 050402 (2003).
17. “Extra Dimensions, New Forces, and Non-Newtonian Gravity,” E. Fischbach and D. E. Krause, in *2001 Very High Energy Phenomena in the Universe: Proceedings of the XXXVIth Rencontres de Moriond*, edited by M. Boër and J. Trân Thanh Vân (Thê’ Giói Publishers, Vietnam, 2003), 337–346.
16. “Isotopic Dependence of the Casimir Force,” D. E. Krause and E. Fischbach, *Physical Review Letters* **89**, 190406 (2002)
15. “Gravity Experiments in the Casimir Regime,” D. E. Krause, E. Fischbach, S. W. Howell, S. Karunatilake, and M. West, in *Proceedings of the Ninth Marcel Grossmann Meeting on General Relativity*, edited by R. T. Jantzen, V. Gurzadyan, and R. Ruffini (World Scientific, Singapore, 2002), 1822–1824.
14. “Experimental Search for New String-Inspired Forces using Atomic Force Microscopy,” E. Fischbach, S. W. Howell, S. Karunatilake, D. E. Krause, and M. West, in *Proceedings of the Ninth Marcel Grossmann Meeting on General Relativity*, edited by R. T. Jantzen, V. Gurzadyan, and R. Ruffini (World Scientific, Singapore, 2002), 1817–1821.
13. “Measuring Gravity at Sub-Millimeter Distances,” P. Boynton, E. Fischbach, and D. E. Krause, in *Proceedings of the Ninth Marcel Grossmann Meeting on General Relativity*, edited by R. T. Jantzen, V. Gurzadyan, and R. Ruffini (World Scientific, Singapore, 2002), 619–622.
12. “New constraints on ultrashort-ranged Yukawa interactions from atomic force microscopy,” E. Fischbach, D. E. Krause, V. M. Mostepanenko, and M. Novello, *Physical Review D* **64**, 075010 (2001).
11. “Testing gravity in space and at ultrashort distances,” E. Fischbach, S. W. Howell, S. Karunatilake, D. E. Krause, R. Reifenberger, and M. West, *Classical and Quantum Gravity* **18**, 2427–2434 (2001).
10. “Testing Newtonian Gravity at Ultra-short Distances,” D. E. Krause and E. Fischbach, *International Journal of Modern Physics D* **10**, 25–31 (2001). [This essay received an “honorable mention” in the Annual Essay Competition of the Gravity Research Foundation for the year 2000.]
9. “Searching for Extra Dimensions and New String-Inspired Forces in the Casimir Regime,” D. E. Krause and E. Fischbach, in *Gyros, Clocks and Interferometers...: Testing Relativistic Gravity in Space*, edited by C. Lammerzahl, C. W. F. Everitt, and F. W. Hehl (Springer-Verlag, Berlin, 2001), 292–309.
8. “Constraints on Light Pseudoscalars Implied by Tests of the Gravitational Inverse-Square Law,” E. Fischbach and D. E. Krause, *Physical Review Letters* **83**, 3593–3596 (1999).
7. “New Limits on the Couplings of Light Pseudoscalars from Equivalence Principle Experiments,” E. Fischbach and D. E. Krause, *Physical Review Letters* **82**, 4753–4756 (1999).
6. “Higher-order weak interactions and the equivalence principle,” E. Fischbach, D. E. Krause, and C. Talmadge, *Physical Review D* **52**, 5417–5427 (1995).
5. “Time Dependent Perturbation Theory and the Zel’dovich Electric Dipole Moment in Atoms,” D. Tadić, D. E. Krause, E. Fischbach, and D. Sudarsky, *Fizika B* **4**, 259–272 (1995).
4. “Multipole Radiation from Massive Fields: Application to Binary Pulsar Systems,” D. E. Krause, H. T. Kloor, and E. Fischbach, *Physical Review D* **49**, 6892–6906 (1994).
3. “A New Mechanism for Constraining Macroscopic-Ranged Forces,” D. E. Krause, E. Fischbach, C. Talmadge, D. Sudarsky, and D. Tadić, in *Perspectives in Neutrinos, Atomic Physics, and Gravitation*, Proceedings of the XXVIIIth Rencontre de Moriond, edited by J. Trân Thanh Vân, T. Damour, E. Hinds, and J. Wilkerson (Editions Frontières, Gif-sur-Yvette, 1993), 455–464.

2. “Non-Newtonian Gravity and New Weak Forces: An Index of Measurements and Theory,” E. Fischbach, G. T. Gillies, D. E. Krause, J. G. Schwan, and C. Talmadge, *Metrologia* **29**, 213–260 (1992).
1. “Exponential Models of non-Newtonian Gravity,” E. Fischbach, C. Talmadge, and D. E. Krause, *Physical Review D* **43**, 460–467 (1991)

Presentations

July 12, 2011

External Talks

10. "Measurement and Uncertainty the GUM Way," Annual Meeting of the Indiana section of the American Association of Physics Teachers, Plainfield High School, April 2011.
9. "An Energy Conservation Lab using a Vertical Simple Harmonic Oscillator," Annual Meeting of the Indiana section of the American Association of Physics Teachers, Indiana University, April 2009.
8. "Searching for New Forces at Sub-micron Separations using Casimir Force Experiments," Physics Department colloquium, DePauw University, Greencastle, IN, November 9, 2005.
7. "Searching for New Forces and Extra Dimensions at Sub-Micron Separations using Casimir Force Experiments," American Physical Society April Meeting, Tampa, FL, April 2005.
6. "Searching for New Forces and Extra Dimensions at Submicron Distances," Physics Department colloquium, Hastings College, Hastings, NE, March 29, 2005.
5. "Searching for New Forces and Extra Dimensions using Casimir Force Experiments," Physics Department colloquium, Indiana State University, March 19, 2004.
4. "Searching for New Forces and Extra Dimensions using Casimir Force Experiments," invited talk, Sixth Workshop on Quantum Field Theory under the Influence of External Conditions, University of Oklahoma, September 16, 2003.
3. "Searching for New Forces and Extra Dimensions at Sub-Micron Separations using Casimir Force Experiments," research talk, annual meeting of the Indiana section of the American Association of Physics Teachers, Indiana University, April 2003.
2. "Gravity Experiments in the Casimir Regime," research talk, Ninth Marcel Grossmann Meeting on General Relativity, Rome, Italy, July 2000.
1. "Exploring Quantum Electrodynamics, the Arrow of Time, and Other Things with a Spring and String," Physics Department colloquium, Towson University, April 1997.

Wabash College Talks

19. "A Quantum Twin Paradox," Physics Department Colloquium, February 2011.
18. "The Quantum Twin Paradox," Ides of August, August 2010.
17. "Newton on the Mound: The Physics of a Baseball in Flight," Wally at the Bat: A Liberal Arts Symposium on Baseball, March 2010.
16. "The Casimir Effect: The Force of the Quantum Vacuum," Physics Department Colloquium [with Diego Aliaga ('10)], September 2009.
15. "The Not-So-Simple Simple Harmonic Oscillator," Ides of August, August 2008.
14. "The World Isn't Flat: The Casimir Force Beyond Parallel Plates," Physics Department Colloquium, February 2007.
13. "Searching for New Forces at Sub-micron Separations using Casimir Force Experiments," Physics Department colloquium, November 2005.
12. "The Casimir Force with Negative Index Materials," with Prasanna Pokhrel ('07), Physics Department colloquium, October 2005.

11. “Negative Refraction: What Happens When Light Bends the Wrong Way?” Ides of August, August 2005.
10. “Searching for New Forces and Extra Dimensions using Casimir Force Experiments,” Physics Department colloquium, March 2004.
9. “Quantum Mechanics Meets Archimedes: Is there a Vacuum Buoyant Force?” Ides of August, August 2003.
8. “The Casimir Force and the Search for New Forces and Extra Dimensions,” Physics Department colloquium, December 2002.
7. “Quantum Game Theory,” Math Department colloquium, January 2002.
6. “The Quantum Vacuum: Much Ado about Nothing,” Ides of August, August 2001.
5. “Constraining New Spatial Dimensions with Atomic Force Microscopy,” Physics Department colloquium, April 2001.
4. “Looking Beyond 3-D: How to Understand and Search for New Compact Dimensions,” Math Department colloquium, December 1999.
3. “Why is Testing Newtonian Gravity at Short Distances so Important?” Physics Department colloquium, September 1999.
2. “Searching for New Forces and New Dimensions by Testing Newtonian Gravity,” Ides of August, August 1999.
1. “More than Four? The Search for New Fundamental Forces,” Physics Department colloquium, April 1999.

Williams College Talks

6. “What Can Electric Dipole Moments Tell Us about Spacetime Symmetries?” Math Department colloquium, November 1997.
5. “What’s so Interesting about Open Systems?” Physics Department seminar, July 1997.
4. “Springs, Strings, and Atoms: The Physics of Open Systems,” Bronfman lunch seminar, October 1996.
3. “What’s the Big Deal about Open Systems?” Physics Department seminar, June 1996.
2. “The Quantum Vacuum: Much Ado about Nothing?” Physics Department colloquium, October 1995.
1. “The Quantum Vacuum: Much Ado about Nothing?” Bronfman lunch seminar, October 1995.