

JENS H. GUNDLACH

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Education and Physik-Vordiplom , Johannes Gutenberg Universität, Mainz, Germany, 1982.

Employment: Physik-Diplom , Johannes Gutenberg Universität, Mainz, Germany, 1986.

Ph.D. (Nuclear Physics), University of Washington, 1990.

Postdoctoral Research Associate (Experimental Gravitation),
University of Washington, 1990-93.

Research Assistant Professor, University of Washington, 1993-98.

Research Associate Professor, University of Washington, 1998-2004.

Full Professor, University of Washington, 2004-present.

Member of the Center for Experimental Nuclear Physics and Astrophysics
(CENPA) since inception in 2000.

Honors and Deutscher Akademischer Austausch Dienst, Full Scholarship, 1982-83.

Awards: National Institute of Standards and Technology Precision Measurement
Grant, 1997-2000.

Francis M. Pipkin Award of the American Physical Society in 2001.

Royalty Research Fund Award, University of Washington, 2003.

Fellow of the American Physical Society, 2010.

Research Interests Fundamental Physics/Gravitation:

- and Activities:*
- My experiment is the most stringent equivalence principle test from millimeters to infinity.
 - First test of the $1/r^2$ -law of gravity at distances as small as $\approx 50\mu m$.

Precision measurement:

- Most precise measurement to date of the gravitational constant, G .

Gravitational waves:

- Ultra-small force measurements for gravitational wave detectors.
- Laser Interferometer Space Antenna (LISA), LIST member.
- Laser Interferometer Gravitational Wave Observatory (LIGO), LSC member.

Biophysics:

- Study of nano-scale dynamics of single biological molecules.

Nanotechnology:

- Nanopore DNA sequencing.
- Single molecule detection devices.

Other My thesis advisor: Kurt Snover (Nuclear Physics)

information: My post doctoral advisors: Eric Adelberger, Blayne Heckel (Gravitation)

Selected recent publications in gravitation:

- “Indirect Evidence for Lévy Walks in Squeeze Film Damping”, S. Schlamminger, C.A. Hagedorn and J.H. Gundlach, *Phys. Rev.* **D81**, 123008 (2010).
- “Charge Management for Gravitational Wave Observatories using UV LEDs”, S.E. Pollack, M.D. Turner, S. Schlamminger, C.A. Hagedorn, and J.H. Gundlach, *Phys. Rev.* **D81**, 021101(R) (2010).
- “Laboratory Tests of the Equivalence Principle at the University of Washington”, J. H. Gundlach, S. Schlamminger, and T. A. Wagner, *Space Science Review* 148, **201** (2009).
- “Torsion Balance Experiments: A low-energy frontier of particle physics”, E.G. Adelberger, J.H. Gundlach, B.R. Heckel, S. Hoedl, and S. Schlamminger, *Progress in Particle and Nuclear Physics* **62**, 102 (2009).
- “Temporal Extend of Surface Potentials between Closely Spaced Metals”, S.E. Pollack, S. Schlamminger, J.H. Gundlach, *Phys. Rev. Lett.* **101** (2008) 071101.
- “Test of the Equivalence Principle Using a Rotating Torsion Balance”, S. Schlamminger, K.-Y. Choi, T.A. Wagner, J. H. Gundlach, E.G. Adelberger, *Phys. Rev. Lett.* **100** (2008) 041101.
- “Tests of the Gravitational Inverse-Square Law below the Dark-Energy Length Scale”, D. J. Kapner and T. S. Cook and E. G. Adelberger and J. H. Gundlach and B. R. Heckel and C. D. Hoyle and H. E. Swanson, *Phys. Rev. Lett.* **98** (2007) 021101.
- “Laboratory Test of Newton’s Second Law for Small Accelerations”, J. H. Gundlach, S. Schlamminger, C. D. Spitzer, and K.-Y. Choi, *Phys. Rev. Lett.* **98** (2007) 150801.
- “Sub-millimeter Tests of the Gravitational Inverse-square Law”, C.D. Hoyle, D.J. Kapner, B.R. Heckel, E.G. Adelberger, J.H. Gundlach, U. Schmidt, and H.E. Swanson, *Phys.Rev.* **D70** (2004) 042004.
- “Submillimeter Tests of the Gravitational Inverse-Square Law: A Search for “Large” Extra Dimensions”, C.D. Hoyle, U. Schmidt, B.R. Heckel, E.G. Adelberger, J.H. Gundlach, D.J. Kapner, and H.E. Swanson, *Phys. Rev. Lett.* **86** (2001) 1418.
- “Measurement of Newton’s Constant Using a Torsion Balance with Angular Acceleration Feedback”, Jens H. Gundlach and Stephen M. Merkowitz, *Phys. Rev. Lett.* **85** 2869 (2000).
- “Short range test of the equivalence principle”, G.L. Smith, C.D. Hoyle, J.H. Gundlach, E.G. Adelberger, B.R. Heckel, H.E. Swanson, *Phys. Rev.* **D61**, 022001-1 (1999).

Selected recent publications in biophysics:

- “Planar Lipid Membranes Formed From Mycolic Acids of *M. Tuberculosis*”, Kyle W. Langford, Boyan Penkov, Ian M. Derrington and Jens H. Gundlach, *Journal of Lipid Research*, in press (Nov. 2010).
- “Nanopore DNA sequencing with MspA”, Ian M. Derrington, Tom Z. Butler, Marcus D. Collins, Elizabeth Manrao, Mikhail Pavlenok, Michael Niederweis, and Jens H. Gundlach, *Proc. Nat. Acad. Sci. USA*, **107** 16060 (2010).
- “Single-molecule DNA detection with an engineered MspA protein nanopore”, Tom Z. Butler, Mikhail Pavlenok, Ian M. Derrington, Michael Niederweis, and Jens H. Gundlach, *Proc. Nat. Acad. Sci. USA*, **105** 20647 (2008).
- “Ionic current blockades from DNA and RNA molecules in the alpha-hemolysin nanopore”, Tom Z. Butler, Jens H. Gundlach, and Mark Troll *Biophys. J.* **93**, 190 3229 (2007).
- “Determination of RNA Orientation during Translocation through a Biological Nanopore”, Tom Z. Butler, Jens H. Gundlach, Mark A. Troll, *Biophys. J.* **90**, 190 (2006).

*Selected recent & current
professional activities
and committees:*

LISA International Science Team member (LIST) (2005-present)
and US Core Member for Working Group 3 (LISA gravitational
reference sensor (2005-present).

Member of the Program Advisory Committee for Advanced LIGO,
(2006-present).

Advisory Panel for Fermilab's Holometer (Craig Hogan), (2010).

Member of the Program Advisory Committee for LIGO, (2005-2008).

Organizing committee for "Fundamental Physics in Space", Warrenton (2010).

Organizing committee for LISA7, Barcelona, (2008).

Selected presenter to NSF headquarters on experimental gravity (2008).

Organizing committee for "Quantum to Cosmos" (Q2C2), Bremen, (2007).

Session Chair, Beckmann Frontiers of Science Symposium,
U.S. National Academy of Sciences & Kavli (2004).

Planning committee member (and participant) of JAFoS Symposium sponsored
by the U.S. National Academy of Sciences & Kavli (2005 and 2006).

NIH study section member to review grant applications to the
National Human Genome Research Institute for new sequencing
technology (2007-present).

NSF Electrochemical/Biosensing Review Panel (2010).

Review-Panel for NASA's Fundamental Physics in Space
program (2001, chair 2002, 2006).

Review panel to the NSF LIGO operation (2004).

Review panel to the NSF for Advanced LIGO (2003).

Ad Hoc Reviewer for Nano Letters, Nature, Physical Review,
Proc. Nat. Acad. Sci. Physics Letters, Science, others...

Executive Committee At-large for APS Precision Measurement and
Fundamental Constants Topical Group (2002).

*Some University-
internal activities*

University of Washington Chemistry Department
chair search committee (2010).

University of Washington Interdisciplinary Faculty Search committee (2010).

UW-Physics Graduate School Admission Committee for the (2004-2008,
chair 2006-2008).

UW-Physics Executive Committee, (2005-2008).

*Professional
memberships*

American Physical Society
- Topical Group in Gravitation
- Topical Group on Precision Measurement & Fundamental Constants

Biophysical Society

Jens H. Gundlach

- Recent and current research support:*
- “Small Force measurements for LISA”, NASA contract, \$410K for 2007-2010.
 - “Preparation for Space: Torsion balance Tests for NASA”, NASA grant, \$415K for 2004-2009.
 - “Vibration Isolation for Torsion Balances and New Compound Torsion Balances”, NASA grant, \$268K for 2005-2008.
 - “SGER: New Torsion Balance Technique to Test Gravity at Short Distances”, NSF, \$150K for 2006-2008.
 - “Precision Tests of Contemporary Ideas in Gravitational/Particle Physics”, NSF, \$1,800K for 2007-2010 (Adelberger PI, Heckel & I are CoPI).
 - “Probing Fundamental Physics with Gravitational Experiments, NSF, \$1,900K for 2010-2013 (Adelberger PI, Heckel & I are CoPI).
 - “LIGO grant, LSC”, NSF-gravity \$300K for 2010-2013.
 - “Engineering MspA for Nanopore Sequencing”, NIH R21 grant \$950K for 2006-2009.
 - “Nanopore Sequencing with MspA”, NIH R01 grant \$3,000K for 2009-2013.
- Patents:*
- “Single-Molecule DNA Detection with an Engineered MspA Protein”, PCT/US2009/057915.
 - “DI Sequencing”, provisional patent application: 61/375,737.
- Recent teaching activities and classes taught:*
- Currently I advise and support 7 PhD students and 4 undergraduate students.
 - Phys 121, Mechanics
 - Phys 122, Electrodynamics
 - Phys 117, Mechanics Lab
 - Phys 118, Electrodynamics Lab
 - Phys 121, Mechanics Lab
 - Phys 122z, Electrodynamics Lab
 - Phys 485, Senior Seminar
 - Phys 494, Senior Honors Seminar
 - Phys 528, Current Problems in Physics
 - Curriculum Committee for Phys 12X, (2005-present)
 - Instructional Quality Committee, (2009-present)
 - Wrote the Phys 117 & Phys 122z lab manuals and adapted them with Webassign (2009).

Narative CV

I was born in Würzburg, Bavaria. My Father, Gerd Gundlach, was a biochemist, and my mother Dagmar Gundlach, a pharmacist. We moved around Germany until my father was tenured at the Justus Liebig Universität in Giessen, Germany. I qualified to graduate from high school a year early to begin my studies in physics at the Johannes Gutenberg Universität in Mainz, Germany. After what amounts to a Bachelor of Science (Vordiplom) I received a scholarship to study abroad and went to Seattle for one year. Due to the untimely death of my research mentor in Mainz, I decided to return to the US two years later to pursue a Ph.D. in physics with Prof. Kurt Snover at the University of Washington. I graduated in 1990 in experimental nuclear physics. My research involved gamma ray spectroscopy of highly excited nuclei. During my Ph.D. a “fifth force” proposal was too intriguing for me to not be involved. Led by Prof. Eric Adelberger we formed University of Washington’s gravity group, in which I became a postdoc, then a research assistant professor and research associate professor. All along I built contraptions, in particular torsion balances to test one of nature’s most important symmetries, the equivalence principle. During the end of the 90’s I invented a new torsion balance method to measure the gravitational constant. My measurement, published in 2000, is still the most precise value and since 2006 the CODATA-accepted value for G is based on it. Again, motivated by tantalizing scenarios from fundamental physics and our torsion balance technology at hand we tested Newton’s $1/r^2$ law for very short length scales, exactly where extra spatial dimension could have been hidden. I also learned that much of the technology I developed is very applicable to the detection of gravitational waves and I joined the LISA collaboration and later the LIGO collaboration. Right around the time when I received tenure in 2004, I also became interested in something totally new, but equally exciting: nanopore DNA sequencing. The University of Washington was nice enough to grant me some latitude and helped fund the upstart. This project has quickly grown, resulting in several collaborations, substantial NIH grants, patents and involvement with industry. I am now splitting my professional life between teaching, my gravity group and the bio group. At home my wife, Cassandra Giedt, a physician, and I are preparing our three children for the adventure of life.