

Robert V. Duncan, Ph.D.

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Born in St. Joseph, Missouri on November 15, 1959

Education

- Ph.D.** Physics, University of California, Santa Barbara (UCSB), 1988
Thesis: *Development of Toroidal Magnetic Thermometry to Study New Phenomena Associated with the Superfluid Transition in Liquid ^4He*
Advisor: Professor Guenter Ahlers
- B.S.** Physics, Massachusetts Institute of Technology (MIT), 1982
Thesis: *Study of Energy Transfer Processes in Methyl Alcohol Using A Computer-Controlled IR-IR Double-Resonance Spectrometer*
Advisors: Professor Michael Feld and Dr. Ramchandra Dasari

Major Professional Appointments, Awards, and Activities

Vice Chancellor for Research, University of Missouri (2008 – Date)
Founder and Interim Director of the Sidney Kimmel Institute for Nuclear Renaissance (SKINR) at the University of Missouri (2012 – Date)
Chief Operating Officer of the New Mexico Consortium (NMC, 2006 – 2008)
Founding Director, NMC's Institute at Los Alamos National Laboratory (2006 – 2008)
Fellow (and Life Member) of the American Physical Society (2006)
The Gordon and Betty Moore Distinguished Scholar in the Physics, Mathematics, and Astronomy Division, Caltech (2004 – 2005)
International Steering Committee for Quantum Fluids and Solids (2003 – 2008, Committee Chair in 2004, Symposium Chair in 2003)
Chair, *Instrumentation and Measurement Topical Group*, American Physical Society (2002)
Co-Chair, Science and Technology for Biothreat Reduction Conference Series (BTR'01, BTR'02, BTR'03, BTR'04, BTR'05)
NASA Flight Principal Investigator, *Critical Dynamics in Microgravity* (1992 – 2006)

National and International Advisory Panel Assignments

Member of the National Academy of Sciences Panel to Review the Experimental Program to Stimulate Competitive Research (2012 – Date)
Member of the Visiting Committee to Consider Curriculum Performance and Revisions at the United States Military Academy at West Point, NY (2012 – Date)
Member of the Executive Committee of the Council on Research Policy and Graduate Education, Association of Public and Land-Grant Universities (APLU, 2011 – Date)
Member of the World Federation of Scientists, Erice, Sicily (2009 – Date)
Chair, National Academy of Sciences Panel on Fundamental Physical Sciences in Space, for the Decadal Survey. Report published as Chapter 8 in Recapturing a Future for Space Exploration... ISBN-10: 0-309-16384-6, ISBN-13: 978-0-309-16384-2 (National Research Council, 2011, see: http://www.nap.edu/catalog.php?record_id=13048)

Member of a Visiting Committee to Review the Materials Programs at the Naval Research Laboratories (2011).

Member of a Visiting Committee to Brief the Vice-Rectors of Universities throughout the Kingdom of Saudi Arabia regarding Research Strategy, Policies, and Administrative Best Practices in Research (2011).

Referee for Numerous Journals and Federal Funding Agencies (1986 – Date)

Academic Experience

2008 – Date Vice Chancellor for Research, The University of Missouri

2008 – Date Professor of Physics, University of Missouri

2002 – 2006 Associate Dean for Research, College of Arts and Sciences, University of New Mexico (UNM)

2001 – 2008 Professor of Physics and Astronomy, UNM

2000 – 2008 Joint Associate Professor of Electrical and Computer Engineering (ECE), UNM

1998 – Date Visiting Associate in Physics, Caltech Faculty

1996 – 2001 Associate Professor of Physics and Astronomy, UNM

1983 – 1984 Head Teaching Assistant, Department of Physics, UCSB

1981 – 1982 Member of the MIT Committee on Educational Policy

I have taught throughout the UNM physics curriculum, including the introductory sequence of university physics (see for example: http://panda.unm.edu/Courses/Duncan/p161_001.html), introduction to special relativity and to quantum physics, graduate condensed matter physics, graduate electromagnetism, interdisciplinary courses in self-organized criticality and in biological physics, and senior laboratory. I led the development of UNM's new core curriculum course called "Chemistry and Physics at the Nanometer-scale", which I first taught during the Fall Semester, 2006 as part of our new Nanoscience and Microsystems graduate degree program (see: <http://panda.unm.edu/Courses/Duncan/physics452/048/>). I have advised many post-docs, graduate students, and undergraduate students, primarily at UNM, but also I have co-advised some at Caltech. Many of my former students now hold permanent positions in academia, industry, and in the national laboratories within the United States.

Industrial and Economic Development Experience

2008 – Date Board Member, MU Life Sciences Incubator at Monsanto Place

2008 – Date Ex-Officio Board Member of Regional Economic Development, Inc.

2008 – Date Member of the UM President's Economic Development Council

1981 – Date Consultant to numerous high-technology energy, pharmaceutical, and medical instrumentation companies.

2008 – 2012 Executive Board Member of the Columbia, Missouri, Chamber of Commerce

1995 – 1996 Distinguished Member of Technical Staff, Sandia National Laboratories (SNL)

1994 – 1996 Leader, Cryogenic and Superconducting Technologies Team, SNL

1988 – 1995 Member (later Senior Member) of Technical Staff, SNL

1988 – 1989 Visiting Scientist, Electricity Division, National Institute of Standards and Technology (formerly the National Bureau of Standards)

I have assisted in the establishment of successful high-technology companies in minimally invasive health care. I have worked during prior summers as a consultant to help establish these firms, but I am not employed by them. I have invented or co-invented five U.S. Patents, with many international filings.

Refereed Publications in Journals, Books, and Book Chapters

1. "Singularity in the Kapitza Resistance between Gold and Superfluid ^4He " with Guenter Ahlers and Victor Steinberg, *Phys. Rev. Lett.* **58**, 377 (1987).
2. "Nonlinearity in the Kapitza Resistance Between Gold and Superfluid ^4He Near T_λ ", with G. Ahlers, *Jpn. J. Appl. Phys.* **26-3**, 363 (1987).
3. "Depression of the Superfluid Transition in ^4He by a Heat Current" with Guenter Ahlers and Victor Steinberg, *Phys. Rev. Lett.* **60**, 1522 (1988).
4. "Finite-Size Effects on the Thermal Conductivity of ^4He Near the Superfluid Transition" with Guenter Ahlers, *Phys. Rev. Lett.* **61**, 846 (1988).
5. "Recent Experiments near the Superfluid Transition in ^4He " with Guenter Ahlers, in Frontiers of Physics, Proceedings of the Landau Memorial Conference, E. Gotsman, Y. Ne'eman, and A. Voronel (eds.), p.219 (Oxford : Pergamon Press 1990).
6. "Thermal effects on the Josephson series-array voltage standard", *Physica B* **165-166**, 101 (1990).
7. "Singularity and Nonlinearity in the Kapitza Resistance Between Gold and Superfluid ^4He ", with G. Ahlers, *Phys. Rev.* **B 43**, 7707 (1991).
8. "Using a New Generation of Multimeters to Measure the Quantized Resistance" with M.E. Cage, D.Y. Yu, B.M. Jeckelmann, and R.L. Steiner, *IEEE Transactions on Instruments and Measurements* **40**, 262 (1991).
9. "A Refrigerated Dewar for the Josephson Array Voltage Calibration System" *IEEE Transactions on Instrumentation and Measurement* **40**, 326 (1991).
10. "Measurement accuracy of macroscopic quantum circuits with rf-biased Josephson junction arrays" with D. H. Dunlap, *Superconductor Science and Technology* **4**, 413 (1991).
11. "Proposed differential frequency readout system by hysteretic Josephson junctions" with L. Z. Wang, *Phys. Rev. A* **46**, 3617 (1992).
12. "Superconducting Instrumentation for Precision Measurement and Control", in Superconducting Devices and Their Applications, page 446, H. Koch and H. Lubbig, editors (Springer-Verlag, Berlin, 1992).
13. "Fundamental Measurement Accuracy of RF-Biased Josephson Device Comparisons" with D. H. Dunlap, *J. Appl. Phys.* **71**, 6177 (1992).
14. "A Superfluid-Transition Fixed-Point Temperature-Reference" with G. Ahlers, in Temperature : Its Control and Measurement in Science and Industry, Volume 6, page 243, J. F. Schooley, editor (American Institute of Physics Press, New York, 1992).
15. "A frequency to voltage converter based on Bloch oscillations in a capacitively-coupled GaAs-GaAlAs quantum well" with D. Dunlap, V. Kovanis, and J. Simmons, *Phys. Rev. B* **48**, 7975 (1993).
16. "Quantitative Method for Measuring Heat Flux Emitted from a Cryogenic Object", U.S. Patent No. 5,193,909, issued March 16, 1993.
17. "Dynamic measurements near the lambda-point in a low-gravity simulator on the ground" with U.E. Israelsson, D.M. Strayer, T.C.P. Chui, and M. Larson, *Physica B* **194-196**, 593 (1994).
18. "Sidewall thermometry perturbations to nonlinear heat transport near the superfluid transition" with R. Akau, S. Gianoulakis, U.E. Israelsson, and T.C.P. Chui, *Physica B* **194-196**, 603 (1994).

19. "Effect of Gravity on the Thermal-Conductivity Measurement of ^4He near T_λ ", with F-C. Liu, U. E. Israelsson, T.C.P. Chui, D. Hensinger, A. Nash, M.J. Adriaans, W.A. Moeur, *Czechoslovak Journal Of Physics* **46(S1)**, 87 (1996).
20. "Cryogenic Design Of The Liquid-Helium Experiment Critical-Dynamics In Microgravity" with M.J. Adriaans, W. A. Moeur, S.T.P. Boyd, and D. M. Strayer, *Cryogenics* **36**, 787 (1996).
21. "Critical-Dynamics In Microgravity" with S.T.P. Boyd, W.A. Moeur, S. Robinson, R. Akau, and S. Gianoulakis, *International Journal Of Thermophysics* **17**, 631 (1996).
22. "Observation of Self-Organized Criticality Near the Superfluid Transition in ^4He ", with W.A. Moeur, P.K. Day, F-C. Liu, S.T.P. Boyd, and M.J. Adriaans, *Phys. Rev. Lett.* **78**, 2421 (1997).
23. "Large Enhancement of Boron Carbide's Seebeck Coefficients through Vibrational Softening", with T. L. Aselage, D. Emin, and S. S. McCready, *Phys. Rev. Lett.* **81**, 2316 (1998).
24. "Breakdown of Fourier's Law near the Superfluid Transition in ^4He ", with P. K. Day, W. A. Moeur, S. McCready, D. Sergatskov, and F-C. Liu, *Phys. Rev. Lett.* **81**, 2474 (1998).
25. "Gravitational Effects on Nonlinear Heat Transport near the Superfluid Transition in ^4He ", with P. K. Day, S. McCready W. A. Moeur, F-C. Liu, and D. Sergatskov, *J. Low Temp. Phys.* **113**, 861 (1998).
26. "PdMn and PdFe: New Materials for Temperature Measurement Near 2K", with B. Klemme, M.J. Adriaans, P.K. Day, D.A. Sergatskov, and T.L. Aselage, *J. Low Temp. Phys.* **116**, 133 (1999).
27. "Onset of superfluidity far from equilibrium: dynamical effects on the correlation length", with D. Sergatskov, S. Boyd, T. McCarson, A. Babkin, P. Day, and D. Elliott, *Physica B* **280**, 45 (2000).
28. "Dynamic and Gravitational Effects on the Correlation Volume: Experimental Methods" with D.A. Sergatskov, S.T.P. Boyd, S.S. McCready, T.D. McCarson, A.V. Babkin, P.K. Day, F-C. Liu, and D. Elliott, *J. Low Temp. Phys.* **119**, 265 (2000).
29. Science Requirements Document for Critical Dynamics in Microgravity, JPL Document Number D-18698, May 31, 2000.
30. "Gravitational alignment in ground-based measurements to support Critical Dynamics in Microgravity" with Sven Mueller, T. D. McCarson, and D. A. Sergatskov, *AIP Conference Proceedings* **504**, 701 (2000).
31. "The CQ Experiment", with T.C.P. Chui, A.H Harter, R.A.M. Lee, A. Chatto, P.K. Day, and D.L. Goodstein, American Institute of Aeronautics and Astronautics, **AIAA 2001-4964** (2001).
32. "Critical Dynamics in Microgravity - Flight prototype and planned orbital measurements", with D. Sergatskov, S. Boyd, A. Babkin, T. McCarson and P. Day, American Institute of Aeronautics and Astronautics **AIAA-2001-4936** (2001).
33. "Sampled DC technique for high precision resistance measurements" with P. R. Williamson, J. A. Lipa, and D. A. Sergatskov, American Institute of Aeronautics and Astronautics **AIAA-2001-4937** (2001).
34. "Numerical Analysis of a Cryogenic Bolometer for Space Radiation Measurement" with S.T.P. Boyd, W.A. Holmes, and P.R. Williamson, American Institute of Aeronautics and Astronautics **AIAA-2001-4969** (2001).
35. "New Measurement Technology for DYNAMX, and for Future Fundamental Physics Missions in Space" with D. A. Sergatskov, A. V. Babkin, S.T.P. Boyd, R. C. Nelson, P. K. Day, J. Dooley, and D. Elliott, FP-1067, *Proc. 2nd Pan Pacific Basin Workshop on Microgravity Science* (2001).

36. "The CQ Experiment: Enhanced Heat Capacity of Superfluid Helium in a Heat Flux", with D. L. Goodstein, A. W. Harter, R. A. M. Lee, A. Chatto, T. C. P. Chui, and P. Day, FP-1025, *Proc. 2nd Pan Pacific Basin Workshop on Microgravity Science* (2001).
37. "New Paramagnetic Susceptibility Thermometers for Fundamental Physics Measurements" with D. A. Sergatskov, P. K. Day, A. V. Babkin, R. C. Nelson, T. D. McC Carson, and S.T.P. Boyd, in Temperature : Its Control and Measurement in Science and Industry, **7**, 1009, Dean C. Ripple, editor (American Institute of Physics Press, New York, 2002).
38. "Self-Organized Heat Transport near the Superfluid Transition in ⁴He" with D.L. Goodstein, A.V. Babkin, and D.A. Sergatskov, *J. Low Temp. Phys.* **126**, 1529 (2002).
39. Proceedings of the 2002 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2002), R. V. Duncan, Chair, University of New Mexico
40. "The Magnetic Properties of Sputtered Pd_{1-x}Mn_x Films for Thermometry and Bolometry", with R.C. Nelson and D.A. Sergatskov, *J. Low Temp. Phys.* **127**, 173 (2002).
41. "The CQ Experiment: Enhanced Heat Capacity of Superfluid Helium in a Heat Flux", with R. A. M. Lee, A. W. Harter, A. Chatto, T. C. P. Chui, P. K. Day and D. L. Goodstein, Paper-2.0103, 2002 IEEE Aerospace Conference, 1-31 (2002).
42. "Ultrasound Imaging of Breast Tissue" with N. Duric, P. Littrup, E. Holsapple, A. Babkin, A. Kalinin, A. Pevzner, and A. Tokarev, *Proceedings of the SPIE: Medical Imaging 2003*; San Diego, California; Feb. 21-26, 2003. Ultrasonic Imaging and Signal Processing – Paper 5035-4.
43. "New Propagating Mode Near the Superfluid Transition in ⁴He", with D.A. Sergatskov, A.V. Babkin, R.A.M. Lee, and S.T.P. Boyd, *Physica B* **329 – 333**, 208 (2003).
44. "New Paramagnetic Susceptibility Thermometers for Fundamental Physics Measurements" with D.A. Sergatskov, P.K. Day, A.V. Babkin, R.C. Nelson, T.D. McC Carson, and S.T.P. Boyd, AIP Conference Proceedings 684, 1009 (2003).
45. Proceedings of the 2003 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2003), R. V. Duncan, Chair, University of New Mexico
46. "'Heat from Above' heat capacity measurements in liquid ⁴He", with R.A.M. Lee, A. Chatto, D.A. Sergatskov, A.V. Babkin, S.T.P. Boyd, A.M. Churilov, T.D. McC Carson, T.C.P. Chui, P.K. Day, and D.L. Goodstein, *J. Low Temp. Phys.* **134**, 495 (2004).
47. "Preface to the Proceedings of QFS 2003" with S.T.P. Boyd and D. L. Goodstein, *J. Low Temp. Phys.* **134**, 1 (2004); "Welcome Address to QFS 2003, delivered by Louis Caldera, President of UNM", *J. Low Temp. Phys.* **134**, 17 (2004).
48. "Experiments in ⁴He Heated From Above, Very Near the Lambda Point", with D.A. Sergatskov, A.V. Babkin, S.T.P. Boyd, and R.A.M. Lee, *J. Low Temp. Phys.* **134**, 517 (2004).
49. "Experiments in Fundamental Physics Scheduled and in Development for the ISS" with C. Lammerzähl, G. Ahlers, N. Ashby, M. Barmatz, P. Beirmann, H. Dittus, V. Dohm, K. Gibble, J. Lipa, N. Lockerbie, N. Mulders, and C. Salomon, *General Relativity and Gravitation* **36**, 615 (2004).
50. "Fundamental Physics: Long-range quantum order, interactions, and phase transitions" (Preface), *Advances in Space Research*, Elsevier, (2004).
51. Proceedings of the 2004 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2004), R. V. Duncan, Chair, University of New Mexico.
52. "Demonstration of an Ultra-Stable Temperature Platform" with C. J. Green and D. A. Sergatskov, *J. Low Temp. Phys.* **138**, 871 (2005).

53. “Adaptive Optimal PI Controller for Use in Precision Low-Temperature Experiments” with Jinyang Liu and D. A. Sergatskov, *J. Low Temp. Phys.* **138**, 905 (2005).
54. “Dynamic Simulation of the Superfluid / Normal Fluid Interface Motion in ^4He ” with Z. Xie, N. C. Menicucci, S.T.P. Boyd, and D. A. Sergatskov, *J. Low Temp. Phys.* **138**, 79 (2005).
55. Proceedings of the 2005 Conference on Unified Science and Technology for Reducing Biological Threats and Countering Terrorism (BTR 2005), R. V. Duncan, Chair, University of New Mexico.
56. “CW Measurements of the Upward-Going Temperature Wave in the ^4He Self-Organized Critical State” with S.T.P. Boyd and D.A. Sergatskov, AIP Conference Proceedings **850**, 135 (ISBN 0-7354-0347-3; 2006).
57. “Effect of Inhomogeneous Heat Flow on the Enhancement of the Heat Capacity in He-II by Counterflow near T_λ ”, with S.T.P. Boyd, A. Chatto, R.A.M. Lee, and D. Goodstein, AIP Conference Proceedings **850**, 133 (ISBN 0-7354-0347-3; 2006).
58. “Measurement of the SOC State Specific Heat in ^4He ” with A.R. Chatto, R.A.M. Lee, P.K. Day and D.L. Goodstein, AIP Conference Proceedings **850**, 137 (ISBN 0-7354-0347-3; 2006).
59. “Magnetic Properties of Pd(96%)Mn(4%) Films for High Resolution Thermometry” with R. C. Nelson, C. Green, and D.A. Sergatskov, AIP Conference Proceedings **850**, 1123 (ISBN 0-7354-0347-3; 2006).
60. “Experiments on the Self-Organized Critical State of ^4He ” with A. Chatto, R.A.M. Lee, and D. Goodstein, *J. Low Temp. Phys.* **148**, 519 (2007).
61. “Noise Immunity of High-Precision Low-Temperature Experiments” with J. Liu and D.A. Sergatskov, *J. Low Temp. Phys.* **148**, 921 (2007).
62. “Critical phenomena in microgravity: Past, present, and future”, with Martin Barmatz, Inseob Hahn, and John Lipa, *Reviews of Modern Physics*, **79**, pp. 1-52 (January – March, 2007).
63. “Cell phones, texting, position reporting, and self-assembly in emergency response management”, International Seminar on Nuclear War and Planetary Emergencies, 43rd Session (World Scientific Press, 2010) ISBN-13 978-981-4365-92-5 and ISBN-10 981-4365-92-0.

In addition, I have published un-refereed articles on academic leadership strategy in the Proceedings of the Merrill Institute at the University of Kansas in 2009, 2010, 2011, and 2012, and a number of articles on research and education in the popular press. I have published over fifty abstracts, internal reports, and non-refereed articles.

Invited Talks and Presentations

Invited talks at India’s three leading nuclear facilities during November, 2012, specifically at the Bhabha Atomic Research Center (BARC), the Tata Institute for Fundamental Research (TIFR), and the Indira Gandhi Centre for Atomic Research (IGCAR).

Inaugural Speaker at “MAM-12”: The Sixth International Symposium on Macro- and Supramolecular Architectures and Materials in Coimbatore, India (November 21-25, 2012).

Banquet Speaker, ICCF-17 in Daejeon, Korea, August 16, 2012.

Keynote Speaker at the 2012 National Instruments Days in Austin, Texas.

Invited presentation at the “Condensed Matter Meets Gravity” Workshop at the Lorentz Institute in Leiden, NL (August, 2007).

Invited presentation to the International Symposium on Quantum Fluids and Solids in Kyoto, Japan (2006).

Invited presentation at the “Self-Organized Criticality” Conference in Porto Alegre, Brazil (2004).

Invited presentation to the Fourth Annual “Pushing the Envelope: Medicine in Extreme Environments” conference at the University of Texas, Medical Branch in February, 2004.

Invited presentation to the International Symposium on Quantum Fluids and Solids (Minnesota, USA, 2000).

Two invited presentations to The American Physical Society’s March Meeting (1987 and 2000).

Invited presentation at the 22nd International Conference on Low-Temperature Physics (Helsinki, Finland, 1999).

Presented the Mechanical Engineering Colloquium at Yale University, October 17, 2007.

Delivered invited Physics Symposium Presentations or Condensed Matter Physics Seminars at Caltech, Stanford, University of Texas (El Paso), University of California (Santa Barbara), State University of New York (Buffalo), Purdue, Los Alamos National Laboratory, Sandia National Laboratories, Air Force Research Labs, and the University of New Mexico.

Professional Society Service

Fellow (and life member), American Physical Society (APS).

Executive Committee, APS Instrumentation and Measurement Topical Group (IMSTG), 1998 - 2002

Vice Chair, IMSTG, 1999

Chair of the APS Fellowship Nomination Committee of the IMSTG, 1999

Chair, IMSTG, 2001-2002

Referee for the National Science Foundation, Physical Review Letters, and the Journal of Low Temperature Physics

Served on two federal ‘Blue Ribbon’ review committees in the past.

Other Activities

President of the Great Rivers Council Eagle Scout Association, 2010 – Date

Executive Board of the Great Rivers Council of the Boy Scouts of America, 2008 – Date.

Distinguished Eagle Scout Alumnus Award, Pony Express Council, 2007.

Ultra-Marathon Runner, two finishes in the Leadville 100-Mile Mountain Run (1996, 1999).

Former Assistant Scoutmaster of a troop serving scouts with neurodevelopmental limitations.

Former Private Pilot, with over 250 hours of total flight time

MIT Intercollegiate Crew oarsman, 1979 National Intercollegiate Rowing Association Championships competitor.

Former Director of Wilderness Survival Training, Boy Scouts of America, Pony Express Council

Former Youth President of the National Eagle Scout Association, Pony Express Council

Winner in the 1978 Westinghouse Science Talent Search (‘Top 40’)

Eagle Scout (1976)