

UNIVERSITY OF MARYLAND
Department of Physics
College Park, Maryland

February, 2003

CURRICULUM VITA

Ho Jung Paik
Professor

I. Education:

B.S.	Seoul National University, Korea	February 1966
M.S.	Stanford University	June 1970
Ph.D.	Stanford University	August 1974

II. Experience in Higher Education:

1974-78	Stanford University, Dept. of Physics	Research Associate
1978-83	University of Maryland, Dept. of Physics and Astronomy	Assistant Professor
1983-89	University of Maryland, Dept. of Physics and Astronomy	Associate Professor
1984-85	Stanford University, Dept. of Physics	Visiting Assoc. Professor
1989-	University of Maryland, Dept. of Physics	Professor
1991-92	Stanford University, Dept. of Physics	Visiting Professor

III. Publications:

42 papers published in refereed journals
58 papers published in conference proceedings
13 papers published in books

IV. Professional Service:

Member of the American Physical Society (1978-present)
Referee for the Physical Review, Physical Review Letters, Journal of Applied Physics,
Journal of Physics, Physics Letters, and other journals (1974-present)
Reviewer of research proposals for NSF, NASA, DOE and others (1978-present)
Interagency Gravity Gradiometer Study Team (NASA, Air Force, Army, JPL, MIT and the
University of Maryland) (1985-91)
Science Coordinating Committee for NASA Experimental Gravitation Program (1988-93)
NASA Ad Hoc Committee on Gravitation Physics and Astronomy (1989-1991)
Science Study Team for ESA mission STEP (Satellite Test of the Equivalence Principle)
(1992-96)
Science Study Team for NASA mission GEOID (Gravity for Earth, Ocean, and Ice
Dynamics) (1996-97)
Dutch Science Foundation Review Panel for GRAIL (Gravitation Radiation Antenna In
Leiden) R&D Proposal (1997)
Proposal Review Panel for NASA Astrophysics Division (1998)
International Coordinating Committee for the Fifth International Workshop on Gravitation
and Astrophysics, Moscow, Russia (2001)
Pre-Phase A Study Team for NASA's New Millennium Program mission DRS
(Disturbance Reduction System) (2001)
International Organizing Committee for the Sixth International Workshop on Gravitation
and Astrophysics, Seoul, Korea (2003)
Organizing Committee for fundamental physics in 2004 Space Congress, Paris (2004)

V. Honors and Awards:

Stanford Fellowship (1968-1969)
Honorable Mention for Essay on Gravity, Gravity Research Foundation, New Boston, New
Hampshire (1974, 1979)
Faculty Research Grant, University of Maryland (Spring, 1981)
Alfred Sloan Fellowship (September, 1981-September, 1983)
NASA Certificates (2) of Recognition for Tech Briefs Publication on Superconducting
Gravity Gradiometer and Superconducting Six-Axis Accelerometer (1986)
General Research Board Faculty Award, University of Maryland (Fall, 1995)
General Research Board Faculty Award, University of Maryland (Fall, 2002)

VI. Patents:

"Improved Three-Axis Superconducting Gravity Gradiometer," U.S. Patent, No. 4,841,772
(Issued on June 27, 1989).
"Improved Superconducting Six-Axis Accelerometer," U.S. Patent No. 5,224,380 (Issued
on July 6, 1993).
"Proof Mass Support and Sensing System," British Patent Application Nos. 9419649.0 and
9406347.6 (September 20, 1994 and March 20, 1994).

LIST OF PUBLICATIONS

November, 2002

Ho Jung Paik

A. Papers Published (or Accepted for Publication) in Refereed Journals

1. Physics and Astronomy research
 - 1) "Distribution of Pulsar Duty Cycles," with G.R. Henry, *Nature* **224**, No. 5525, 1188 (1969).
 - 2) "Superconducting Tunable-Diaphragm Transducer for Sensitive Acceleration Measurements," *J. Appl. Phys.* **47**, 1168 (1976).
 - 3) "Calculation of the Absorption Cross Section of a Cylindrical Gravitational-Wave Antenna," with R.V. Wagoner, *Phys. Rev. D* **13**, 2694 (1976).
 - 4) "The Observation of Mechanical Nyquist Noise in a Cryogenic Gravitational Wave Antenna," with S.P. Boughn, W.M. Fairbank, R.P. Giffard, J.N. Hollenhorst, M.S. McAshan and R.C. Taber, *Phys. Rev. Lett.* **38**, 454 (1977).
 - 5) "Response of a Disk Antenna to Scalar and Tensor Gravitational Waves," *Phys. Rev. D* **15**, 409 (1977).
 - 6) "Tunable 'Free-Mass' Gravitational Wave Detector," with R.V. Wagoner and C.M. Will, *Phys. Rev. D* **19**, 2325 (1979).
 - 7) "New Null-Experiment to Test the Inverse Square Law of Gravitation," *Phys. Rev. D* **19**, 2320 (1979).
 - 8) "Design of a Resonant Gravitational Wave Detector with Quantum-Limited Sensitivity," *Nuovo Cimento* **55B**, 15 (1980).
 - 9) "Superconducting Tensor Gravity Gradiometer for Satellite Geodesy and Inertial Navigation," *J. Astronaut. Sci.* **29**, 1 (1981).
 - 10) "Toroidal dc SQUID with Point-Contact Junctions," with R.H. Mathews and M.G. Castellano, *IEEE Trans. Mag.* **MAG-17**, 404 (1981).
 - 11) "Recent Experimental Work on Point-Contact dc SQUID," with M.G. Castellano, *Physica* **108B**, 1089 (1981).
 - 12) "Superconducting Tensor Gravity Gradiometer," *Bull. Geod.* **55**, 370 (1981).
 - 13) "Observations with a Low Temperature Resonant Mass Gravitational Radiation Detector," with S.P. Boughn, W.M. Fairbank, R.P. Giffard, J.N. Hollenhorst, E.R.

- Mapoles, M.S. McAshan, P.F. Michelson, and R.C. Taber, *Astrophys. J.* **261**, L19 (1982).
- 14) "Null Test of the Gravitational Inverse Square Law," with H.A. Chan and M.V. Moody, *Phys. Rev. Lett.* **49**, 1745 (1982).
 - 15) "Preliminary Tests of a Newly Developed Superconducting Gravity Gradiometer," with M.V. Moody and H.A. Chan, *IEEE Trans. Mag.* **MAG-19**, 461 (1983).
 - 16) "Geodesy and Gravity Experiment in Earth Orbit Using a Superconducting Gravity Gradiometer," Invited Paper to Special Issue, *IEEE Trans. Geoscience and Remote Sensing* **GE-23**, 524 (1985).
 - 17) "Superconducting Inductance Bridge Transducer for Resonant-Mass Gravitational Radiation Detector," *Phys. Rev. D* **33**, 309 (1986).
 - 18) "Superconducting Gravity Gradiometer for Terrestrial and Space Applications," with M.V. Moody and H.A. Chan, *J. Appl. Phys.* **60**, 4308 (1986).
 - 19) "Superconducting Gravity Gradiometer for Sensitive Gravity Measurements. I. Theory," with H.A. Chan, *Phys. Rev. D* **35**, 3551 (1987).
 - 20) "Superconducting Gravity Gradiometer for Sensitive Gravity Measurements. II. Experiment," with M.V. Moody and H.A. Chan, *Phys. Rev. D* **35**, 3572 (1987).
 - 21) "Global Gravity Survey by an Orbiting Gravity Gradiometer," with J.-S. Leung, S.H. Morgan, and J. Parker, *EOS Trans.* **69**, 1601 (1988).
 - 22) "Noise in a Point-Contact dc SQUID," with K.R. Carroll, *J. Low Temp. Phys.* **75**, 187 (1989).
 - 23) "Tests of General Relativity in Earth Orbit Using a Superconducting Gravity Gradiometer," *Adv. Space Res.* **9**, 41 (1989).
 - 24) "Detection of the Gravitomagnetic Field Using an Orbiting Superconducting Gravity Gradiometer. I. Theoretical Principles," with B. Mashhoon and C.M. Will, *Phys. Rev. D* **39**, 2825 (1989).
 - 25) "White-Noise Measurements and Joule Heating in Superconducting Point Contacts", with K.R. Carroll, *J. Appl. Phys.* **65**, 4333 (1989).
 - 26) "A Superconducting Six-Axis Accelerometer," with E.R. Canavan and J.W. Parke, *IEEE Trans. Mag.* **MAG-27**, 3253 (1991).
 - 27) "Gauss's Law Test of Gravity at Short Range," with M.V. Moody, *Phys. Rev. Lett.* **70**, 1195 (1993).

- 28) "Null Test of the Inverse-Square Law of Gravity," with M.V. Moody, *Class. Quantum Grav.* **11**, A145 (1994).
 - 29) "Detectability of Gravitational Wave Events by Spherical Resonant-Mass Antennas," with G.R. Harry and T.R. Stevenson, *Phys. Rev. D* **54**, 2409 (1996).
 - 30) "Predicted Performance of the Superconducting Gravity Gradiometer on the Space Shuttle," with E.R. Canavan, M.V. Moody, P.J. Shirron, and M.J. DiPirro, *Cryogenics* **36**, 795 (1996).
 - 31) "Mission Concepts for the Superconducting Gravity Gradiometer," with P.J. Shirron, M.J. DiPirro, S.H. Castles, E.R. Canavan, and M.V. Moody, *Cryogenics* **36**, 805 (1996).
 - 32) "Principles of STEP Accelerometer Design," *Class. Quantum Grav.* **13**, A79 (1996).
 - 33) "Superconducting Gravity Gradiometers on STEP and GEM," with J.M. Lumley, *Class. Quantum Grav.* **13**, A119 (1996).
 - 34) "Eötvös, an Inertial Instrument for Testing the Equivalence Principle," with J.-P. Blaser, N. Lockerbie, C. Speake, and S. Vitale, *Class. Quantum Grav.* **13**, A203 (1996).
 - 35) "Superconducting Angular Accelerometers for the Superconducting Gravity Gradiometer Experiment," with P.J. Shirron, M.J. DiPirro, D. Goldstein, E.R. Canavan, and M.V. Moody, *Adv. Cryo. Eng.* **41**, 1829 (1996).
 - 36) "Two-Stage Superconducting Quantum Interference Device (SQUID) Amplifier in a High-Q Gravitational Wave Transducer," with G.M. Harry, I. Jin, T.R. Stevenson, and F.C. Wellstood, *Appl. Phys. Lett.* **76**, 1446 (2000).
 - 37) "Three-Axis Superconducting Gravity Gradiometer for Sensitive Gravity Experiments," with M.V. Moody and E.R. Canavan, *Rev. Sci. Instrum.* **73**, 3957 (2002).
 - 38) "Principle and Performance of a Superconducting Angular Accelerometer," with M.V. Moody and E.R. Canavan, *Rev. Sci. Instrum.* **74**, 1310 (2003).
2. Instrumentation and techniques
- 1) "How to Make High Critical Current Joints in Nb-Ti Wire," with D.G. Blair and R.C. Taber, *Rev. Sci. Instrum.* **46**, 8 (1975).

- 2) "Superconducting Techniques for Gravity Survey and Inertial Navigation," with H.A. Chan, M.V. Moody, and J.W. Parke, *IEEE Trans. Mag.* **MAG-21**, 411 (1985).
3. Review papers
 - 1) "The Search for Gravitational Radiation," with S.P. Boughn, *Mercury* **5**, 9 (1976).
 - 2) "Precision Experiments to Search for the Fifth Force," with J.E. Faller, E. Fischbach, Y. Fujii, K. Kuroda, and C.C. Speake, *IEEE Trans. Instr. Meas.* **38**, 180 (1989).
 - 3) "Superconducting Accelerometry: Its Principles and Applications," *Class. Quantum Grav.* **11**, A133 (1994).

B. Papers Presented at Scientific Meetings

1. Invited papers
 - 1) "Low-Temperature Gravitational Wave Detector," at International School of Physics "Enrico Fermi" (Varenna, Italy, July 1972). Also published in *Experimental Gravitation*, edited by B. Bertotti (Academic Press, New York, 1974).
 - 2) "Superconducting Gravity Gradiometers," at the 7th Moving Base Gravity Gradiometer Review (Colorado Springs, Colorado, February 1979).
 - 3) "Application of Superconducting Technology for Sensitivity Gravity Measurements," at the 1979 Korean Scientists and Engineers Association Washington Conference on Science and Technology (Washington, D.C., May 1979). Also published in the *Proceedings*.
 - 4) "Optimization of gravity measuring instruments and Superconducting Gravity Gradiometer," at the 8th Moving Base Gravity Gradiometer Review (Colorado Springs, Colorado, February 1980).
 - 5) "Superconducting Gravity Gradiometer System," at the 2nd Annual NASA Geodynamics Program Review (Greenbelt, Maryland, February 1980).
 - 6) "Gradiometer Development at the University of Maryland," GRAVSAT User's Working Group Meeting (Greenbelt, Maryland, April 1980).
 - 7) "Superconducting Tensor Gravity Gradiometer with SQUID Readout," at the SQUID Applications to Geophysics Workshop (Los Alamos, New Mexico, June

- 1980). Also published in the *Proceedings*.
- 8) "Superconducting Tensor Gravity Gradiometer, Gravity Gradiometer Workshop for POLO Mission (Washington, D.C., January 1981).
 - 9) "Superconducting Gravity Gradiometer," at the 9th Moving Base Gravity Gradiometer Review (Colorado Springs, Colorado, March 1981).
 - 10) "Superconducting Tensor Gravity Gradiometer," at the 2nd International Symposium on Inertial Technology for Surveying and Geodesy (Banff, Canada, June 1981). Also published in the *Proceedings*, edited by K.-P. Schwarz (Canada Institute of Surveying, Ottawa, 1981).
 - 11) "A Spaceborne Superconducting Gravity Gradiometer for Mapping the Earth's Gravity Field," at the 1981 International Geoscience and Remote Sensing Symposium (Washington, D.C., June 1981). Also published in *IGARSS '81 Digest*.
 - 12) "Current Gravity Gradiometer Development," at the Workshop of the GRAVSAT Users Data Analysis Group (Greenbelt, Maryland, June 1982).
 - 13) "A Null Test of the Gravitational Inverse Square Law," at the 3rd Marcel Grossmann Meeting on Recent Developments of General Relativity (Shanghai, China, September 1982). Also published in the *Proceedings*.
 - 14) "Superconducting Gravity Gradiometer," at the 11th Moving Base Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1983).
 - 15) "Gravity Gradiometer Development at the University of Maryland," at the Spaceborne Gravity Gradiometer Workshop (Greenbelt, Maryland, February 1983).
 - 16) "Superconducting Gravity Gradiometer for Spaceborne Geodesy," at American Geophysical Union Meeting (Baltimore, Maryland, June 1983).
 - 17) "Three-Axis Superconducting Gravity Gradiometer," at the 12th Moving Base Gravity Gradiometer Review (Colorado Springs, Colorado, February 1984).
 - 18) "Three-Axis Superconducting Gravity Gradiometer for Spaceborne Gravity Survey," with H.A. Chan, M.V. Moody and J.W. Parke, at American Geophysical Union Meeting (Cincinnati, Ohio, May 1984).
 - 19) "Flight Test Program and the Gravity Gradiometer Mission," at the GRM (Geopotential Research Mission) Conference (College Park, Maryland, October 1984).
 - 20) "Review of Superconducting Accelerometer and Gravity Gradiometer Research at

the University of Maryland," at the 13th Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1985).

- 21) "Geodesy and Precision Gravity Experiments in Earth Orbit Using a Superconducting Gravity Gradiometer," at American Geophysical Union Meeting (Baltimore, Maryland, May 1985).
- 22) "Fully Integrated Superconducting Instrument for Gravity and Inertial Survey," at the 3rd International Symposium on Inertial Technology for Surveying and Geodesy (Banff, Canada, September 1985).
- 23) "Applications of Superconducting Gravity Gradiometer System Toward Inertial Guidance and Fundamental Science," with H.A. Chan and M.V. Moody, at the 14th Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1986).
- 24) "Superconducting Gravity Gradiometer for Geophysical Survey," at the Center for Potential Fields Studies Topical Seminar: Gravity and Magnetic Gradiometry (LaHabra, California, February 1986).
- 25) "Terrestrial Experiments to Test Theories of Gravitation," Symposium Chairman's Review at the 11th International Conference on General Relativity and Gravitation (Stockholm, Sweden, July 1986).
- 26) "Superconducting Six-Axis Accelerometer," at the NASA Workshop on the Measurement and Characterization of the Acceleration Environment on Board the Space Station (Guntersville, Alabama, August 1986).
- 27) "Superconducting Gravity Gradiometer Instrument: Principle and Status," at the Superconducting Gravity Gradiometer Scientific Workshop (Colorado Springs, Colorado, February 1987).
- 28) "Tests of General Relativity in Earth Orbit Using a Superconducting Gravity Gradiometer," at the 15th Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1987).
- 29) "Superconducting Gravity Gradiometer for Space and Terrestrial Applications," with J.W. Parke and M.V. Moody, at the Conference of the International Association of Geodesy (Vancouver, Canada, August 1987).
- 30) "Laboratory and Geophysical Experiments on Gravitation - an Overview," Chairman's Summary at the International Symposium on Experimental Gravitational Physics, (Guangzhou, China, August 1987). Also published in the *Proceedings* (World Scientific, Singapore, 1988).
- 31) "Global Gravity Survey by an Orbiting Gravity Gradiometer," with J.-S. Leung, S.H. Morgan and J. Parker in the special session "Geodesy in the Year 2000," at

- the American Geophysical Union Meeting (San Francisco, California, December 1987). Also published in *The National Academy of Sciences Report* (1988).
- 32) "Distance Dependence of Gravity Force," at the 1988 Conference on Precision Electromagnetic Measurements (Tsukuba Science City, Japan, June 1988).
 - 33) "Earth-Orbiting Resonant-Mass Detectors of Gravitational Waves," at the Workshop on Relativistic Gravitational Experiments in Space (Annapolis, Maryland, June 1988). Also published in the *Proceedings*.
 - 34) "Superconducting Gravity Gradiometer and a Test of the Inverse Square Law," with M. V. Moody, at the Workshop on Relativistic Gravitational Experiments in Space (Annapolis, Maryland, June 1988). Also published in the *Proceedings*.
 - 35) "Resonant-Mass Gravitational Wave Detectors: An Overview," at the International Workshop on Gravitational Wave Signal Analysis and Processing (Amalfi, Italy, July 1988). Also published in the *Proceedings*.
 - 36) "Sensitivity and Bandwidth of Resonant-Mass Gravitational Wave Detectors," at the International Workshop on Gravitational Wave Signal Analysis and Processing (Amalfi, Italy, July 1988). Also published in the *Proceedings*.
 - 37) "Tests of General Relativity in Earth Orbit Using a Superconducting Gravity Gradiometer," at the 27th Plenary Meeting of the Committee on Space Research (Helsinki, Finland, July 1988).
 - 38) "Superconducting Gravity Gradiometer Mission," at the International School of Geodesy: Interdisciplinary Role of Space Geodesy (Erice, Italy, July 1988).
 - 39) "Tests of General Relativity Using a Superconducting Gravity Gradiometer in Earth Orbit," at the 5th Marcel Grossmann Meeting on General Relativity (Perth, Australia, August 1988). Also published in the *Proceedings*, edited by D.G. Blair and M.J. Buckingham (World Scientific, Singapore, 1989).
 - 40) "Detection of the Gravitomagnetic Field and Test of the Inverse Square Law in Earth Orbit," at the 6th Oregon Conference on Low Temperature Physics (Eugene, Oregon, September 1989).
 - 41) "Gravity Mapping Using an Orbiting Superconducting Gravity Gradiometer," at the 6th Oregon Conference on Low Temperature Physics (Eugene, Oregon, September 1989).
 - 42) "Superconducting Gravity Gradiometer Mission," with S.H. Morgan, at the 1st William Fairbank Meeting on Relativistic Gravitational Experiments in Space, (Rome, Italy, September 1990). Also published in the *Proceedings* (World Scientific, Singapore, 1991).

- 43) "Laboratory Demonstrations of Superconducting Gravity and Inertial Sensors for Space and Airborne Gravity Measurements," with E.R. Canavan, Q. Kong, and M.V. Moody, at the International Union of Geophysics and Geodesy Meeting (Vienna, Austria, August 1991). Also published in *From Mars to Greenland: Charting Gravity with Space and Airborne Instruments - Fields, Tides, Methods, Results*, edited by O.L. Colombo (Springer-Verlag, New York, 1992).
- 44) "Superconducting Gravity Gradiometers," Invited talk to the Committee on Geodesy, National Academy of Sciences (Washington, D.C., April 1992).
- 45) "Workshop C1 - Gravitational Wave Experiments," with W.O. Hamilton, at the 13th International Conference on General Relativity and Gravitation (Cordoba, Argentina, July 1992). Also published in the *Proceedings*.
- 46) "Constant of Gravity and Inverse-Square Law Experiments on STEP," with J.-P. Blaser, at the STEP Symposium (Pisa, Italy, April 1993). Also published in the *Proceedings*.
- 47) "Superconducting Gravity Gradiometers on STEP," at the STEP Symposium (Pisa, Italy, April 1993). Also published in the *Proceedings*.
- 48) "Superconducting Inductive Transducer for Ultralow Temperature Gravitational-Wave Detectors," at Cryogenic Gravitational Wave Antennas: Progressive Workshop (Padova, Italy, June 1993).
- 49) "Gravity Gradiometer Instrumentation: Progress Report," at the International Symposium on Experimental Gravitation (Nathiagali, Pakistan, June 1993).
- 50) "Null Test of the Inverse-Square Law," at the International Symposium on Experimental Gravitation (Nathiagali, Pakistan, June 1993).
- 51) "Superconducting Gravity Gradiometers: An Overview," at the Workshop on High- T_c Superconducting Gravity Gradiometers (Enschede, Netherlands, November 1993).
- 52) "Resonant-Mass Gravitational-Wave Detectors," at the International Workshop on Gravitation and Fifth Force (Seoul, Korea, December 1993).
- 53) "Composition-Independent Search for a Fifth Force," at the International Workshop on Gravitation and Fifth Force (Seoul, Korea, December 1993).
- 54) "Electromechanical Transducers and Bandwidth of Resonant-Mass Gravitational-Wave Detectors," at the 1st Edoardo Amaldi Conference on Gravitational Wave Experiments (Frascati, Italy, June 1994). Also published in the *Proceedings*.

- 55) "Passive Superconducting Transducers for Bar and Sphere Gravitational-Wave Detectors," at the 7th Marcel Grossmann Meeting on General Relativity (Stanford, California, July 1994).
- 56) "Superconducting Accelerometers, Gravitational-Wave Transducers, and Gravity Gradiometers," at the American Physical Society Meeting (San Jose, California, March 1995).
- 57) "Superconducting Accelerometers, Gravitational-Wave Transducers, and Gravity Gradiometers," invited lectures at the NATO ASI on SQUID Sensors: Fundamentals, Fabrication and Applications (Maratea, Italy, June 1995).
- 58) "High Resolution Mapping Missions with Superconducting Gravity Gradiometers," at the IUGG XXI General Assembly (Boulder, Colorado, July 1995).
- 59) "Superconducting Gravity Gradiometers on STEP," at the Symposium on Fundamental Physics in Space (London, England, October 1995).
- 60) "Orbital Performance of a Superconducting Gravity Gradiometer: Resolving the Static and Dynamic Components of the Earth's Field," with B.G. Bills, at the American Geophysical Union Meeting (San Francisco, California, December 1995).
- 61) "Superconducting Gravity Gradiometer for Airborne Survey," with E.R. Canavan, M.V. Moody, R.V. Duncan, and J.A. Demko, at the American Geophysical Union Meeting (San Francisco, California, December 1995).
- 62) "Superconducting Gravity Gradiometers: I. Design and Operating Principles," at the American Geophysical Union Meeting (San Francisco, California, December 1995).
- 63) "Superconducting Gravity Gradiometers: II. Performance and Applications," with M.V. Moody, at the American Geophysical Union Meeting (San Francisco, California, December 1995).
- 64) "Orbital Gravity Gradiometry: Flight Instrument Design and Error Budget," with M.V. Moody, at the American Geophysical Union Meeting (San Francisco, California, December 1995).
- 65) "Spheres: Omni-Directional Multi-Mode Gravitational Wave Antennas for Next Generation," at the Pacific Conference on Gravitation and Cosmology (Seoul, Korea, February 1996). Also published in the *Proceedings*.
- 66) "Spheres: Omni-Directional Multi-Mode Gravitational Wave Antennas for Next Generation," at the American Physical Society Meeting (Indianapolis, Indiana, May 1996).

- 67) "General Design Principles for Superconducting Differential Accelerometers," with J.-P. Blaser and S. Vitale, at the COSPAR Symposium on Fundamental Physics in Space (Birmingham, England, July 1996). Also published in the *Proceedings*.
- 68) "Search for New Forces Using Superconducting Accelerometers," at the International Workshop on Gravitation and Astrophysics (Tokyo, Japan, November 1997). Also published in the *Proceedings*.
- 69) "Superconducting Accelerometers for Gravitational Wave Detection and Precision Gravity Experiments," at the 4th High-Temperature Superconductivity Workshop (Twente, Netherlands, May 1998). Also published in the *Proceedings*.
- 70) "Precision Gravity Experiments Using Superconducting Accelerometers," at the 4th international Workshop on Gravitation and Astrophysics (Beijing, China, October 1999). Also published in the *Proceedings*.
- 71) "Precision Measurements of the Gravitational Constant Using Low Temperature Techniques," at an invited session "Modern G Measurements" at the American Physical Society Meeting (Long Beach, California, May 2000).
- 72) "Null Test of Newton's Law of Gravity in the Millimeter Range," at the 9th Marcel Grossmann Meeting on General Relativity (Rome, Italy, July 2000).
- 73) "Precision Gravity Experiments to Test Predictions Beyond General Relativity and the Standard Model of Particle Physics," at the 50th Year Anniversary Meeting of the Korean Physical Society (Seoul, Korea, October 2002).

2. Colloquia, seminars, and special lectures

- 1) "Stanford Cryogenic Gravitational Wave Experiment," at the University of Tokyo (Tokyo, Japan, August 1976).
- 2) "Application of Cryogenic Technology in Gravitational Wave Experiment," at Seoul National University (Seoul, Korea, August 1976).
- 3) "Superconducting Tunable-Diaphragm Transducer for Experimental Gravitation," at Bell Telephone Laboratories (Murray Hill, New Jersey, April 1977).
- 4) "Gravitational Field Measurements Using Low Temperature Techniques," at the University of Maryland (College Park, Maryland, March 1978).
- 5) "Gravitational Field Measurements Using Low Temperature Techniques," at Louisiana State University (College Park, Maryland, April 1978).

- 6) "Superconducting Gravity Gradiometers for Geological Applications," at Bellaire Research Center, Shell Development Company (Houston, Texas, April 1978).
- 7) "One, Two, and Three Dimensional Gravitational Wave Antennas and New Test of Gravitational Inverse Square Law," at California Institute of Technology (Pasadena, California, April 1978).
- 8) "A Null Test of the Inverse Square Law of Gravitation," at University of California, Irvine (Irvine, California, April 1978).
- 9) "A Source Independent Null Test of the Inverse Square Law of Gravitation," at University of Utah (Salt Lake City, Utah, July 1978).
- 10) "A Drag-Free Geodesy Satellite with Superconducting Gravity Gradiometer Assembly as Proof Mass," at Applied Physics Laboratory, Johns Hopkins University (Laurel, Maryland, March 1979).
- 11) "Cryogenic Technology for Measurements of Gravitational Fields," at the National Bureau of Standards (Gaithersburg, Maryland, April 1979).
- 12) "The Super Cooled Gravity Gradiometer," at the NASA Headquarters (Washington, D.C., October 1979).
- 13) "Review of the 2nd Marcel Grossmann Meeting," at the University of Maryland (College Park, Maryland, October 1979).
- 14) "Introduction to the Physics of Superconducting Quantum Interference Devices," as series of three seminars at the University of Maryland (College Park, Maryland, October 1979).
- 15) "Introduction to the Physics of Superconducting Quantum Interference Devices," at Johns Hopkins University (Baltimore, Maryland, October 1979).
- 16) "Applications of Superconducting Technology for Sensitive Gravitational Measurements," at Marshall Space Flight Center (Huntsville, Alabama, November 1979).
- 17) "Quantum-Limited dc SQUID: Theory and Design," University of Tokyo (Tokyo, Japan, August 1980).
- 18) "Null Test of Gravitational Inverse Square Law," University of Tokyo (Tokyo, Japan, August 1980).
- 19) "Gravitational Radiation Experiment," Seoul National University (Seoul, Korea, August 1980).

- 20) "Present Status and Future Prospects of Gravitational Radiation Detection," Relativity Seminar, University of Maryland (College Park, Maryland, October 1980).
- 21) "Recent Experimental Work on Point-Contact dc SQUID," at National Bureau of Standards (Boulder, Colorado, March 1981).
- 22) "Superconducting Gravity Gradiometer for Remote Sensing and Geoscience," at National Bureau of Standards (Boulder, Colorado, March 1981).
- 23) "Development of Superconducting Gravity Gradiometer," at the 4th Annual Conference on the NASA Geodynamics Program (Greenbelt, Maryland, January 1982).
- 24) "Precision Null Test of the Inverse Square Law of Gravitation," Colloquium at National Bureau of Standards (Gaithersburg, Maryland, February 1982).
- 25) "Preliminary Test Results of a Superconducting Gravity Gradiometer," at the Applied Physics Laboratory, Johns Hopkins University (Laurel, Maryland, June 1982).
- 26) "Status Report of Cryogenic Gravity Gradiometer," at Marshall Space Flight Center (Huntsville, Alabama, June 1982).
- 27) "A Null Test of the Gravitational Inverse Square Law," Colloquium at Seoul National University (Seoul, Korea, August 1982).
- 28) "A Null Test of the Gravitational Inverse Square Law," at the University of Tokyo (Tokyo, Japan, September 1982).
- 29) "Encountering the Law of Gravity," Colloquium at the University of Maryland (College Park, Maryland, September 1982).
- 30) "Progress Report on the University of Maryland Gravitational Radiation Program," at the Workshop on SS433 and Gravitational Radiation (Rome, Italy, July 1983).
- 31) "Null Test of the Gravitational Inverse Square Law Using a Spaceborne Gravity Gradiometer," at NASA Headquarters (Washington, D.C., October 1983).
- 32) "Test of Newton's Law of Gravity Using a Superconducting Gravity Gradiometer," Seminar at University of Michigan (Ann Arbor, Michigan, November 1983).
- 33) "Experimental Search for Violations of the Gravitational Inverse Square Law," at the University of Maryland (College Park, Maryland, February 1984).

- 34) "Applications and Prospects of the Superconducting Gravity Gradiometer," at Army Engineers Topographic Laboratory (Fort Belvoir, Virginia, February 1985).
- 35) "Superconducting Gravity Gradiometer for Spaceborne Geodesy and Orbital Gravity Experiments," at NASA Headquarters (Washington, D.C., May 1985).
- 36) "Superconducting Gravity Gradiometer: Instrument Concept and Platform Requirements," at Marshall Space Flight Center (Huntsville, Alabama, October 1985).
- 37) "Some New Ideas on Gravitational Radiation Detection," Relativity Seminar at the University of Maryland (College Park, Maryland, November 1985).
- 38) "Search for a Fifth Force Using a Superconducting Gravity Gradiometer," Department Colloquium at the University of California (Santa Barbara, California, February 1986).
- 39) "Search for a Fifth Force Using a Superconducting Gravity Gradiometer," Department Colloquium at the University of Maryland (Baltimore County, Maryland, March 1986).
- 40) "Search for a Fifth Force in Nature," UM Physics Seminar, at the University of Maryland (College Park, Maryland, April 1986).
- 41) "Superconducting Gravity Gradiometer and Its Applications," Seminar at the Aerospace Engineering Department, University of Maryland (College Park, Maryland, May 1986).
- 42) "Experimental Search for a Fifth Force in Nature," Special Lecture for TV Audience, Filmed by KBS TV from Seoul, Korea (June 1986).
- 43) "NASA Gravity Gradiometer Project," Briefing to the Committee on Geodesy, at the National Academy of Sciences (Washington, D.C., September 1986).
- 44) "Search for a Fifth Force," at Harvard-Smithsonian Institute for Astrophysics (Boston, Massachusetts, October 1986).
- 45) "Superconducting Gravity Gradiometer and Superconducting Six-Axis Accelerometer," at the Air Force Geophysics Laboratory, (Hanscom Air Force Base, Massachusetts, October 1986).
- 46) "Search for a Fifth Force," Relativity Seminar at the University of Maryland (College Park, Maryland, November 1986).
- 47) "Search for a Fifth Force," at the Washington University (St. Louis, Missouri, November 1986).

- 48) "Search for Gravitational Waves: Current Status," at the University of Missouri (Columbia, Missouri, November 1986).
- 49) "Encountering the Law of Gravity," Departmental Colloquium at the University of Missouri (Columbia, Missouri, November 1986).
- 50) "New Test of General Relativity in Earth Orbit," at the University of Virginia (Charlottesville, Virginia, March 1987).
- 51) "Encountering the Law of Gravity," Departmental Colloquium at the University of Virginia (Charlottesville, Virginia, March 1987).
- 52) "Fundamental Gravity Experiments in Earth Orbit Using a Superconducting Gravity Gradiometer," at NASA Headquarters (Washington, D.C., June 1987).
- 53) "Superconducting Gravity Gradiometers: Principles and Status," at the Institute of Geodesy and Geophysics, Chinese Academy of Sciences (Wuhan, China, July 1987).
- 54) "Geodesy and Precision Gravity Experiments in Earth Orbit Using a Superconducting Gravity Gradiometer," at the Institute of Geodesy and Geophysics, Chinese Academy of Sciences (Wuhan, China, July 1987).
- 55) "New Tests of General Relativity in Earth Orbit," Relativity Seminar at the University of Maryland (College Park, Maryland, November 1987).
- 56) "Detection of the Lense-Thirring Effect Using an Orbiting Superconducting Gravity Gradiometer," at Stanford University (Stanford, California, December 1987).
- 57) "Superconducting Inertial Instruments for Gravity Survey and Navigation," at a Special Meeting on the Applications of High-Temperature Superconductivity, DARPA (Arlington, Virginia, February 1988).
- 58) "Precision Test of the Gravitational Inverse Square Law in Search for New Forces," Departmental Colloquium at Purdue University (West Lafayette, Indiana, March 1988).
- 59) "Gravity Experiments at the University of Maryland," at the University of Tokyo (Tokyo, Japan, June 1988).
- 60) "Search for the Fifth Force by Using Sensitive Superconducting Gravity Gradiometer," Relativity Seminar at the University of Maryland (College Park, Maryland, November 1988).
- 61) "Principles of Gravity Gradient Detection," Experimental Relativity Seminar at the

- University of Maryland (College Park, Maryland, September 1989).
- 62) "General Description of Errors," Experimental Relativity Seminar at the University of Maryland (College Park, Maryland, November 1989).
 - 63) "Investigation of Instrument Noise and Errors," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, December 1989).
 - 64) "Null Test of the Gravitational Inverse Square Law - Errors," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, February 1990).
 - 65) "Null Test of the Gravitational Inverse Square Law - Data and Results," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, March 1990).
 - 66) "Improved Null Experiment with Modified Gravity Source," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, September 1990).
 - 67) "Superconducting Transducer for 50mK Gravitational Wave Detector," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, October 1990).
 - 68) "SGG Flight Test of the European Retrievable Carrier (EURECA)," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, February 1991).
 - 69) "Lunar Gravity Mission with a Superconducting Gravity Gradiometer," Experimental Relativity Seminar, University of Maryland (College Park, Maryland, April 1991).
 - 70) "Superconducting Gravity Gradiometer for Airborne Gravity Survey," at Bellaire Research Center, Shell Development Company (Houston, Texas, May 1991).
 - 71) "Superconducting Gravity Gradiometer for Airborne Gravity Survey," at Dallas Potential Fields Group Meeting (Dallas, Texas, October 1991).
 - 72) "Superconducting Gravity Gradiometer for Airborne Gravity Survey," at Houston Potential Fields Group Meeting (Houston, Texas, November 1991).
 - 73) "Superconducting Gravity Gradiometer for Space and Airborne Gravity Survey," at Delft University of Technology (Delft, Netherlands, May 1992).
 - 74) "New Null Test of the Gravitational Inverse Square Law Using a Superconducting Gravity Gradiometer," at Stanford University (Stanford, California, July 1992).

- 75) "Gauss's Law Test of Gravity at Short Range," at the University of Washington (Seattle, Washington, August 1992).
- 76) "Testing the Validity of the Law of Gravitation," Departmental Colloquium at West Virginia University (Morgantown, West Virginia, October 1992).
- 77) "Superconducting Gravity Gradiometers: Application in Geodesy and Gravitational Physics," at Eidgenössische Technische Hochschule (Zürich, Switzerland, November 1992).
- 78) "New Limits on Vacuum Curvature on One Meter Scale," Departmental Colloquium at the University of Maryland (College Park, Maryland, March 1993).
- 79) "Superconducting Accelerometry: Its Principles and Applications," at Pohang Institute of Technology (Pohang, Korea, July 1993).
- 80) "Gauss's Law Test of Gravity," at Pohang Institute of Technology (Pohang, Korea, July 1993).
- 81) "Resonant-Mass Gravitational-Wave Detectors," at Hanyang University (Seoul, Korea, July 1993).
- 82) "Gauss's Law Test of Gravity," at Seoul National University (Seoul, Korea, July 1993).
- 83) "Resonant-Mass Gravitational-Wave Detectors," at Seoul National University (Seoul, Korea, July 1993).
- 84) "Superconducting Gravity Gradiometers: An Overview," at the University of Gotenburg (Gotenburg, Sweden, November 1993).
- 85) "Resonant-Mass Gravitational Wave Detectors," at Kamelingh Onnes Laboratory (Leiden, Netherlands, March 1994).
- 86) "Superconducting Gravity Gradiometers at the University of Maryland," at Sandia National Laboratories (Albuquerque, New Mexico, September 1994).
- 87) "Gauss's Law Test of Gravity," at the University of New Mexico (Albuquerque, New Mexico, September 1994).
- 88) "Spherical Gravitational-Wave Antenna," at the University of New Mexico (Albuquerque, New Mexico, September 1994).
- 89) "Superconducting Gravity Gradiometers: Designs and Applications," Colloquium at Applied Physics Laboratory, Johns Hopkins University (Columbia, Maryland,

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- 90) "Omni-Directional Search for Gravitational Waves Using a Sphere: A Complement to Laser Interferometers," at California Institute of Technology (Pasadena, California, April 1996).
- 91) "Superconducting Gravity Gradiometer Project at Maryland," at the Summer Workshop of American Association of Physics Teachers (College Park, Maryland, August 1996).
- 92) "Search for Axions Using a High-Q Torsional Detector," Superconductivity Seminar, University of Maryland (College Park, Maryland, April 1997).
- 93) "Development of SGG Survey System," at Lamont-Doherty Earth Observatory (Palisades, New York, May 1997).
- 94) "Search for Axions Using a High-Q Torsional Detector," at the University of Colorado (Boulder, Colorado, June 1997).
- 95) "Development of SGG Survey System," at the Naval Research Laboratory (Washington, D.C., August 1997).
- 96) "Search for Axions Using a High-Q Torsional Detector," at the University of Virginia (Charlottesville, Virginia, September 1997).
- 97) "Search for Axion-Like Particles Using a Superconducting Differential Accelerometer," Joint Gravitation/High Energy Physics Seminar at the University of Maryland (College Park, Maryland, November 1998).
- 98) "Does Newton's Law Break Down at mm Ranges?" Joint Gravitation/Elementary Particle Physics Seminar at the University of Maryland (College Park, Maryland, November 1999).
- 99) "Precision Gravity Experiments on ISS and Vibration Isolation Requirements," at Jet Propulsion Laboratory (Pasadena, California, January 2001).
- 100) "Spheres - Omni-Directional Gravitational-Wave Antennas for Next Generation," Invited Lecture at INPE (Sao Jose dos Campos, Brazil, March, 2001).
- 101) "Electromechanical Transducers and Bandwidth of Resonant-Mass Gravitational-Wave Detectors," Invited Lecture at INPE (Sao Jose dos Campos, Brazil, March, 2001).
- 102) "Superconducting Inductive Transducers for Bar and Sphere Gravitational-Wave Detectors," Invited Lecture at INPE (Sao Jose dos Campos, Brazil, March, 2001).

- 103) "Search for a String-Theory Predicted Violation of Gravitational Inverse-Square Law," Gravitation Seminar at the University of Maryland (College Park, Maryland, May 2001).
- 104) "Search for a String-Theory Predicted Violation of Gravitational Inverse-Square Law," at the Ajoo University (Soowon, Korea, June 2001).
- 105) "Spin-Mass Interaction Low-temperature Experiment (SMILE) and Inverse-Square Law Experiment in Space (ISLES)," at Ball Aerospace (Boulder, Colorado, February 2002).
- 106) "Short-Range Inverse-Square Law Experiment in Space (ISLES)," at the University of Washington (Seattle, Washington, May 2002).
- 107) "Superconducting Accelerometers for Gravitational Wave Detection and Precision Gravity Experiments," at Jet Propulsion Laboratory (Pasadena, California, July 2002).

3. Contributed papers

- 1) "Superconducting Tunable-Diaphragm Transducer for Sensitive Gravitational Radiation Detector," Bull. Am. Phys. Soc. 20, 100 (1975).
- 2) "Cryogenic Gravitational Radiation Detector," with S.P. Boughn, W.M. Fairbank, M.S. McAshan, R.C. Taber, and R.P. Giffard, Bull. Am. Phys. Soc. 20, 100 (1975).
- 3) "Response of a Disk Antenna to Scalar and Tensor Gravitational Waves," Bull. Am. Phys. Soc. 21, 1308 (1976).
- 4) "Superconducting 'Tensor' Gravity Gradiometer for Geophysical and Navigational Applications," with H.A. Chan and J.-P. Richard, 1980 Applied Superconductivity Conference (Santa Fe, New Mexico, September, 1980).
- 5) "Status of dc SQUID Development at Maryland," at the 10th Texas Symposium on Relativistic Astrophysics (Baltimore, Maryland, December 1981).
- 6) "Development of Superconducting Gravity Gradiometer," with H.A. Chan and M.V. Moody, at the 4th Annual Conference on the NASA Geodynamics Program (Greenbelt, Maryland, January 1982).
- 7) "Development of Point-Contact dc SQUID to Reach the Quantum Limit of a 1 KHz Gravitational Wave Detector," at the Third Marcel Grossmann Meeting on Recent Developments of General Relativity (Shanghai, China, September 1982).

- 8) "Superconducting Gravity Gradiometer," at the Annual NASA Geodynamics Program Review (Washington, D.C., January 1983).
- 9) "Progress Report on the University of Maryland Gravitational Radiation Program," at the Workshop on SS433 and Gravitational Radiation (Rome, Italy, July 1983).
- 10) "The Gravity Wave Antenna Program at Maryland," at the 10th International Conference on General Relativity and Gravitation (Padova, Italy, July 1983).
- 11) "Null Test of the Inverse Square Law in the Earth's Orbit," at the 10th International Conference on General Relativity and Gravitation (Padova, Italy, July 1983).
- 12) "Superconducting Gravity Gradiometer with SQUID Readout," at the Workshop on SQUIDS and Motion Transducers (Boulder, Colorado, March 1984).
- 13) "Test of Gravitational Inverse Square Law Using an Orbiting Gravity Gradiometer," with J. Murphy, EOS Trans. 65, 196 (1984).
- 14) "Superconducting Accelerometers and Gravity Gradiometers," at the 10th International Cryogenic Engineering Conference (Helsinki, Finland, July 1984).
- 15) "Precision Gravity Experiments in Earth Orbit Using a Superconducting Gravity Gradiometer," at the Pacific Coast Gravity Meeting (Pasadena, California, March 1985).
- 16) "Development of Superconducting Gravity Gradiometer for Space Applications," with H.A. Chan and M.V. Moody, at the 14th Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1986).
- 17) "Platform Requirements and Error Composition for a Superconducting Gravity Gradiometer," at the 14th Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1986).
- 18) "Development of Superconducting Gravity Gradiometer for Space Applications," with H.A. Chan, Q. Kong, M.V. Moody, and J.W. Parke, at the American Geophysical Union Meeting (Baltimore, Maryland, May 1986).
- 19) "Platform Requirements and Error Compensation for a Superconducting Gravity Gradiometer," at the American Geophysical Union Meeting (Baltimore, Maryland, May 1986).
- 20) "Search for Medium-Range Force with Null Detector and Symmetric Source," with H.A. Chan and M.V. Moody, at the 11th International Conference on General Relativity and Gravitation (Stockholm, Sweden, July 1986).
- 21) "Wideband Detection of Gravitational Radiation Using Non-Resonant Mechanical

- Amplification," at the 11th International Conference on General Relativity and Gravitation (Stockholm, Sweden, July 1986).
- 22) "Superconducting Six-Axis Accelerometer for Inertial Instrumentation," with J.W. Parke, at the Applied Superconductivity Conference (Baltimore, Maryland, September 1986).
 - 23) "Versatile Gravity Gradiometer with New Superconducting Technology," with H.A. Chan, Q. Kong, and M.V. Moody, at the Applied Superconductivity Conference (Baltimore, Maryland, October 1986).
 - 24) "Development of a Three-Axis Superconducting Gravity Gradiometer and a Six-Axis Superconducting Accelerometer," with M.V. Moody, H.A. Chan, Q. Kong, and J.W. Parke, at the 15th Gravity Gradiometer Conference (Colorado Springs, Colorado, February 1987).
 - 25) "Progress of a Null Test of the Inverse Square Law," at the International Symposium on Experimental Gravitational Physics (Guangzhou, China, August 1987).
 - 26) "Three-Axis Superconducting Gravity Gradiometer - Progress Report," with M.V. Moody, Q. Kong, and J.W. Parke, at the 16th Gravity Gradiometry Conference (Colorado Springs, Colorado, February 1988).
 - 27) "Global Gravity Survey and Precision Gravity Experiments by an Earth Orbiting Gravity Gradiometer," with J.S. Leung, S.H. Morgan, and J. Parker, at the 16th Gravity Gradiometry Conference (Colorado Springs, Colorado, February 1988).
 - 28) "Superconducting Six-Axis Accelerometer for Platform Stabilization in Sensitive Gravity Experiments," with E.R. Canavan and J.W. Parke, at the 12th International Conference on General Relativity and Gravitation (Boulder, Colorado, July 1989).
 - 29) "Electrical Quality Factor in a Gravitational Wave Transducer," with K.R. Carol, at the 12th International Conference on General Relativity and Gravitation (Boulder, Colorado, July 1989).
 - 30) "Development of the Model III Superconducting Gravity Gradiometer," with M.V. Moody and Q. Kong, at the 17th Gravity Gradiometry Conference (Hanscom Air Force Base, Massachusetts, October 1989).
 - 31) "Development of a Superconducting Six-Axis Accelerometer," with E.R. Canavan and J.W. Parke, at the 17th Gravity Gradiometry Conference (Hanscom Air Force Base, Massachusetts, October 1989).
 - 32) "Superconducting Gravity Gradiometer Mission - An Overview," at the 17th Gravity Gradiometry Conference (Hanscom Air Force Base, Massachusetts,

October 1989).

- 33) "A Superconducting Gravity Gradiometer," at the 1st William Fairbank Meeting on Relativistic Gravitational Experiments in Space (Rome, Italy, September 1990).
- 34) "SREP - a Short-Range Equivalence Principle Experiment," at the STEP Symposium (Pisa, Italy, April 1993).
- 35) "Satellite Tests of the Inverse Square Law: the ISLAND and LORE proposals," at the International Symposium on Future Fundamental Physics Missions in Space and Enabling Technologies (El Escorial, Spain, April 1994).
- 36) "Status and Expected Performance of Dynamic Alignment of Accelerometers," at the 2nd STEP Workshop (Mürren, Switzerland, February 1995).
- 37) "Status and Requirements for the G/ISL Experiment," at the 2nd STEP Workshop (Mürren, Switzerland, February 1995).
- 38) "High Resolution Gravity Measurement: I. Establishing a Baseline for Global Change," with B.G. Bills, at the American Geophysical Union Meeting (Baltimore, Maryland, May 1995).
- 39) "High Resolution Gravity Measurement: II. Instrument Concept," with E.R. Canavan and M.V. Moody, at the American Geophysical Union Meeting (Baltimore, Maryland, May 1995).
- 40) "Detectability of a Neutron Star Coalescence in a Spherical Resonant-Mass Detector: A Numerical Simulation," with G.M. Harry and T.R. Stevenson, at the Conference on Astrophysical Sources of Gravitational Waves (Penn State University, Pennsylvania, July 1995).
- 41) "A Novel Superconducting Gravity Gradiometer for GEM," with J.M. Lumley, at the Symposium on Fundamental Physics in Space (London, England, October 1995).
- 42) "GEOID Mission: Instrument and Error Budget," with E.R. Canavan and M.V. Moody, at the American Geophysical Union Meeting (Baltimore, Maryland, May 1996).
- 43) "Precision Measurements of the Gravitational Constant Using Low Temperature Techniques," at the 9th Marcel Grossmann Meeting on General Relativity (Rome, Italy, July 2000).
- 44) "Short-Range Inverse-Square Law Experiment in Space," with M.V. Moody and D.M. Strayer, at the 2002 World Space Congress (Houston, Texas, October 2002).

- 45) "Spin-Mass Interaction Low-Temperature Experiment on ISS," with J. Lee, M.V. Moody and D.M. Strayer, at the 2002 World Space Congress (Houston, Texas, October 2002).

C. Books or Contributions to Edited Books

- 1) "The Use of Cryogenic Techniques to Achieve High Sensitivity in Gravitational Wave Detectors," with S.P. Boughn, W.M. Fairbank, M.S. McAshan, R.C. Taber, T.P. Bernat, D.G. Blair, and W.O. Hamilton, in *Gravitational Radiation and Gravitational Collapse*, edited by C. DeWitt-Morette (1973).
- 2) "Search for Gravitational Radiation Using Low Temperature Techniques," with W.M. Fairbank, S.P. Boughn, M.S. McAshan, J.E. Opfer, R.C. Taber, W.O. Hamilton, B. Pipes and T. Bernat, in *Experimental Gravitation*, edited by B. Bertotti (Academic Press, New York, 1974), p. 294.
- 3) "Experimental Test of a Spatial Variation of the Newtonian Gravitational Constant at Large Distances," with H.A. Chan in *Precision Measurement and Fundamental Constants II*, edited by B.N. Taylor and W.D. Phillips, Natl. Bur. Stand. (U.S.) Spec. Publ. 617 (1984), p. 601.
- 4) "Nero Zero: Toward a Quantum-Limited Resonant-Mass Gravitational Radiation Detector," with P.F. Michelson, M. Bassan, S. Boughn, R.P. Giffard, J.N. Hollenhorst, E.R. Mapoles, M.S. McAshan, B.E. Moskowitz, and R.C. Taber, in *Near Zero: New Frontiers of Physics*, edited by J.D. Fairbank, B.S. Deaver, Jr., C.W.F. Everitt, and P.F. Michelson (Freeman, New York, 1988), p. 713.
- 5) "Precision Gravity Experiments Using Superconducting Accelerometers," in *Near Zero: New Frontiers of Physics*, edited by J.D. Fairbank, B.S. Deaver, Jr., C.W.F. Everitt, and P.F. Michelson (Freeman, New York, 1988), p. 755.
- 6) "Composition-Independent Null Test of the Gravitational Inverse Square Law," with Q. Kong, M.V. Moody, and J.W. Parke, in *5th Force - Neutrino Physics*, edited by O. Fackler and J. Tran Thanh Van (Editions Frontirres, Gif-sur-Yvette Cedex, France, 1988), p. 531.
- 7) "Potential Field Measurement Systems," with J. Achache, C. W. F. Everitt, C. Reigber, and D. Sonnabend, in *The Interdisciplinary Role of Space Geodesy*, edited by I. I. Mueller and S. Zerbini (Springer-Verlag, Berlin, 1989), p. 166.
- 8) "Superconducting Accelerometry: Its Principles and Applications," in *Experimental Gravitation*, edited by M. Karim and A. Qadir (IOP Publishing, Bristol, 1994), p. A133.
- 9) "Null Test of the Inverse-Square Law of Gravity," with M.V. Moody, in

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- 10) "Superconducting Accelerometers, Gravitational-Wave Transducers, and Gravity Gradiometers," in *SQUID Sensors: Fundamentals, Fabrication and Applications*, edited by H. Weinstock (Kluwer, Dordrecht, 1996), p. 569.
- 11) "Chapter 13: Gravity and Motion Sensors," in *SQUID Handbook*, edited by J. Clark and A. Braginski (Wiley, New York, in press).

D. Papers Submitted to Refereed Journals, but Not Yet Published

E. Technical Reports

- 1) "Field Quenching of the Electron Magnetic Moment," with R.A. Smith and G.R. Henry, ITP-353, Stanford University (1969).
- 2) "Analysis and Development of a Very Sensitive Low Temperature Gravitational Radiation Detector," Ph.D. thesis, HEPL Report No. 743, Stanford University (1974).
- 3) "How to Detect Gravitational Radiation: From Supernova to Superconductor," Essay on Gravitation submitted to Gravity Research Foundation, New Boston, New Hampshire (1974).
- 4) "Derivation of Relations Between Mechanical and Electrical Amplitudes for Modulated Resonant Transducers," with R.P. Giffard, Stanford University (1977).
- 5) "Source-independent Experiment to Test the Metric Theories of Gravitation in the Newtonian Limit," Essay on Gravitation submitted to Gravity Research Foundation, New Boston, New Hampshire (1979).
- 6) "Development of a Sensitive Superconducting Gravity Gradiometer for Geological and Navigational Applications," NASA Contractor Report 4011 (1986).
- 7) "Geophysical and Geodetic Requirements for Global Gravity Field Measurements: 1987-2000," with J. Apel, L. Cordell, C.J. Finley, T. Fischetti, E.A. Flinn, B. Hager, A. Hsui, A. Lazarewicz, M. McNutt, D. Sandwell, D.E. Smith, D. Sonnabend and L. Walter, Report of a Gravity Workshop, NASA (1987).
- 8) "Superconducting Gravity Gradiometer Mission, Volume II. Study Team Technical Report," with S.H. Morgan, NASA Technical Memorandum 4091 (1988).

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- 10) "Gravity Measurement Techniques," with C. W. F. Everitt, C. Reigber, and D. Sonnabend, in Measurement Techniques and Technology Panel Report, NASA Solid Earth Science Planning Conference (1989).
- 11) "Development of a Superconducting Six-Axis Accelerometer," with J.W. Parke and E.R. Canavan, Final Report to the Air Force, Report No. GL-TR-89-0181 (1989).
- 12) "Feasibility Study of the Superconducting Gravity Gradiometer (SGG) Flight Test on the European Retrievable Carrier (EURECA), Section 3," Final Report 91SDS4201, General Electric Company (1991).
- 13) "STEP Phase A Report, Chapter 2: The Principles of the STEP Experiments, and Chapter 5: The Constant of Gravity and the Inverse Square Law Experiments," Report to the European Space Agency (March 1993).
- 14) "Superconducting Gravity Gradiometer Experiment," with M.V. Moody, E.R. Canavan, B.G. Bills, P.J. Shirron, M.J. DiPirro, and S.H. Castles, In-STEP (In-Space Technology Experiment) Phase A report to NASA (February 1995).
- 15) "Mission Concepts for a Superconducting Gravity Gradiometer Earth Survey to Establish a Baseline for Global Change," with M.V. Moody, E.R. Canavan, B.G. Bills, P.J. Shirron, M.J. DiPirro, and S.H. Castles, Pre-Phase A report to NASA (April 1995).
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- 1) "Low Temperature Gravity Wave Detector," with S.P. Boughn, W.M. Fairbank, M.S. McAshan, J.E. Opfer and R.C. Taber, in the *Proceedings of the 13th International Conference on Low Temperature Physics* (Boulder, Colorado, 1971).
- 2) "Preliminary Measurements with a 4 K Gravitational Wave Antenna," with S.P. Boughn, M.S. McAshan, R.C. Taber, W.M. Fairbank and R.P. Giffard, in the *Proceedings of the 14th International Conference on Low Temperature Physics* (Helsinki, Finland, 1975).
- 3) "Multi-mode Detection of Gravitational Waves by a Sphere," with R.V. Wagoner, in the *Proceedings of the Accademia Nazionale dei Lincei International Symposium on Experimental Gravitation* (Pavia, Italy, 1976).

- 4) "Cryogenic Approach to an Optimal Gravitational Wave Detector," with S.P. Boughn, W.M. Fairbank, R.P. Giffard, J.N. Hollenhorst, M.S. McAshan and R.C. Taber, in the *Proceedings of the Accademia Nazionale dei Lincei International Symposium on Experimental Gravitation* (Pavia, Italy, 1976).
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- 6) "Progress Report on the Stanford Refrigerated Gravitational Radiation Antenna," with S.P. Boughn, W.M. Fairbank, R.P. Giffard, M.S. McAshan and R.C. Taber, in the *Proceedings of the 8th International Conference on General Relativity and Gravitation* (Waterloo, Ontario, 1977).
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- 8) "Experimental Examination of the Inverse Square Law of Gravitation, with H.A. Chan, in the *Proceedings of the 2nd Marcel Grossmann Meeting on Recent Developments of General Relativity* (Trieste, Italy, 1979).
- 9) "Unified Theory of Gravitational Radiation Detectors for Pulses and Monochromatic Signals," in the *Proceedings of the 2nd Marcel Grossmann Meeting on Recent Developments of General Relativity* (Trieste, Italy, 1979).
- 10) "Toroidal Point-Contact DC SQUID For Gravitational Radiation Antenna," in the *Proceedings of the 9th International Conference on General Relativity and Gravitation* (Jena, East Germany, 1980).
- 11) "A True Laplacian Detector for Null Test of the Inverse Square Law of Gravitation," in the *Proceedings of the 9th International Conference on General Relativity and Gravitation* (Jena, East Germany, 1980).
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- 15) "Development of Three-Axis Superconducting Gravity Gradiometer," with H.A. Chan, M.V. Moody and J.W. Parke, in the *Proceedings of the 17th International Conference on Low Temperature Physics* (Kahlsruhe, West Germany, 1984), edited by V. Echern, A. Schmid, W. Weber and H. Wuhl (Elsevier), p. DR3.
- 16) "A Superconducting Penetration Depth Thermometer," with M.V. Moody, H.A. Chan and C. Stephens, in the *Proceedings of the 17th International Conference on Low Temperature Physics* (Kahlsruhe, West Germany, 1984), edited by B. Echern, A. Schmid, W. Weber and H. Wuhl (Elsevier).
- 17) "A Point-Contact dc SQUID," with K.R. Carroll, in the *Proceedings of the SQUID Magnetometry Workshop* (Berkeley Springs, West Virginia, 1984).
- 18) "Detection of Gravitomagnetic Field Using an Orbiting Superconducting Gravity Gradiometer," with B. Mashhoon and C.M. Will, in the *Proceedings of the International Symposium on Experimental Gravitational Physics* (Guangzhou, China, 1987).
- 19) "Composition-Independent Null Test of the Gravitational Inverse Square Law," with Q. Kong, M.V. Moody and J.W. Parke, in the *Proceedings of the 5th Marcel Grossmann Meeting on General Relativity* (Perth, Australia, 1988).
- 20) "Ultralow Temperature Resonant-Mass Gravitational-Wave Detectors: Current Status and Future Prospects," with P.F. Michelson, T. Aldcroft, J. Chiang, D. DeBra, J. Henderson, L. Mann, D. McKenzie, S. McLoughlin, R. Penny, J.C. Price, T. Stevenson, B. Vaughan, C. Zhou, in *Gravitational Astronomy - Instrument Design and Astrophysical Prospects*, edited by D.E. McClelland and H.A. Bachor (World Scientific, Singapore, 1991).
- 21) "Constant of Gravity and Composition-Dependent Inverse Square Law Test on STEP," in the *Proceedings of the 13th Moriond Workshop* (Villars sur Ollon, Switzerland, February 1993).
- 22) "Gauss's Law Test of Gravity at Short Range," with M.V. Moody, in the *Proceedings of the 13th Moriond Workshop* (Villars sur Ollon, Switzerland, February 1993).
- 23) "A Superconducting Six-Axis Accelerometer for Platform Control and Space Applications," with E.R. Canavan, in the *Proceedings of the 16th Biennial Guidance Test Symposium* (Holloman Air Force Base, New Mexico, October 1993).
- 24) "A Shuttle Test of Superconducting Gravity Gradiometer," with M.V. Moody and

- E.R. Canavan, in the *Proceedings of the NASA/JPL 1994 Microgravity Low Temperature Physics Workshop* (Washington, D.C., January 1994).
- 25) "EÖTVÖS, a New Concept for Low Disturbance Measurements in Space", with J.-P. Blaser, in the *Proceedings of the 14th Moriond Workshop* (Villars sur Ollon, Switzerland, January 1994).
 - 26) "Wideband Resonant Lever Transducer for Massive Spherical Gravitational-Wave Detectors," with G.M. Harry and T.R. Stevenson, in the *Proceedings of the 7th Marcel Grossmann Meeting on General Relativity* (Stanford, California, July 1994).
 - 27) "Fundamental Gravity Experiments on Space Station," in the *Proceedings of the NASA/JPL 1995 Microgravity Low Temperature Physics Workshop* (Pasadena, California, April 1996).
 - 28) "Airborne/Shipborne SGG Survey System," with E.R. Canavan and M.V. Moody, in the *Proceedings of the International Symposium on Kinematic Systems in Geodesy, Geomatics and Navigation* (Banff, Canada, June 1997), p.565.
 - 29) "Search for Axions Using a Superconducting Differential Angular Accelerometer," with E.R. Canavan and M.V. Moody, in the *Proceedings of the 8th Marcel Grossmann Meeting on General Relativity* (Jerusalem, Israel, June 1997).
 - 30) "Search for Spin-Mass Coupling Using a Superconducting Differential Accelerometer," in the *Proceedings of the 1998 NASA/JPL Workshop on Fundamental Physics in Microgravity* (Oxnard, California, June 1998).
 - 31) "Construction of the Spin Source for Spin-Mass Experiment," with J. Lee and M.V. Moody, in the *Proceedings of the 2000 NASA/JPL Investigators' Workshop on Fundamental Physics in Microgravity* (Solvang, California, June 2000).
 - 32) "Fundamental Gravity Experiments on ISS," with M.V. Moody and J. Lee, in the *Proceedings of 2nd Pan Pacific Basin Workshop on Microgravity Sciences* (Pasadena, California, May 2001).
 - 33) "A Superconducting Gravity Gradiometer Tool for Exploration," with J. M. Lumley, J. P. White, G. Barnes, and D Huang, in the *Proceedings of the Society of Exploration Geophysics Meeting* (San Antonio, Texas, September 2001).
 - 34) "Short-Range Inverse-Square Law Experiment in Space," with M.V. Moody and D.M. Strayer, in the *Proceedings of 2002 NASA/JPL Workshop on Fundamental Physics in Space* (Dana Point, California, May 2002).

- 35) "Spin-Mass Interaction Low-Temperature Experiment on ISS," with M.V. Moody and D.M. Strayer, in the *Proceedings of 2002 NASA/JPL Workshop on Fundamental Physics in Space* (Dana Point, California, May 2002).

G. Contracts, Grants, and Proposals

- 1) "The Experimental and Analytical Development of a Sensitive Superconducting Accelerometer and Gravity Gradiometer," with W.M. Fairbank and D.B. Debra, AFOSR Grant, \$80,000 (October 1978-September 1979). Joint Project with Stanford University.
- 2) "Construction of a Prototype Superconducting Gravity Gradiometer," with J.-P. Richard, NASA Contract, \$55,000 (August 1979-July 1980).
- 3) "Development in a Sensitive Superconducting Gravity Gradiometer for Geological and Navigational Applications," with J.-P. Richard, NASA Contract, \$900,000 (July 1980-July 1985).
- 4) "Research and Development of Gravitational Radiation Antennas," with W.S. Davis, J.-P. Richard and J. Weber, NSF Grant, \$835,000 (August 1979-August 1982).
- 5) "Investigation of Noise in Solids at Low Temperatures," with W.S. Davis, J.-P. Richard and J. Weber, \$225,000 (March 1979-February 1982).
- 6) "Solid State Crystal Physics at Very Low Temperatures," with J. Weber, W.S. Davis, and J.-P. Richard, NASA Grant, \$80,705 (July 1979-November 1980).
- 7) "Research and Development of Gravitational Radiation Antennas," with J.-P. Richard and J. Weber, NSF Grant, \$1,050,000 (November 1982-November 1985).
- 8) "Development of Electronic Control of Superconducting Gravity Gradiometer," Army Corps of Engineers Contract, \$95,000 (June 1984-February 1986).
- 9) "Development of a Sensitive Six-Axis Superconducting Accelerometer," Air Force Contract, \$510,000 (April 1985-March 1988).
- 10) "Development of a Three-Axis Superconducting Gravity Gradiometer for Spaceborne Gravity Survey," NASA Contract, \$1,010,000 (June 1985-June 1989).
- 11) "Research and Development of Sensitive Gravitational Radiation Antennas," with J.-P. Richard and J. Weber, NSF Grant, \$865,000 (December 1985-June 1989).
- 12) "Development of Electronic Control of Superconducting Gravity Gradiometer," Army Corps of Engineers Contract, \$50,000 (September 1987-July 1988).

- 13) "Development of Superconducting Technology for Inertial Guidance, Gravity Survey and Fundamental Gravity Experiments," Air Force Contract, \$1,875,000 (September 1987-September 1992).
- 14) "Group Travel to the 5th Marcel Grossmann Meeting," with D.R. Brill and B.-L. Hu, National Science Foundation Grant, \$25,000 (March 1988-October 1988).
- 15) "Low Cost SQUID Electronics," with A.K. Drukier, Maryland Industrial Partnerships (MIPS) Award, \$49,709 (August 1988-August 1989).
- 16) "Development of a Three-Axis Superconducting Gravity Gradiometer for Spaceborne Gravity Survey," NASA Contract, \$2,100,000 (June 1989-December 1995).
- 17) "Development of Improved Gravitational-Wave Transducers," NSF Grant, \$489,000 (August 1990-July 1993).
- 18) "START Signature Analysis," with M.V. Moody, Contract with System Planning Corporation, \$18,000 (May 1992-September 1992).
- 19) "Cryogenic Sensors for Platform Stabilization," with E.R. Canavan, Air Force Contract, \$258,000 (September 1993-March 1995).
- 20) "Development of Improved Gravitational-Wave Transducers," with T.R. Stevenson, NSF Grant, \$489,000 (December 1993-March 1998).
- 21) "Superconducting Gravity Gradiometer Experiment," with M.V. Moody, NASA Contract for Phase-A Study of IN-STEP (In-Space Technology Experiment Program), \$100,000 (March 1994-December 1994).
- 22) "Superconducting Gravimeter and Gravity Gradiometer Development," Sandia National Laboratories Contract, \$66,008 (August 1994-September 1994).
- 23) "Superconducting Gravimeter and Gravity Gradiometer Development," Sandia National Laboratories Contract, \$380,000 (June 1995-September 1997).
- 24) "Integration and Tests of Superconducting Angular Accelerometers with the Superconducting Gravity Gradiometer," with M.V. Moody, NASA Grant, \$590,000 (November 1995-March 1998).
- 25) "Search for Spin-Mass Interaction with a Superconducting Differential Angular Accelerometer," with M.V. Moody, NASA Grant, \$540,600 (February 1998-December 2002).
- 26) "Fabrication and Testing of a Superconducting Transducer," NSF Grant through

LSU, \$135,000 (August 1998-July 1999).

- 27) "Search for Gravitational Waves with the Allegro Detector," NSF Grant through LSU, \$285,000 (August 1999-July 2002).
- 28) "Superconducting Gravity Gradiometer for Moving-Base Applications," with M.V. Moody, Contract with Lockheed-Martin, \$599,000 (November 2002-April 2004).
- 29) "Search for Gravitational Waves with the Allegro Detector," NSF Grant through LSU, \$360,000 (February 2003-January 2006).
- 30) "Inverse-Square Law Experiment in Space (ISLES)," with M.V. Moody, NASA Grant, \$375,000 (April 2003-March 2008).
- 31) "Null Test of Newton's Law of Gravitation on a 100-Micrometer Scale," with M.V. Moody, NSF Grant, \$459,000 (April 2003-March 2006).

H. Patents

- 1) "Improved Three-Axis Superconducting Gravity Gradiometer," U.S. Patent, No. 4,841,772 (Issued on June 27, 1989).
- 2) "Improved Superconducting Six-Axis Accelerometer," U.S. Patent No. 5,224,380 (Issued on July 6, 1993).
- 3) "Proof Mass Support and Sensing System," British Patent Application Nos. 9419649.0 and 9406347.6 (September 20, 1994 and March 20, 1994).