

CURRICULUM VITAE

February, 2008

Bei-Lok Bernard Hu, Professor of Physics

I. PERSONAL DATA

Date and Place of Birth: October 4, 1947, Chungking, China. Citizenship: U.S.A.

Permanent Address:

Department of Physics, University of Maryland,
 College Park, Maryland 20742-4111
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II. EDUCATION

Date	School	Location	Major	Degree
1958-64	Pui Ching Middle School	Hong Kong	Science	High School
1964-67	University of California	Berkeley	Physics	A.B.
1967-69	Princeton University	Princeton	Physics	M.A.
1969-72	Princeton University	Princeton	Physics	Ph.D.

III. ACADEMIC EXPERIENCE

Date	Institution	Position
June 1972- Jan. 1973	Princeton University Princeton, N.J. 08540	Research Associate Physics Department
Jan. 1973- Aug. 1973	Institute for Advanced Study Princeton, N.J. 08540	Member School of Natural Science
Sept.1973- Aug. 1974	Stanford University Stanford, Calif. 94305	Research Associate Physics Department
Sept.1974- Jan. 1975	University of Maryland College Park, Md. 20742	Postdoctoral Fellow Physics & Astronomy
Jan. 1975- Sept.1976	University of California Berkeley, Calif. 94720	Research Mathematician Mathematics Department
Oct. 1976- May 1977	Institute for Space Studies NASA, New York, N.Y. 10025	Research Associate Astrophysics

June 1977- University of California Research Physicist
Aug. 1979 Santa Barbara, Calif. 93106 Physics Department

Aug 1980- University of Maryland Assist, Assoc. & Full
Now College Park, MD 20742 Professor of Physics

Visiting or Honorary Appointments:

Sept.1979- Harvard University Honorary Research Fellow
Aug. 1980 Cambridge, Mass. 02138 Lyman Lab. of Physics

Jan. 1987- Institute for Advanced Study Member
Aug. 1987 Princeton, New Jersey 08540 School of Natural Sciences

Jan. 1989- Cornell University Professor of Physics and Research Fellow
June 1990 Ithaca, New York 14853 Newman Lab. of Nuclear Studies

April-May Newton Institute for Math. Member
1994 Sciences, Cambridge Univ. Geometry and Physics Program

Sept.1994- Institute for Advanced Study Dyson Visiting Professor
Jan. 1995 Visiting Professor School of Natural Sciences

Mar-May Perimeter Institute of Theoretical Visiting Professor
2008 Physics, Waterloo, Canada

Short-term Visitor or Lecturer:

July 1982 Nuffield Foundation, Participant and Speaker at the
Univ. of Cambridge Workshop on the Early Universe

Aug. 1982 Shanghai Normal Univ. Visiting Professor

Sept. 1984 Erice Int'l School, Italy Principal Lecturer

Nov. 1984 Raman Institute, India Visiting Professor

July 1985 Chinese Academy of Sciences Visiting Professor

Aug. 1985 Yukawa Institute, Kyoto, Japan Visiting Professor

June 1986 Academia Sinica, Taiwan Visiting Professor

May 1989 Erice Int'l School, Italy Principal Lecturer

Dec. 1990 SILARG7, Mexico City Principal Lecturer

Spring 1992 Institute for Theor. Physics Workshop on Phase Transition
Univ. Calif. Santa Barbara in the Early Universe (declined)

June 1992 Univ., Buenos Aires, Argentina Visiting Professor

Aug. 1992 Waseda University, Senior Fellow,
Tokyo Univ., and Japan Society for the
Yukawa Institute Promotion of Science

July. 1993	Instituto Superior Tecnico, Lisbon	Visiting Professor
Aug. 1993	CAP-NSERC, Summer Institute in Theoretical Physics, Banff, Canada	Principal Lecturer
Nov. 1994	Department of Physics University of Buenos Aires	Honorary Professor
Spring 1995	Dept. of Physics,	Visiting Professor
Spring 99,01	Hong Kong University of Science and Technology	
July 1995	Tubitak, Istanbul, Turkey	Visiting Professor
July 1995	University of Barcelona, Spain	Visiting Professor
Aug. 1995	Department of Mathematics University of Sydney	Visiting Professor
Aug. 1995	Institute for Mathematical Physics, University of Adelaide	Visiting Professor
Sept. 1995	Erice International School, Italy	Principal Lecturer
June 1997	Dept. of Mathematics Hong Kong University of Science and Technology	Visiting Professor
Jan. 1999	Institute for Theor. Physics Univ. Calif. Santa Barbara	Workshop on Nonequilibrium Quantum Fields
Nov. 1999	Institute for Nuclear Theory University of Washington	Workshop on Quantum Field Nonequilibrium Processes
May 2001	Erice International School, Italy	Principal Lecturer
Jan 2004	University of Queensland University of New South Wales	Visitor
2004-2007	Institute of Physics, Academia Sinica, Taiwan National Center for Theoretical Sciences, National Tsing Hua University Center for Information Sciences, National Cheng Kung University	Visiting Professor
Mar 2006	National University of Singapore	Visitor
June 2006	Gdansk University, Krakow University, Poland. Benasque Center, Spain	Visitor
July 2007	Institute of Physics, Institute of Theoretical Physics, Institute of Applied Mathematics and Systems Sciences, Academy of Science, Beijing, China	
Aug. 2007	Lorentz Center, University of Leiden, Holland	Workshop on Condensed Matter meets Gravity
Sept.2007	Center of Excellence Interdisciplinary Program, Waseda University, Japan	
Feb. 2008	Kavli Institute for Theoretical Physics, University of California, Santa Barbara, Program on Nonequilibrium Quantum Processes in Particle Physics and Cosmology	
Mar-June 2008	Perimeter Institute for Theoretical Physics, Waterloo, Canada.	Visiting Professor

IV. PROFESSIONAL ACTIVITIES

Member, International Society for General Relativity and Gravitation
Trustee, Association of Members of the Institute for Advanced Study (1984-1990)

- Council, Chinese Society on Gravitational Physics and Relativistic Astrophysics (1979-85)
- Council, Overseas Chinese Physics Association (1990-94, 98-)
- Member, International Advisory Committee for the Third Marcel Grossmann Meeting, Shanghai, China, 1983
- Member, International Advisory Committee for the Instructional Conference on Gauge Theory, Gravitation and the Early Universe, Bangalore, India, 1984
- Member, Local Organizing Committee of the 13th International Colloquium on Group Theoretical Methods in Physics, College Park, U.S.A., 1984
- Member, Local Organizing Committee of the First International Conference on the Physics of Phase Space, College Park, U.S.A., 1986.
- Member, Scientific Organizing Committee, International Conference on Gravitation and Cosmology, Goa, India, 1987.
- Member, International Advisory Committee for the Workshop on Thermal Field Theories and their Applications,
First Meeting: Cleveland, U.S.A., Oct., 1988;
Second Meeting: Tsukuba, Japan, July, 1990;
Third Meeting: Banff, Canada, August, 1993;
Fourth Meeting: Dalian, China, August 1995.
- Member, International Advisory Committee for the Peyresq Meetings on Quantum And Stochastic Gravity, Cosmology and Black Holes, France. 1999 – now
- Member, International Advisory Board for the DICE Meetings on Foundational Issues of Quantum Mechanics, Gravity, Cosmology & Quantum Information. Piombino, Italy. 2006, 2008
- Member, Technical Program Committee for the Workshop on Entanglement and Quantum Decoherence (EQD) organized by the Optical Society of America January 28-30, 2007 in Nara, Japan
- Member, NSF Panel for the review of proposals for Centers of Creativity
NSF Panel for the review of proposals for gravitational physics
NASA Panel for the review of proposals for gravity and relativistic physics
- Chair, Scientific and Organizing Committees, International Symposium on Directions in General Relativity, College Park, USA, May, 1993
- Co-Chair, International Symposium on Quantum Classical Correspondence, Drexel University, Philadelphia, U.S.A., Sept., 1994
- Editor, International Journal of Modern Physics, A, D, Modern Physics Letters A
Quantum Information and Computation

V. HONORS AND AWARDS

- *Fellow, American Physical Society
- *Fellow, Joint Quantum Institute, University of Maryland and NIST Gaithersburg
- *Senior Fellow, Japan Society for the Promotion of Science
- * Dyson Visiting Professor (1994) Institute for Advanced Study, Princeton
- *General Research Board Award (1994, 2007) University of Maryland Graduate School

- *Teaching Excellence Award (1996) Univ. of Maryland, Dean for Undergraduate Studies
- * Princeton National Fellow (1967) Princeton University Graduate School
- *NSF Exceptional Undergraduate Traineeship (1965-67) Univ. of California, Berkeley
- Biographic Listing in: American Man and Women of Science (USA)
 - Who's Who in Science and Engineering (USA)
 - Who's Who in Frontiers of Science and Technology (USA)
 - Who's Who in the World (USA)
 - Marquis Who's Who (USA)
 - Men of Achievement (UK)
 - Who's Who among Asian Americans (USA)
 - Huaxia Haiwai Keji Jingying (China)
 - Reference Asia (India)

VI. GRANTS AND CONTRACTS

Gravitation and Cosmology, Quantum Field Theory:

Principal Investigator on individual (no sponsoring institution) NSF grant,
 "Research in General Relativity and Relativistic Cosmology"

Sept. 1979-1980 (at Harvard)	\$25,000
Sept. 1980-1981 (at Maryland)	\$27,750

Principal Investigator on NSF Grant PHY-81-07387 to the University of Maryland:
 "Research in General Relativity and Relativistic Cosmology" (3 year grant)

1981-1983	\$39,043
1983-1984	\$38,817

Principal Investigator on NSF Grant PHY-84-18199 to the University of Maryland:
 "Gravitation, Quantum Field Theory and Relativistic Cosmology" (3 year grant)

1984-1985	\$44,300
1985-1986	\$45,000
1986-1987	\$50,000

Principal Investigator on NSF Grant PHY-87-17155 to the University of Maryland:
 "Gravitation Quantum Field Theory and Relativistic Cosmology" (4 year grant)

Nov. 1987 - Nov. 1988	\$63,000
Dec. 1988 - Nov. 1989	\$69,644
Dec. 1989 - Nov. 1990	\$85,346
Dec. 1990 - Nov. 1991	\$63,000

Principal Investigator on NSF Grant PHY-91-19726 to the University of Maryland:
"Gravitation, Quantum Statistical Fields, and Relativistic Cosmology" (3 year grant)

Jan. 1992 - Dec. 1992	\$ 76,184
Jan. 1993 - Dec. 1993	\$117,679
Jan. 1994 - Dec. 1994	\$122,400

Principal Investigator on NSF Grant PHY94- 21849 to the University of Maryland:
"Gravitation, Quantum Statistical Fields and Relativistic Cosmology" (3 year grant)

Feb. 95 - Aug. 98	\$346,677
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Principal Investigator (Joint with Dr. T. Jacobson) on NSF Grant 98-00967 to the
University of Maryland: "Gravitation and Quantum Fields" (3 year grant)

April 1, 1998 - March 31, 1999 (Year 1)	\$215,336
April 1, 1999 - March 31, 2000 (Year 2)	\$214,695
April 1, 2000 - March 31, 2001 (Year 3)	\$221,173
Creativity renewal for 2 years (Year 4)	\$226,495
April 1, 2002 – March 31, 2003 (Year 5)	\$235,378

Principal Investigator (Joint with Dr. T. Jacobson) on NSF Grant PHY03-00710 to
the University of Maryland: "*Towards the Microscopic Structure of Spacetime*"

(3 year grant) July 1, 03- June 30, 2006	\$665,000
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Principal Investigator on NSF Grant PHY-0601550 to the University of Maryland:
"*Quantum Field and Gravitational Waves in Black Holes and the Early Universe*"

(2 year grant) July 1, 06 - June 30, 2008	\$80,000
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Perimeter Institute for Theoretical Physics, Waterloo, Canada
Individual grant, March 1-May 31, 2008 \$31, 822 (no overhead)

Quantum Coherence Phenomena, Quantum Control, AMO and Superconducting Quantum Computer Theory

PI on **ARDA** Contract MDA90401/C0903, on *Decoherence and Basic Issues in Quantum
Computers* for three years May 1, 2002-April 30, 2005. \$300K

PI on **LPS** grant for support of my graduate student, Nick Cummings for five years,
February 2005 –January 2010 \ \$129,537/3 yrs + 2 yrs increment

PI on **NIST** Grant: *Quantum Information Processing with Neutral Atoms*
July 1, 2002-June 30, 2005. \$271,430

PI on **NIST** Grant: *Quantum Information Science: From Nanomechanical Resonators to Neutral Atoms Quantum Computing*
July 1, 2005-June 30, 2008. \$217,440

co-PI on **NSF** Grant PHY-0426696 "*ITR: Distributive Quantum Information*"
(Pis: Steven Rolston, Bei-Lok B. Hu, Carl J. Williams, Luis A. Orozco, Wendell T. Hill.)
Sept., 04- Aug., 2009 \$1.65M

evenly divided by 5 PIs translates to per PI amount:

Sept 2004 –Aug 2005	\$ 50K
Sept 2005-2006	\$ 40K
Sept 2006-2007	\$100K
Sept 2007-2008	\$100K
Sept 2008-2009	\$100K

International Cooperative Research Grants

Principal Investigator (joint with Prof. E. Calzetta) "US -Argentina Cooperative Research on Statistical Field Theory in Gravitation and Cosmology" NSF INT95-09847
Sept. 1995 - Aug. 1997 \$23,092

Principal Investigator (joint with Professors Denjoe O'Connor and Chris Stephens)
(U.S.-Mexico Workshop: "The Renormalization Group at the Turn of the Millennium",
Jan 1999, Taxco, Mexico NSF INT-9813918 Sept. 30, 1998 - Feb. 28, 1999 \$10,150

Travel Grants: Principal Investigator NSF Grants for International group travel

1982 \$38,750 Third Marcel Grossmann Meeting (with D.R. Brill)
1983 \$50,000 Tenth General Relativity and Gravitation (with D. R. Brill)
1988 \$25,000 Fifth Marcel Grossmann Meeting (MG5) (with D.R. Brill and H. J. Paik)

Conference Grants :

Principal Investigator (with T. A. Jacobson) for an International Symposium on
"Directions in General Relativity" held at University of Maryland, May 1993 \$5,000

Principal Investigator (with D. H. Feng) for an International Symposium on
"Quantum Classical Correspondence" held at Drexel University, September 1994 \$5,000

VII. TEACHING EXPERIENCE

1. **Regular courses** taught:

Freshman-Sophomore *Introductory Physics for Physical Sciences, Engineering and Biosciences Majors* (Physics 122, 262, 263, 270)
Introductory Physics for Physics Majors (Phys. 272/272H)

Junior-Senior Courses for Physics Majors:

Modern Physics (Physics 421-422)
Modern Physics for Engineering Majors (Physics 420)
Thermal Physics (404)

Undergraduate Physics Research: Physics 389

Independent Study Seminar: Physics 398

Graduate Physics *Core Course: Statistical Mechanics* (Physics 602)

Topical Courses: *General Relativity* (Physics 675/875)

Topical Courses: *Advanced Gravitation Theory* (Phys. 776)

Special Topics Courses (Physics 879: see below)

Interdisciplinary Courses (Physics 889: see below)

Seminar: *Gravitation Theory*: Physics 779A

Seminar: *Quantum Coherence and Information*: Physics 779B

Special Problems in Advanced Physics: Physics 798

Master's Thesis Research: Physics 799

Ph.D. Dissertation Research: Physics 899

2. Innovations: **New courses** designed and taught:

"*Quantum Processes in the Early Universe*" Physics 889 (Fall 1983)

"*Quantum Field Theory in Curved Spacetime*" Physics 879 (S'84, S'86, S'92)

"*Geometric Methods in Physics*" Physics 798B (S'88)

"*Particles and the Universe*" Physics 889 (S'88):

taught jointly with Professors Pati and Eichler

"*Statistical Field Theory: Problems in Gravitation Cosmology and Nuclear- Particle Physics*," Physics 889 (S'91, S'97)

"Advanced Gravitation Theory" Physics 776 Designed this new course and taught (S'93, S'96, S'02 S'04)

"*Statistical Field Theory: Quantum and Atom Optics*", Physics 889 (S'98)

"*Black Holes and the Early Universe*", Physics 499G (S'99)

"*Nonequilibrium Quantum Field Theory: Dynamics of Bose Einstein Condensate and Advanced Topics*", Physics 889 (S'03)

"Gravitational Wave Physics and New Cosmology" Physics 776 (S '04)

3. Supervised **independent research** or reading course to undergraduates

1983-1986 Chairman of Physics Honors Committee

Spring 1983 Dallas Kennedy, David Wasson, Selman Herschfield
1993-1994 Steve Sabian
1995-1996 Veronika Hubeny
1999-2000 Nick Cummings

4. *Master of Science* Students

James T. Wheeler, May 1981
Liam M. Healy, December 1981
Joseph Shanks, May 1982
Laura Mersini, May 1997

VIII. *Doctor of Philosophy* Students Supervised and *Postdoctoral Research Associates*

1. *Doctor of Philosophy* Students

Tsung-Chen Shen, Oct. 1985
"Quantum Effects on Non-Maximally Symmetric Spaces"

Dennis Joseph O'Connor, Oct. 1985
"Quantum Field Theory in Curved Spacetime: Phase Transition and Finite Size Effect"

Christopher Rhodes Stephens (joint with Prof. Charles W. Misner), Oct. 1986
"On Some Aspects of the Relationship between Quantum Physics, Gravity and Thermodynamics"

Salman Habib, Sept. 1988
"Quantum Fields in Curved Spacetime: Kinetic Theory"

Yuhong Zhang, Dec. 1990
"Stochastic Properties of Interacting Quantum Fields"

Aris Stylianopoulos, Dec. 1990
"Finite Temperature Quantum Field Theory in Curved Spacetime"

Roberto Camporesi, May 1991
"Geometrical Representation of Propagators and Quantum Effects in Spacetimes with Symmetry"

Sukanya Sinha, May 1991 "Semiclassical Limit of Quantum Cosmology"

Andrew Matacz (joint with Prof. Paul Davies, Univ. of Adelaide), May 1994
"Quantum Statistical Processes in Cosmology and Gravity"

Don Koks (joint with Prof. Paul Davies, Univ. of Adelaide), May 1996

Decoherence, Entropy and Thermal Radiance Using Influence Functionals

Alpan Raval, Dec. 1996

"Stochastic Properties of Particle Detector and Quantum Field Interactions"

Stephen A. Ramsey, Dec. 1997

"Nonequilibrium Dynamics of Quantum Fields in Inflationary Cosmology"

Kazutomu Shiokawa, May 1998

"Coherence in Quantum Chaos, Stochastic Spacetimes and Collective Phenomena"

Nicholas G. Phillips, May 1999

"Fluctuations of the Quantum Stress Tensor in Curved Spacetimes via Generalized Zeta Functions and Point Separation"

Philip Johnson, Dec. 1999

"Nonequilibrium Dynamics of Particle Field Interaction"

Gregory Stephens, Aug. 2000

"Nonequilibrium Dynamics of Defect Formation in the Early Universe"

Sanjiv Shresta, Oct. 2003

"Coherent Quantum Dynamics of Atom- Quantum Field Interaction"

Ana Maria Rey, Dec. 2004 (joint with Prof. Theodore Kirkpatrick, IPST, and Dr. Charles Clark, NIST) "Ultra-cold Bosonic Atoms in an Optical Lattices"

Guido Pupillo, Aug. 2005 (joint with Dr. Carl Williams, NIST)

"Confined Ultracold Bosons in One Dimensional Optical Lattices"

Andrew Skinner Aug. 2006 (joint with Dr. Bruce Kane, LPS)

"Hydrogenic Spin Quantum Computing in Silicon and Damping and Diffusion in a Chain-Boson Model"

Ardeshir Eftekharzadeh May, 2007

"Topics in Gravitational Radiation Reaction and Black Hole Fluctuations"

Chad R. Galley, December 2007

"Stochastic and Effective Field Theory Approach to Gravitational Radiation Reaction"

Nick Cummings, 2008 (expected)

"Quantum Entanglement, Back-Action and Control: Basic Issues and Applications"

Chris Fleming, 2008 (expected)

“Macroscopic Quantum Phenomena: Basic Issues and Applications”

Anzi Hu, 2009 (expected)

Quantum Entanglement in Strongly Correlated Systems

Chad Sprouse 2010 (expected)

Stress energy tensor correlations with applications to early universe and black hole physics.

Ryan Buhunin 2010 (expected)

Metric Fluctuations from Stochastic Gravity and Applications in AMO physics

2. *Postdoctoral Research Associates*

(Supported under my own, joint or group grants at UMCP, and current position)

Rafael Sorkin (Perimeter Institute, Waterloo, Canada)

Ping Yip,

A. Sen,

Esteban Calzetta (University of Buenos Aires, Argentina)

Henry Kandrup (deceased),

Arlen Anderson,

Kristen Schleich (Univ British Columbia, Vancouver, Canada)

Iannis Bakas (University of Crete, Greece)

Atsushi Higuchi, (University of York, UK)

Juan Pablo Paz, (Univ. Buenos Aires, Argentina; Fellow, Santa Fe Institute, USA)

Jonathan Simon, (University of Maryland, USA)

Jorma Louko, (Nottingham University, UK)

Charis Anastopoulos, (University of Patras, Greece)

Stefano Liberati, (ICTP, Trieste, Italy)

Albert Roura (Los Alamos National Laboratory, Director's Fellow)

Kazutomu Shiokawa (National Center of Theoretical Sciences, Taiwan)

Chun-Hsien Chou (National Cheng Kung University, Tainan, Taiwan)

Shih-Yun Lin (National Center of Theoretical Sciences, Taiwan)

IX. INVITED TALKS AT INTERNATIONAL MEETINGS

Speaker or Chairman at International Meetings or Visits (*indicates invited talks or lectures, - indicates invited participants, + indicates chairman of sessions,)

1971 Sixth International Conference on General Relativity and Gravitation,
July, Copenhagen, Denmark

1972 Summer Institute on "The Physics of Black Holes" July, Les Houches, France
Sixth Texas Symposium on Relativistic Astrophysics, Dec., New York, U.S.A.

- 1974 Seventh Texas Symposium on Relativistic Astrophysics, Dec., Dallas, U.S.A.
- 1976 Eighth Texas Symposium on Relativistic Astrophysics, Dec., Boston, U.S.A.
- 1977 Eighth International Conference on General Relativity and Gravitation, Aug., Waterloo, Canada
- 1978 Summer Institute on "Quantum Gravity and Supergravity", July, Cargese, France
- 1979 +*Second Marcel Grossman Meeting in commemoration of **Albert Einstein's Centenary**, July, Trieste, Italy
- 1980 +***First Theoretical Particle Physics Conference**, Jan., Gaungzhou, China
Ninth International Conference on General Relativity and Gravitation, July, Jena, D.D.R.
- 1981 ***Workshop on the Interaction of Particle Physics and Astrophysics**, May, Santa Barbara, U.S.A.
- 1982 ***Nuffield Workshop on the Very Early Universe**, July, Cambridge, U.K.
*Imperial College, July, London, U.K.
***Third Marcel Grossmann Meeting** on Recent Developments of General Relativity, August, Shanghai, China
*Shanghai Teacher's University, August, Shanghai, China
- 1983 ***Second New Orleans Conference on Quantum Theory and Gravitation** May, New Orleans, U.S.A.
Tenth International Conference on General Relativity and Gravitation, July, Padova, Italy
***Workshop on Induced Gravity** Oct., Erice, Italy
- 1984 ***Inner Space/Outer Space Conference on the Intersection of Particle Physics and Cosmology**, May, Fermilab, U.S.A.
*International Workshop on **Gauge Theory, Gravitation and the Early Universe**, Nov., Ahmedabad, India
*Raman Institute of Physics, Nov., Bangalore, India
- 1985 +*Conference on **Classical and Quantum Gravity** April, Syracuse, U.S.A.
***Fourth Marcel Grossman Meeting** on the Recent Development of General Relativity, June, Rome, Italy
*International Symposium on "**Particles and the Universe**" June, Thessaloniki, Greece
*Institute of Theoretical Physics, Academia Sinica, July, Beijing, China
*Research Institute of Fundamental Physics, Aug., Kyoto, Japan

- 1986 +Washington American Physical Society Meeting, Session on Gravitation Physics, April, Washington, D.C, U.S.A.
 +First International Conference on the **Physics of Phase Space**, May, College Park, U.S.A.
 +Workshop on **Approaches to Quantum Gravity**, June, Santa Barbara, U.S.A.
 +**NATO Workshop on Superfields**, July, Vancouver, Canada
 *New York State **American Physical Society Meeting** on Cosmology and Elementary Particles, Oct., Syracuse, U.S.A.
- 1987 ***Quantum Cosmology Workshop**, May, Fermilab, U.S.A.
 ***CAP-NSERC Summer Institute Theoretical Physics**, July, Edmonton, Canada
 ***International Conference on Gravitation and Cosmology**, Dec., Goa, India
- 1988 ***Third Asia-Pacific Physics Conference** June, Hong Kong
 *Academia Sinica, June, Taipei, Taiwan
 *+**Fifth Marcel Grossmann Meeting** on the Recent Development of General Relativity, August, Perth, Australia
 *First International Workshop on **Thermal Field Theories** and Applications, Oct., Cleveland, U.S.A.
- 1989 *Eleventh International School on Cosmology and Gravitation, "**Quantum Mechanics in Curved Spacetime**," May, Erice, Italy
 *Workshop on Quantum Field Theory in Curved Spacetime, at the Twelfth International Conference on **General Relativity and Gravitation**, July, Boulder, Colorado, U.S.A.
- 1990 *CIAR-CITA Workshop on **Quantum Cosmology** and Workshop on **Inflation and Exotic Cosmic Structure Formation**, May, Vancouver, Canada
 *Second International Workshop on the Theory and Application of **Thermal Fields**, July, Tsukuba, Japan
 *University of Tokyo & Waseda University Joint Seminar, July, Tokyo, Japan
 *Seventh **Latin American International Symposium on General Relativity**, Dec., Mexico City, Mexico
- 1991 *Workshop on the **Physical Origin of Time-Asymmetry**, Sept., Heulva, Spain
 *Universidad Autonoma de Barcelona, Spain, August
- 1992 *International Conference on the **Origin of Structure in the Universe**, April, Chateau de Pont d'Oyle, Belgium
 ***Journées Relativiste**, May, Amsterdam, Holland
 *Third International Workshop on **Quantum Nonintegrability**, May, Drexel Univ., Philadelphia, U.S.A.
 *Institute for Astrophysics and Space Sciences, June, Buenos Aires, Argentina
 *Fifth Asia-Pacific Physics Conference, August, Genting, Malaysia

- *International Conference on **Quantum Physics and the Universe**,
August, Waseda University, Tokyo, Japan
- *University of Tokyo and Yukawa Institute, August, Kyoto, Japan

- 1993 +International Symposium on **Directions in General Relativity**,
May, College Park, U.S.A.
- *Instituto Superior Tecnico, July, Lisbon, Portugal
- *Third International Workshop on **Thermal Field Theory** and Applications,
August, Banff, Canada
- *International Workshop on **Fluctuations and Order**, Sept., Los Alamos, U.S.A.
- *Institute for Astrophysics and Space Sciences, Nov., Buenos Aires, Argentina
- ***Lanczos Centenary International Conference**, Symposium on Decoherence
and Foundation of Quantum Mechanics, Dec., Raleigh, N.C., U.S.A.

- 1994 ***Newton Institute, Program for Geometry and Gravity**, April-May,
Cambridge, U.K.
- ***Journee Cosmologie**, June, Observatoire de Paris, France
- ***Quantum Concepts of Space and Time**, July, University of Durham, U. K.
- ***Heat Kernel Techniques and Quantum Gravity**,
August, Univ. of Winepeg, Canada
- *International Symposium on **Quantum Classical Correspondence**,
Sept., Drexel University, Philadelphia, U.S.A.
- *Institute for Astrophysics and Space Studies,
Nov., University of Buenos Aires, Argentina

- 1995 *19th **International Conference on Statistical Physics**, July, Xiamen, China.
- *4th International Workshop on Thermal Field Theory and its Applications,
August, Dalian, China,.
- ***International School on Astro-fundamental Physics**, Sept. Erice, Italy.

- 1996 ***Second International Sakharov Conference**, Lebedev Physical Institute,
Moscow, Russia, May, 1996
- *International Workshop on **Non-equilibrium Phase Transitions**, Santa Fe,
New Mexico July, 1996
- *University of Alberta, Edmonton, August 1996
- *Imperial College, London, Nov. 1996

- 1997 *International Symposium on **Gravitation and Cosmology**, Soochow University,
Taipei, Taiwan, June 1997
- *International Symposium on **Macroscopic Quantum Coherence**, Northeastern
University, Boston, July 1997
- ***Cosmology/Topology Workshop**, Case Western Reserve University, Cleveland,
October 1997
- *Imperial College, London, U.K., November 1997
- *University of Cardiff, Wales, U.K., November 1997

- *Korean Institute for Advanced Study, Seoul, December 1997
- *Institute for Theoretical Sciences, Tsing Hua University, Hsing chu, Taiwan, December, 1997

- 1998 *Second International Symposium on **Quantum Gravity** in the Southern Cone", Centro Atomico, Bariloche, Argentina, January 1998
- *Third Peyresq Meeting on **Quantum Cosmology**, Peyresq, France, June 1998
- ***Nonequilibrium Quantum Fields and Relativistic Heavy Ion Physics**, Brookhaven National Laboratory, October 1998

- 1999 *Workshop on **Nonequilibrium Quantum Fields**, Institute for Theoretical Physics, UC Santa Barbara, January 1999
- *The **Renormalization Group** 2000, Taxco, Mexico, January 1999
- ***Black Holes II: Theory and Mathematical Aspects**, Val Morin, Quebec, Canada, June, 1999
- *Fourth Peyresq Meeting on **Quantum and Stochastic Gravity**, String Cosmology and Inflation. Peyresq, France, June 1999
- *Workshop on **Quantum Field Theory of Nonequilibrium Processes** , Institute for Nuclear Theory, University of Washington, Seattle. Nov. 1999

- 2000 *Fifth Peyresq Meeting on **Stochastic Gravity and Quantum Cosmology**, Peyresq, France, June 2000
- *International Conference in Honor of E. Fradkin, Moscow, June 2000 (declined)
- *International Conference on **Mechanisms of Decoherence** , Utrecht, Netherland, June 2000 (declined)
- *Minisymposium in Honor of Leonard Parker, Oakland University, Oct. 2000
- *Second International Workshop on **Quantum Aspects of Beam Physics**, Capri, Italy, Oct. 2000

- 2001 * Lectures on **Quantum and Gravity Physics** at the Erice International School, Italy; May 2001.
- ***Black Holes III: Theory and Mathematical Aspects**, Banff, Canada, May, 2001
- *Sixth Peyresq Meeting on **Quantum and Stochastic Gravity, String and Brane Cosmology**. Peyresq, France, June 2001
- * Workshop on **Mechanisms for Decoherence**-Theory and Applications to Nanotechnology and Quantum Information Science held at IC2, University of Texas, Austin, October 2001

- 2002 + Session on New Approaches to Quantum Gravity in the Workshop on **New Directions in the Foundations of Physics** May 3-5, 2002. AIP, College Park
- * IXth International Conference on **Quantum Optics** Raubichi, BELARUS, May 14-17, 2002. ICQO'2002 (declined)
- * Third International **Sakharov Conference** on Physics, Lebedev Institute Moscow June 24-28. (declined)

- *Seventh Peyresq Meeting on Quantum and Stochastic Gravity, **Brane and String Cosmology** Peyresq, France, June 23-28, 2002
 - *Santa Fe **Cosmology Summer Workshop**, July 8-27, 2002
 - *Dynamics Days Asia-Pacific: Second International Conference on **Nonlinear Science** (DDAP2) Hangzhou, China. August 8-12, 2002. (declined)
 - *Workshop on **Quantum Control** at MIT, October 14-18, 2002
- 2003
- *International Workshop on **Quantum Aspects of Beam Physics**. Hiroshima, January 2003 (declined)
 - *APS Topical Group: **Analog Models of Gravity**, Philadelphia, April 2003 (paper presented by co-author E. Calzetta)
 - +2nd annual New Directions in the **Foundations of Physics**. AIP, U Maryland, College Park. May 2-4, 2003
 - *First International Conference on **Noise and Fluctuations in Photonics and Quantum Optics**", Santa Fe, USA, 1-4 June (Program comm.& Invited speaker)
 - *Workshop on "The **Early Universe, Inflation and CMB Fluctuations**" Peyresq, France June 22-26, 2003
 - *Santa Fe **Cosmology Summer Workshop**, July 7-25, 2003 (declined)
 - *Sixth International Workshop on **Quantum Field Theory** under the Influence of External Conditions (QFEXT03), Univ.of Oklahoma, Norman, Sept. 15-19, 2003
- 2004
- +3rd annual New Directions in the Foundations of Physics conference, AIP, Univ. Maryland, College Park. April 30 - May 2, 2004
 - *Second International Conference on **Noise and Fluctuations**, Canary Islands, May 26-28. Program committee member and Invited speaker in **Photonics and Quantum Optics** (declined)
 - *7th Capra Meeting on **Gravitational Radiation Reaction**, Brownsville, Texas May 29-31, 2004 (declined)
 - *Biennial conference of the International Association for **Relativistic Dynamics**, Saas Fee, Switzerland 12-19 June 2004
 - *Workshop on "**Macro and Micro Structures of Spacetime**" Peyresq, France June 22-26
 - *Second International Workshop (DICE 2004) on **Decoherence, Gravity, Cosmology and Extensions of Quantum Theory**, Tuscany, Italy. Sept. 1-4 - International Workshop on RHIC physics. Brookhaven National Laboratory. Dec. 16-17, 2004
- 2005
- *International Conference on **Theoretical Physics** dedicated to the 70th **Anniversary of the Tamm Theory** Department, Lebedev Institute, Moscow, April 11-16 (declined)
 - ***Quantum Physics of Nature** (QUPON), Vienna, Austria, May 22-26
 - *10th Peyresq Workshop on "**Macro and Micro Structures of Spacetime II**", Peyresq, France, June 18-24
 - *Santa Fe **Cosmology Summer Workshop**, Santa Fe, New Mexico. July 5-23 (declined)

- Quantum Control** Summer School, Caltech, Pasadena, Aug. 8-14 (declined)
 - ***Quark-Gluon-Plasma** Thermalization, Vienna, Austria, August 10-12, 2005 (declined)
 - *14th International Conference on **Fluid Dynamics in Complex Systems**. Kyoto University, Japan, Aug. 22-26 (declined)
 - 6th International Conference **Renormalization Group 2005** (RG2005) at the University of Helsinki, August 30 - September 3, 2005 (declined)
 - *Asia-Pacific Conference on **Gravitation and Cosmology** – in celebration of the 90th anniversary of the publication of the Theory of General Relativity, National Central University, Taiwan. Nov 23-26.
- 2006
- *Winter School on **Quantum Information Science**, National Cheng Kung University, Sun Moon Lake, Taiwan, Jan 5-7
 - *National University of Singapore, Physics Department and Center for **Quantum Information Science**, March 30-April 3
 - *National Center for Theoretical Science, Taiwan April 6-8
 - *Institute of Physics, Academia Sinica, Taiwan May 13-23
 - * International Conference on **Nonlinear Science**, Hong Kong May 24-26
 - * **Quantum Entanglement & Geometry**, Toruń, Poland June 4-7, 2006
 - * Jagiellonian University, Krakow, Poland June 12-13
 - *11th Peyresq Workshop on "**Macro and Micro Structures of Spacetime IV**", Peyresq, France, June 17-23
 - * Workshop on **Quantum - Classical Transition and Quantum Information**, June 18-30 Benasque
 - * Santa Fe **Cosmology Summer Workshop**, Santa Fe, New Mexico. July 3-21
 - * Workshop on NonGaussianity in **Cosmology**, ICTP Trieste, Italy July 24- 28 (both declined)
 - * DICE2006 International Workshop: **Quantum Mechanics between Decoherence and Determinism**: new aspects from particle physics to cosmology Castello di Piombino (Tuscany) Italy, September 11-15, 2006
- 2007
- *Third Workshop on **Quantum Information Science and Technology**, National Center for Theoretical Sciences, Tainan, Taiwan, Jan 5- 11
 - *Tainan Workshop on **Gravitation and Cosmology**, Jan 13-15, Tainan, Taiwan
 - *National Center for Theoretical Science, National Tsing Hua University, National Cheng Kung University; Institute of Physics, Academia Sinica, Taiwan
 - *Workshop: "From **Quantum to Emergent Gravity**: Theory and Phenomenology" Trieste, Italy. June 11-15
 - *12th Peyresq Workshop on "**Macro and Micro Structures of Spacetime III**", Peyresq, France, June 16-22
 - *International Conference on **Quantum Gravity "LOOPS '07** Morelia, Mexico June 25 - 30
 - *Summer School on "**Nonequilibrium Dynamics and Quantum Coherence Phenomena**" National Center for Theoretical Sciences, Taiwan, July 4-6

- *The **Chinese Academy of Sciences**, Beijing, China: Institute of Physics, Institute of Theoretical Physics, and Academy of Mathematics and Systems Sciences, July 23-27
 - *Workshop on “**Condensed Matter meets Gravity**”, Lorentz Center, University of Leiden, Holland, August 27-31
 - *Symposium on **New Directions in Interdisciplinary Research** in the 21 Century, Japanese Government sponsored Center of Excellence program, Waseda University, Tokyo. Sept 13-14. Seminar at Research Center for Early Universe, Tokyo University, Sept 12
- 2008
- *Taitung Winter School of **Gravitation and Cosmology** Jan 7-10, Taiwan.
 - * KITP program on **Nonequilibrium Phenomena in Cosmology and Particle Physics** and invited speaker at the Conference. Feb 4-29
 - * **Foundations of Physics** Symposium, U. Maryland, College Park. April 24-27
 - * 13th Peyresq Workshop on “**Macro and Micro Structures of Spacetime**”, Peyresq, France, June 21-27.
 - * Chinese Society of **Gravitation & Relativistic Astrophysics**, Lanzhou July 19-23
 - *Workshop on “**Condensed Matter meets Gravity**”, MIT, August 25-29
 - * DICE2008 – **From Quantum Mechanics through Complexity to Gravity**: the role of emergent dynamical structures. September 22-26 at the Castello Pasquini (Castiglioncello), Tuscany, Italy.

X. RESEARCH SCOPES	(needs update)	Publication No.
1. Laser Physics and Molecular Kinetic		A1
2. General Relativity: homogeneous anisotropic cosmology, group-theoretical methods in perturbation theory, wave equations in curved space		A2, 3, 6
3. Relativistic Cosmology and Astrophysics: gravitational wave physics, radiation reaction and galaxy formation		A8, 11, 17, 58
4. Thermodynamics and Cosmology: noise, fluctuation, irreversibility and structure		B26, 27, 29, 31
5. Particle Physics and Cosmology, Cosmology as 'Condensed Matter' Physics, Semi-classical gravity and mesoscopic physics, general relativity as hydrodynamics		B2, 15, 18, 24, 34, 37
6. Quantum Field Theory in Curved Spacetime:		
a) Canonical Formalism: canonical quantization, adiabatic regularization, trace anomaly		A4, 5, 7, 12, 13
b) Path-integral Formalism: Feynman propagator in curved space, effective action method, interacting field theory, renormalization group equations, quasi-local approximation, closed-time path formalism		A14,15,35, 65
7. Quantum Effects in the Early Universe: particle creation in cosmological spacetimes and backreaction on the structure and dynamics of the early universe		A9,10,14,16 18,31,37 B1,17,19,25
8. Symmetry Breaking of Quantum Systems in Curved Spacetime: effects of spacetime curvature, topology and field coupling on the symmetry behavior; finite size effect and dimensional reduction, infrared behavior and phase transition		A23,25,34,38,39,40 B7,9,12
9. Inflationary Cosmology and Phase Transition in the Early Universe: phase transitions and reheating, thermal and quantum gravitational effects on Planck scale process		A27,28,47,66,68 B10,11,12,13,16
10. Quantum Cosmology and Semiclassical Gravity: Validity of minisuperspace approximation; Noise, decoherence and backreaction, Fluctuations and validity of semi-classical gravity		A43, 45,52,55 B14, 21,24,25

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|---|---------------------------------------|
| 11. Higher-Dimensional Unified Theories, Propagators in Symmetric Spaces: Kaluza-Klein theory and cosmology, classical and quantum dynamical effects, vacuum stability, gauge coupling constants | A6,29 |
| 12. Finite Temperature Quantum Field Theory in Curved Spacetime: criteria for thermal equilibrium and finite temperature theories in curved spacetimes, real and imaginary time thermal Green function, adiabatic expansion, quasi-local effective Lagrangian | A18,19,22,26,32,40
B3,4,5,7 |
| 13. Statistical Thermodynamics of Quantum Fields in Gravitational Systems: entropy of fields, subdynamics analysis, entropy generation in quantum cosmological processes, vacuum viscosity, gravitational entropy | A20,21,30,33,41,70
B6,26, C |
| 14. Non-Equilibrium Statistical and Kinetic Field Theories in Curved Spacetime: effective action methods in quantum statistical theory, Wigner function and quantum kinetic theory, dissipation in semiclassical theories, transport phenomena | A35,36,43,72,77,78
B14 |
| 15. Quantum Open Systems and Stochastic Field Theory quantum Brownian motion, influence functional method, coarse-grained effective action, decoherence and quantum to classical transition, uncertainty principle and squeezed states, quantum dynamics of correlations, applications to atomic physics, quantum optics and mesoscopic systems | A46,49,52,56,57,63,64,82
B26-34 |
| 16. Effective Field Theory | A61 |
| 17. Stochastic Semiclassical Gravity | A53, 54, 55, 69,74,79,80,81,85
B54 |
| 18. Structure and Defect Formation in the Early Universe | A58, 71,83 |
| 19. Black Hole Fluctuations and Backreaction, Phase Transitions | A64, 73, C4 |
| 20. Stochastic Theory of Thermal Radiance in Detectors, Black Holes and Cosmology | A59-62,67 |
| 21. Relativistic Particles Moving in a Quantum Fields | A84, B50,51,52 |
| 22. Atom-Field Interaction, Bose Einstein Condensation | A75,76,86 |

Mathematical Physics: (needs to add content and update)

Inasmuch as the objects of investigation are motivated by physical problems, the methods used in most of the research above bear on various branches of mathematics. In addition to the obvious relation of differential geometry with general relativity and gauge theory, and Lie groups with symmetric spaces, the following arise in the contexts of quantum field theory and statistical mechanics in curved spacetimes:

a) Scalar and Tensor Wave Equations in Curved Manifolds:

Separation by group theory methods

b) Harmonic Analysis on Homogeneous Spaces:

Geometric Representation of Feynman Propagators,
Kaluza-Klein theories with non-maximally symmetric internal spaces

c) Quantum Field Theory in Curved Spacetimes:

Path-Integral quantization, proper-time representations,
Heat Kernel techniques and zeta-function regularizations

d) Symmetry Breaking and Phase Transition:

Curvature, topological and finite size effects,
Spectral analysis, infrared behavior, dimensional reduction

e) Thermal Field Theory

Finite temperature field theory in spacetimes with Euclidean sections,
Thermal Green functions, Adiabatic expansions in dynamic spacetimes

f) Quantum Kinetic Theory

Wigner functions, Weyl transform, Riemann normal coordinate expansion of propagators, quantum transport of quasiparticles;
Boltzmann equation and BBGKY hierarchy, Quantum transport and dynamics of correlation functions. Nonequilibrium dynamics of strongly correlated systems, BEC atoms in optical lattices

g) Stochastic Field Theory

Quantum Brownian motion, non-Markovian processes,
Influence functional method: nonlocal dissipation and colored noise,
Functional Langevin equations, Fokker-Planck equations.

h) Quantum Coherence and Information

Decoherence mechanisms in condensed matter and superconductivity based quantum computer schemes. Entanglement dynamics in many qubit systems. Quantum trajectory applied to dissipative tunneling. Quantum backaction, feedback and control.

A. Papers Published in Refereed Journals:

Physics and Astronomy Research

1. "VIBRATIONAL ENERGY TRANSFER IN CO₂ LASERS"
C. B. Moore, R. E. Wood, B. L. Hu and J. T. Yardley
Journal of Chemical Physics 46, 4222 (1967).
2. "PERTURBATIONS ON THE MIXMASTER UNIVERSE"
B. L. Hu and T. Regge, Physical Review Letters 29, 1616 (1972).
3. "SCALAR WAVES IN THE MIXMASTER UNIVERSE I. Helmholtz Equation in a Fixed Background", Physical Review D8, 1048 (1973).
4. "QUANTIZED SCALAR FIELDS IN A CLOSED ANISOTROPIC UNIVERSE"
B. L. Hu, S. A. Fulling and L. Parker, Physical Review D8, 2377 (1973)
5. "SCALAR WAVES IN THE MIXMASTER UNIVERSE II. Particle Creation"
Physical Review D9, 3263 (1974).
6. "SEPARATION OF TENSOR EQUATIONS IN A HOMOGENEOUS SPACE BY GROUP THEORETICAL METHODS"
Journal of Mathematical Physics 15, 1748 (1974).
7. "CONFORMAL ENERGY-MOMENTUM TENSOR IN CURVED SPACETIMES: Adiabatic Regularization and Renormalization"
S. A. Fulling, L. Parker and B. L. Hu, Physical Review D10, 3905 (1974).
8. "NUMERICAL EXAMPLES FROM PERTURBATION ANALYSIS OF THE MIXMASTER UNIVERSE" Physical Review D12, 1551 (1975).
9. "EFFECT OF GRAVITON CREATION IN ISOTROPICALLY EXPANDING UNIVERSES" B. L. Hu and L. Parker, Physics Letters 63A, 217 (1977).
10. "ANISOTROPY DAMPING THROUGH QUANTUM EFFECTS IN THE EARLY UNIVERSE" B. L. Hu and L. Parker, Physical Review D17, 933 (1978).
11. "GRAVITATIONAL WAVES IN A BIANCHI TYPE I UNIVERSE"
Physical Review D18, 969 (1978).
12. "CALCULATION OF TRACE ANOMALY OF CONFORMAL TENSOR ENERGY- MOMENTUM IN KASNER SPACETIME BY ADIABATIC REGULARIZATION" Physical Review D18, 4460 (1978).

13. "TRACE ANOMALY OF THE ENERGY-MOMENTUM TENSOR OF QUANTIZED SCALAR FIELDS IN ROBERTSON-WALKER SPACETIME" Physics Letters 71A, 169-173 (1979)
14. "QUANTUM EFFECTS IN THE EARLY UNIVERSE I. Influence of Trace Anomalies on Anomalies on Isotropic, Classical Geometries" M. V. Fischetti, J. B. Hartle and B. L. Hu, Physical Review D20, 1757 (1979).
15. "QUANTUM EFFECTS IN THE EARLY UNIVERSE II. Effective Action for Scalar Fields in Homogeneous Cosmologies with Small Anisotropy" J. B. Hartle and B. L. Hu, Physical Review D20, 1772 (1979).
16. "QUANTUM EFFECTS IN THE EARLY UNIVERSE III. Dissipation of Anisotropy by Scalar Particle Production" J. B. Hartle and B. L. Hu, Physical Review D21, 2756 (1980).
17. "THE INFLUENCE OF COSMOLOGICAL GRAVITATIONAL WAVES ON A NEWTONIAN BINARY SYSTEM" B. Mashhoon, B. J. Carr and B. L. Hu, Astrophysical Journal 246, 569 (1981).
18. "EFFECT OF FINITE TEMPERATURE QUANTUM FIELDS ON THE EARLY UNIVERSE" Physics Letters 103B, 331 (1981).
19. "FINITE TEMPERATURE QUANTUM FIELDS IN EXPANDING UNIVERSES" Physics Letters 108B, 19 (1982).
20. "VACUUM VISCOSITY DESCRIPTION OF QUANTUM PROCESSES THE EARLY UNIVERSE" Physics Letters 90A, 375 (1982).
21. "QUANTUM DISSIPATIVE PROCESSES AND GRAVITATIONAL ENTROPY OF THE UNIVERSE" Physics Letters 97A, 368 (1983).
22. "FINITE TEMPERATURE EFFECTIVE POTENTIAL FOR Φ^4 THEORY IN ROBERTSON-WALKER UNIVERSES" Physics Letters 123B, 189 (1983).
23. "SYMMETRY BEHAVIOR IN THE EINSTEIN UNIVERSE: Effect of Spacetime Curvature and Arbitrary Field Coupling" J. O'Connor, B. L. Hu and T. C. Shen. Physics Letters 130B, 31 (1983).
24. "EFFECTIVE LAGRANGIAN FOR Φ^4 THEORY IN CURVED SPACETIME WITH VARYING BACKGROUND FIELDS: Quasi-Local Approximation" B. L. Hu and D. J. O'Connor, Physical Review D30, 743 (1984).

25. "SYMMETRY BEHAVIOR IN THE STATIC TAUB UNIVERSE:
Effect of Curvature Anisotropy"
T. C. Shen, B. L. Hu and D. J. O'Connor, Physical Review D31, 2401 (1985).
26. "FINITE TEMPERATURE ENERGY DENSITY AND EFFECTIVE
QUASI-POTENTIAL IN ANISOTROPIC UNIVERSES"
L. F. Chen and B. L. Hu, Physics letters 160B, 36 (1985).
27. "INFRARED BEHAVIOR AND FINITE SIZE EFFECTS IN INFLATIONARY
COSMOLOGY"
B. L. Hu and D. J. O'Connor, Physical Review Letters 56, 1613 (1986).
28. "MIXMASTER INFLATION"
B. L. Hu and D. J. O'Connor, Physical Review D (Rapid Comm.) 34, 2535 (1986).
29. "WEAK ANGLE FROM KALUZA-KLEIN THEORY WITH DEFORMED
INTERNAL SPACE"
B. L. Hu and T. C. Shen, Physics Letters B180, 373 (1986).
30. "INTRINSIC MEASURES OF FIELD ENTROPY AND COSMOLOGICAL
PARTICLE CREATION"
B. L. Hu and D. Pavon, Physics Letters B180, 329 (1986).
31. "CLOSED TIME-PATH FUNCTIONAL FORMALISM IN CURVED
SPACETIME: Application to Cosmological Backreaction Problems"
E. Calzetta and B. L. Hu, Physical Review D35, 495 (1987).
32. "FINITE TEMPERATURE QUANTUM FIELD THEORY IN CURVED
SPACETIME: Quasi-Local Effective Lagrangians"
B. L. Hu, R. Critchley and Aris Stylianopoulos,
Physical Review D35, 510 (1987).
33. "ENTROPY GENERATION IN COSMOLOGICAL PARTICLE CREATION
AND INTERACTIONS: A Statistical Subdynamics Analysis"
B. L. Hu and H. E. Kandrup, Physical Review D35, 1776 (1987).
34. "SYMMETRY BEHAVIOR IN CURVED SPACETIME: FINITE SIZE EFFECT
AND DIMENSIONAL REDUCTION"
B. L. Hu and D. J. O'Connor, Physical Review D36, 1701 (1987).
35. "NON-EQUILIBRIUM QUANTUM FIELDS: CLOSED TIME-PATH
EFFECTIVE ACTION, WIGNER FUNCTION AND BOLTZMANN
EQUATION" E. Calzetta and B. L. Hu, Physical Review D37, 2878 (1988).

36. "QUANTUM KINETIC FIELD THEORY IN CURVED SPACETIME WIGNER FUNCTION AND LIOUVILLE EQUATION"
E. Calzetta, S. Habib and B. L. Hu, Physical Review D37, 2901 (1988).
37. "QUANTUM EFFECT OF INTERACTING FIELDS IN THE EARLY UNIVERSE" B. L. Hu and Y. H. Zhang, Physical Review D37, 2151 (1988).
38. "SYMMETRY BEHAVIOR IN COSMOLOGICAL SPACETIME: Effect of Slowly-Varying Background Fields"
S. Sinha and B. L. Hu, Physical Review D38, (1988) 2422-2433.
39. "ON FINITE SIZE SYSTEMS"
D. J. O'Connor, C. R. Stephens and B. L. Hu,
Annals of Physics (N.Y.) 190, (1989) 310-353.
40. "INFRARED BEHAVIOR OF QUASILOCAL SYSTEMS AT FINITE TEMPERATURE"
Aris Stylianopoulos and B. L. Hu, Physical Review D39 (1989) 3647.
41. "DISSIPATION IN QUANTUM FIELDS AND SEMICLASSICAL GRAVITY"
Physica A158 (1989) 399-424.
42. "DISSIPATION OF QUANTUM FIELDS FROM PARTICLE CREATION"
E. Calzetta and B. L. Hu, Physical Review D40 (1989) 656-659.
43. "WIGNER DISTRIBUTION FUNCTION AND PHASE-SPACE FORMULATION OF QUANTUM COSMOLOGY"
E. Calzetta and B. L. Hu, Physical Review D40 (1989) 380-389.
44. "DISSIPATION OF QUANTUM FIELDS FROM PARTICLE CREATION"
E. Calzetta and B. L. Hu, Physical Review D40, 656-659 (1989).
45. "VALIDITY OF THE MINISUPERSPACE APPROXIMATION: An Example from Interacting Quantum Field Theory"
S. Sinha and B. L. Hu, Physical Review D44, 1028 (1991)
46. "QUANTUM BROWNIAN MOTION IN A GENERAL ENVIRONMENT I. Exact Master Equation with Nonlocal Dissipation and Colored Noise"
B. L. Hu, J. P. Paz and Yuhong Zhang, Physical Review D45, 2843 (1992).
47. "CRITICAL DYNAMICS IN THE EARLY UNIVERSE"
Class. Quantum Gravity 10, 593 (1993)
48. "QUANTUM STATISTICAL PROCESSES IN THE EARLY UNIVERSE"
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49. "QUANTUM BROWNIAN MOTION IN A GENERAL ENVIRONMENT II. Nonlinear Coupling and Perturbative Approach"
B. L. Hu, J. P. Paz and Yuhong Zhang, Physical Review D47, 1576 (1993).
50. "SQUEEZED STATES AND UNCERTAINTY PRINCIPLE AT FINITE TEMPERATURE"
B. L. Hu and Yuhong Zhang, Modern Physics Letters A8, 3575-3584 (1993).
51. "SQUEEZED VACUUA AND THE QUANTUM STATISTICS OF COSMOLOGICAL PARTICLE CREATION"
B. L. Hu, G. Kang and A. Matacz,
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52. "QUANTUM BROWNIAN MOTION IN A BATH OF PARAMETRIC OSCILLATORS: A Model for System-Field Interactions"
B. L. Hu and A. Matacz, Physical Review D49, 6612 (1994).
53. "NOISE AND FLUCTUATIONS IN SEMICLASSICAL GRAVITY"
E. Calzetta and B. L. Hu, Physical Review D49, 6636 (1994).
54. "BACKREACTION IN SEMICLASSICAL GRAVITY: Einstein-Langevin Equation" B. L. Hu and A. Matacz, Physical Review D51, 1577-1586 (1995).
55. "FLUCTUATION-DISSIPATION RELATION FOR SEMICLASSICAL COSMOLOGY"
B. L. Hu and S. Sinha, Physical Review D51, 1587-1606 (1995).
56. "UNCERTAINTY PRINCIPLE FOR QUANTUM OPEN SYSTEMS"
B. L. Hu and Yuhong Zhang, Int. J. Modern Physics A10, 4537-4561 (1995).
57. "DECOHERENCE, DELOCALIZATION AND IRREVERSIBILITY IN QUANTUM CHAOTIC SYSTEMS"
K. Shiokawa and B. L. Hu, Physical Review E52, 2497-2509 (1995).
58. "QUANTUM FLUCTUATIONS, DECOHERENCE OF THE MEAN FIELD, AND STRUCTURE FORMATION IN THE EARLY UNIVERSE"
E. Calzetta and B. L. Hu, Physical Review D52, 6770-6788 (1995).
59. "STOCHASTIC THEORY OF ACCELERATED DETECTORS IN QUANTUM FIELDS"
A. Raval, B. L. Hu and J. Anglin, Physical Review D53, 7003-7019 (1996).

60. "THERMAL RADIATION FROM BLACK HOLES AND COSMOLOGICAL SPACETIMES"
B. L. Hu and A. Raval, Modern Physics Letters A 32/33, 2625-2638 (1996).
61. "STOCHASTIC BEHAVIOR OF EFFECTIVE FIELD THEORIES ACROSS THRESHOLD"
E. Calzetta and B. L. Hu, Physical Review D55, 3536-3551 (1997).
62. "NEAR-THERMAL RADIATION IN DETECTORS, MIRRORS AND BLACK HOLES: A Stochastic Approach"
A. Raval, B. L. Hu and Don Koks, Physical Review D55, 4795-4812 (1997).
63. "ENTROPY AND UNCERTAINTY OF SQUEEZED QUANTUM OPEN SYSTEMS" D. Koks, A. Matacz and B. L. Hu
Physical Review D55, 5917-5935 (1997).
64. "FLUCTUATIONS IN THE VACUUM ENERGY DENSITY OF QUANTUM FIELDS IN CURVED SPACETIMES VIA THE GENERALIZED ZETA FUNCTION"
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65. "O(N) Quantum Fields in Curved Spacetime"
S. A. Ramsey and B. L. Hu, Physical Review D56, 661-677 (1997).
66. "NONEQUILIBRIUM INFLATON DYNAMICS AND REHEATING I. Backreaction of Parametric Particle Creation and Curved Spacetime Effects"
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67. "THERMAL PARTICLE CREATION IN COSMOLOGICAL SPACETIMES: A Stochastic Approach"
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68. "NONEQUILIBRIUM INFLATON DYNAMICS AND REHEATING II. Fermion Production, Noise and Stochasticity"
S. A. Ramsey, B. L. Hu and A. Stylianopoulos, Physical Review D57, 6003-6021 (1998).
69. "WAVE PROPAGATION IN STOCHASTIC SPACETIMES: Particle Creation Amplification and Localization"
B. L. Hu and K. Shiokawa, Physical Review D57, 3474-3483 (1998).
70. "NON-EQUILIBRIUM DYNAMICS OF A THERMAL PLASMA IN A GRAVITATIONAL FIELD"
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71. "DEFECT FORMATION AND CRITICAL DYNAMICS IN THE EARLY UNIVERSE"
G. J. Stephens, E. A. Calzetta, B. L. Hu and S. A. Ramsey,
Physical Review D**59** (1999) 045009 gr-qc/9808059
72. "INFLUENCE ACTION AND DECOHERENCE OF HYDRODYNAMIC MODES" E. Calzetta and B. L. Hu, Physical Review D**59**, (1999) 065018.
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73. "FLUCTUATIONS IN A THERMAL FIELD AND DISSIPATION OF A BLACK HOLE SPACETIME: FAR-FIELD LIMIT"
A. Campos and B. L. Hu, Int. J. Theoretical Physics **38** (1999) 1253-1271.
[gr-qc/9812034]
74. "STOCHASTIC GRAVITY"
B. L. Hu, Int. J. Theoretical Physics **38** (1999) 2987-3037 [gr-qc/9902064]
75. "FINITE NUMBER AND FINITE SIZE EFFECT IN RELATIVISTIC BOSE EINSTEIN CONDENSATION"
K. Shiokawa and B. L. Hu, Physical Review D**60** (1999) 045009. [quant-ph/9808006]
76. "ATOM-FIELD INTERACTION: EXACT MASTER EQUATIONS FOR NON-MARKOVIAN DYNAMICS, DECOHERENCE AND RELAXATION"
C. Anastopoulos and B. L. Hu, Physical Review A **62** (2000) 033821,
[quant-ph/9901078]
77. "STOCHASTIC DYNAMICS OF CORRELATIONS IN QUANTUM FIELD THEORY : From Schwinger-Dyson to Boltzmann-Langevin Equations"
E. Calzetta and B. L. Hu, Physical Review D**61** (2000) 025012
78. "HYDRODYNAMIC TRANSPORT FUNCTIONS FROM QUANTUM KINETIC FIELD THEORY"
E. Calzetta, B. L. Hu, S. A. Ramsey, Physical Review D**61** (2000) 125013
79. **Fluctuations of Energy Density and Validity of Semiclassical Gravity**
B. L. Hu and Nicholas G. Phillips, Int. J. Theor. Phys. **39**, 1661–1674 (2000)
80. **Fluctuations of the Vacuum Energy Density in Minkowski and Casimir States via Smeared Quantum Fields and Point-Separation**
N. G. Phillips and B. L. Hu, Physical Review D **62** (2000) 084017

81. **Noise Kernel in Stochastic Gravity and Stress Energy Bi-Tensor of Quantum Fields in Curved Spacetimes**, Nicholas. G. Phillips, B. L. Hu, Phys. Rev. D**63** (2001) 104001 [gr-qc/0010019]
82. **Coarse-Grained Effective Action and Renormalization Group Theory in Semiclassical Gravity and Cosmology**
Esteban A. Calzetta, Bei-Lok Hu, Francisco D. Mazzitelli
Physics Report. **352** (2001) 459-520 [hep-th/0102199]
83. **Notes on Black Hole Phase Transitions**, Greg Stephens and B. L. Hu,
Int. J. Theor. Phys. **40** (2001) 2183-2200 [gr-qc/0102052]
84. **Stochastic Theory of Relativistic Particles Moving in a Quantum Field: Scalar Abraham-Lorentz-Dirac-Langevin Equation, Radiation Reaction and Vacuum Fluctuations**, Philip R. Johnson and B. L. Hu, Phys. Rev. D**65** (2002) 065015 [quant-ph/0012137]
85. **A Kinetic Theory Approach to Quantum Gravity**
B. L. Hu, Invited talk given at the 6th Peyresq Meeting, France, June 2001.
Int. J. Theor. Phys. **41** (2002) 2111-2138 [gr-qc/0204069]
86. **Decoherence of Two-Level Systems Can Be Very Different from Brownian Particles**,
B. L. Hu, *Chaos, Solitons and Fractals*, **16**, (2003) 391-398 [quant-ph/0203001]
87. **Noise Kernel and Stress Energy Bi-Tensor of Quantum Fields in Hot Flat Space and the Schwarzschild Metric: Failure of the Gaussian Approximation**
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88. **Black Hole Fluctuations and Backreaction in Stochastic Gravity**, S. Sinha, A. Raval and B. L. Hu in Foundations of Physics **33** (2003) 37-64 [gr-qc/0210013]
89. **Stochastic gravity: A primer with applications**, B. L. Hu and E. Verdaguer,
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92. **Bose-Einstein condensate collapse and dynamical squeezing of vacuum fluctuations**
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93. **Correlation Entropy of an Interacting Quantum Field and H-theorem for the O(N) Model** E. A. Calzetta and B. L. Hu, Physical Review D **68** (2003) 065027 [hep-ph/0305326]
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95. **Radiation Reaction in Schwarzschild Spacetime:
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96. **Nonequilibrium Dynamics of Optical Lattice-Loaded BEC Atoms:
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99. **Induced Metric Fluctuations and Validity of Semiclassical Gravity**
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100. **Stability of Semiclassical Gravity Solutions with respect to Quantum
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101. **Comment on "Enhancing Acceleration Radiation from Ground-State Atoms
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A. Eftekharzadeh and B. L. Hu, Brazilian J. Phys. **35** (2005) 333-342 [hep-th/0504150]

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111. Self-force on a scalar charge in radial infall from rest using the Hadamard-WKB expansion

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117. **New Insights into Uniformly Accelerated Detector in a Quantum Field:** Shih-Yuin Lin and B. L. Hu, in Foundations of Physics **37**, 480 (2007) *Proceedings of the IARD 2006 conference*, Storrs, Conn. [[gr-qc/0610024](#)]
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119. **Stochastic Gross-Pitaevsky Equation for BEC via Coarse-Grained Effective Action** Esteban Calzetta, B. L. Hu, Enric Verdaguer, Int. J. Mod. Phys. B **21** (2007) 4239-4247 [[cond-mat/0702046](#)]
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122. **Exact Master Equation and Quantum Decoherence for Two Harmonic Oscillators in a General Environment** C. H. Chou, Ting Yu and B. L. Hu, Phys. Rev. E **77** (2008) 011112 [[quant-ph/0703088](#)]
123. **Quantum Brownian Motion of a Macroscopic Object in a General Environment**, C. H. Chou, B. L. Hu and Ting Yu [[arXiv:0708.0882](#)] Physica A **387** (2008) 432- 444

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Quantum Entanglement under Non-Markovian Dynamics of Two Qubits Interacting with a Common Electromagnetic Field,

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Quantum Entanglement, Recoherence and Information Flow in a Particle- Field System: Implications for black hole information issue
S. Y. Lin and B. L. Hu, Class. Quant. Grav. (special issue) (2008) Proceedings of Peyresq 12 [[arXiv:0710.0435](#)]

Black Hole Information from a Detector (Atom) -Field Analog B. L. Hu and S. Y. Lin, in Proceedings of Workshop "From Quantum to Emergent Gravity: Theory and Phenomenology." SISSA, Trieste, Italy, June 11-15, 2007. PoP publications (2008) [arXiv:0712.3643](#)

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Chad R. Galley and B. L. Hu, Phys. Rev. D (2008) [arXiv:0801.0900](#)

Intrinsic and Fundamental Decoherence : Issues and Problems C. Anastopoulos and B. L. Hu, Class. Quant. Grav. (special issue) (2008) Proceedings of Peyresq 11

In preparation

Nonlocality and Stochasticity at the Macro-micro interface: Implications for Quantum Gravity DICE 2008

Self-force on a scalar charge in motion from rest in arbitrary trajectory using the Hadamard-WKB expansion, P. R. Anderson, A. Eftekharzadeh and B. L. Hu

Noise Kernel of a Quantum Scalar Field near a Schwarzschild Black Hole Horizon
A. Eftekharzadeh, B. L. Hu and Albert Roura

Motion of a small mass in a massive black hole spacetime: Gravitational radiation, self force and backreaction. Chad Galley and B. L. Hu

Dissipative Quantum Tunneling in Real Time Formulation,
Chris Fleming, Albert Roura, Philip Johnson, Ting Yu and B. L. Hu

Dissipative Quantum Tunneling via Quantum Trajectory,

Chris Fleming, Albert Roura, Philip Johnson, B. L. Hu and Ting Yu

Quantum Field Theory of Moving Mirrors

I. Influence Functional formulation II. Vacuum Viscosity

Chad Galley and B. L. Hu

Stochastic motion of macroscopic objects interacting with a quantum field

I. Langevin Equation for Mirror-Photon Coupling

Chris Fleming, B. L. Hu and Ting Yu

II. Mirror-Field Interaction via Bilinear coupling

C. H. Chou, Chad Galley and B. L. Hu

Quantum Superposition of Two Mirrors C. H. Chou, B. L. Hu and Ting Yu

Decoherence and Relaxation of a Few Coupled Spin Chain in a Phonon Bath

A. J. Skinner, B.-L. Hu

B. Papers Presented at Scientific Meetings:

1. Invited Papers

1. "QUANTUM FIELD THEORIES AND RELATIVISTIC COSMOLOGY"
Plenary talk given at the 2nd Marcel Grossmann Meeting on Developments in General Relativity, Trieste, Italy, July, 1979. Published in the Proceedings edited by R. Ruffini (North-Holland Publishing Co., Amsterdam, 1982).
2. "ELEMENTARY PARTICLE PHYSICS AND COSMOLOGY"
Plenary talk given at Guangzhou Conference on Particle Physics, January 1980, Guangzhou, China. Published in the Proceedings edited by Hu Ning (Science Press, Beijing, China, 1980).
3. "EFFECT OF FINITE TEMPERATURE QUANTUM FIELDS IN THE EARLY UNIVERSE"
Invited talk at the Workshop on the Interaction of Particle Physics and Astrophysics, May 1981, Santa Barbara.
4. "SYMMETRY BEHAVIOR AT FINITE TEMPERATURE IN DYNAMIC "
Invited talk given at the Nuffield Workshop on the Very Early Universe, Cambridge, England, July 1982. Published in "The Very Early Universe", edited by G. W. Gibbons, S. W. Hawking and S. Siklos (Cambridge University Press, Cambridge, 1983).
5. "FINITE TEMPERATURE QUANTUM PROCESSES IN THE EARLY UNIVERSE"

Invited talk given at the 3rd Marcel Grossmann Meeting on Recent Developments in General Relativity, August 1982, Shanghai, China.
Proceedings edited by Hu Ning (Science Press, Beijing, 1983).

6. "ON THE DISSIPATIVE NATURE OF QUANTUM GRAVITATIONAL PROCESSES"
Invited talk given at the Second New Orleans Conference on Quantum Theory and Gravitation, May 1983, New Orleans.
7. "SPACETIME DYNAMICS AND FINITE TEMPERATURE EFFECTS ON SYMMETRY RESTORATION"
Invited talk at the Workshop on the Early Universe at the 10th International Conference on General Relativity and Gravitation, Padova, July 1983.
Proceedings edited by B. Bertotti, F. deFelice and A. Pascolini.
8. "QUASI-LOCAL EFFECTIVE LAGRANGIAN IN CURVED SPACETIME"
Invited talk given at the Induced Gravity Workshop, Oct. 1983, Erice, Italy.
9. "NOTES ON COSMOLOGICAL PHASE TRANSITIONS"
Invited talk at the Inner Space/Outer Space Conference, Fermi Lab, May 1984.
Published in the Proceedings edited by E. Kolb et al
(University of Chicago Press, Chicago, 1986). pp 479-483.
10. "CAN QUANTUM GRAVITATIONAL EFFECTS PREVENT INFLATION?"
Invited talk given at the International Workshop on Gauge Theory, Gravitation and the Early Universe, Nov. 1984, Ahmedabad, India, and at the Raman Institute of Physics, Bangalore, India.
11. "QUANTUM GEOMETRIC EFFECTS AND INFLATIONARY COSMOLOGY"
Invited talk given at the Workshop on "Classical and Quantum Gravity"
May 1985, Syracuse, New York.
12. "GEOMETRIC EFFECTS IN COSMOLOGICAL PHASE TRANSITION"
Invited talk given at the "Particle and the Universe" International Symposium, Thessaloniki, Greece, June 1985. Proceedings edited by G. Lazarides and Q. Shafi, (Elsevier Science Publishing Co., N.Y. 1986).
13. "PHASE TRANSITIONS IN THE EARLY UNIVERSE: Geometric Effects"
Plenary talk given at the 4th Marcel Grossmann Meeting on Recent Developments in General Relativity, Rome, Italy, June 1985. Published in Proceedings edited by R. Ruffini (North-Holland Publishing Co., Amsterdam, 1986).
14. "WIGNER FUNCTION AND QUANTUM LIOUVILLE EQUATION IN CURVED SPACETIME" E. Calzetta and B. L. Hu.

Invited talk given at the First International Conference on the Physics of Phase Space, College Park, Maryland, May 1986. Proceedings edited by Y. S. Kim and W. W. Zachary, (Springer-Verlag, Berlin 1986)

15. "THE EARLY UNIVERSE AND PARTICLE PHYSICS".
Invited talk at the New York State American Physical Society Meeting on Cosmology and Particle Physics, Oct. 1986, Syracuse.
16. "DYNAMICAL FINITE SIZE EFFECT, INFLATIONARY COSMOLOGY AND THERMAL PARTICLE PRODUCTION"
Invited talk given at the CAP-NSERC Summer Institute in Theoretical Physics, Edmonton, Canada, July 1987. Proceedings edited by K. Khanna, G. Kunstatter and H. Umezawa (World Scientific Publishing Co., Singapore, 1988).
17. "QUANTUM THEORIES OF THE EARLY UNIVERSE: A Critical Appraisal"
Invited talk given at the International Conference on Gravitation and Cosmology, Dec. 1987. Goa, India. Proceedings edited by B. Iyer and C. V. Vishveshwara (Cambridge University Press, Cambridge 1989).
18. "COSMOLOGY AS 'CONDENSED MATTER' PHYSICS"
Invited talk given at the Third Asia-Pacific Physics Conference, Hong Kong, June 1988. Proceedings edited by K. Young (World Scientific Publishing Co., Singapore, 1989). [gr-qc/9511076]
19. "THE ROLE OF GRAVITY IN QUANTUM PROCESSES IN CURVED SPACE"
Invited talk given at the Fifth Marcel Grossmann Meeting, Perth, Australia, August 1988. Proceedings edited by D. Blair and M. J. Buckingham (World Scientific Publishing Co., Singapore, 1989).
20. "ON THE NATURE OF DISSIPATION IN SEMI-CLASSICAL GRAVITATIONAL THEORIES"
Invited talk given at the Workshop on Thermal Fields and Applications, Cleveland, October 1988. Proceedings in Physica A158 (1989).
21. "QUANTUM EFFECTS OF SUPERSPACE COSMOLOGY"
Invited lectures at the 11th Course of the International School on Cosmology and Gravitation, Erice, Italy, May 1989. Published in Quantum Mechanics in Curved Space-Time, edited by J. Audretsch and V. de Sabbata (Plenum, London 1990).
22. "COARSE-GRAINED EFFECTIVE ACTION AND INFLATIONARY COSMOLOGY"
B. L. Hu and Yuhong Zhang
Invited talk at the Quantum Field Theory in Curved Space-Time Workshop in GR12, Boulder, Colorado, July 1989.

23. "MINISUPERSPACE COSMOLOGY AS THE INFRARED LIMIT OF QUANTUM GRAVITY" B. L. Hu and Sukanya Sinha
Invited talk at the Quantum Field Theory in Curved Space-Time Workshop in GR12, Boulder, Colorado, July 1989.
24. "STATISTICAL MECHANICS AND QUANTUM COSMOLOGY"
Invited talk given at the 2nd International Workshop on Thermal Fields and Applications, Tsukuba, Japan, July, 1990. Proceedings appeared as Thermal Field Theories, edited by T. Ezawa et al (North-Holland, Amsterdam 1991). gr-qc/9511079.
25. "COARSE-GRAINING AND BACKREACTION IN INFLATIONARY AND MINISUPERSPACE COSMOLOGY,"
Invited Lectures at the Seventh International Latin-American Symposium on General Relativity (SILARG VII). Proceeding appeared as Relativity and Gravitation: Classical and Quantum, edited by J. D'Olivio et al (World Scientific, Singapore, 1991).
26. "FLUCTUATION, DISSIPATION AND IRREVERSIBILITY IN COSMOLOGY"
Invited Talk at the Workshop on The Physical Origin of Time-Asymmetry, Huelva, Spain, Oct. 1991. Proceedings edited by J. J. Halliwell, J. Perez-Mercader and W. H. Zurek (Cambridge University, Cambridge, 1994). gr-qc/9302021.
27. "QUANTUM ORIGIN OF NOISE AND FLUCTUATION IN COSMOLOGY"
Invited Talk at the International Conference on the Origin of Structure in the Universe, Chateau de Pont d'Oye, Belgium April, 1992. Proceedings edited by E. Gunzig, P. Nardonn (NATO ASI Series, Kluwer, Dordrecht, 1993) gr-qc/9512049.
28. "QUANTUM AND THERMAL FLUCTUATIONS, UNCERTAINTY PRINCIPLE, DECOHERENCE AND CLASSICALITY"
Invited Talk at the Third International Workshop on Quantum Nonintegrability, Drexel University, Philadelphia, May, 1992. Published in "Quantum Dynamics of Chaotic Systems," edited by J. M. Yuan, D. H. Feng and G. M. Zaslavsky (Gordon and Breach, Philadelphia, 1993) gr-qc/9302029.
29. "QUANTUM NOISE IN GRAVITATION AND COSMOLOGY"
Invited Talk at the Workshop on Fluctuation and Order, Los Alamos National Laboratory, Sept. 1993. Proceedings published in the Santa Fe Institute Series, ed. M. Millonas (Springer-Verlag, Berlin, 1994) astro-ph/9312012.
30. "QUANTUM STATISTICAL FIELD THEORY IN GRAVITATION AND COSMOLOGY"
Invited Lectures at the Third International Workshop on Thermal Fields and

Applications, Banff, Canada, Aug. 1993. Proceedings ed. R. Kobe, G. Kunstatter (World Scientific, 1994) gr-qc/9403061.

31. "NONEQUILIBRIUM QUANTUM FIELDS IN COSMOLOGY: Comments on Current Selected Topics"
Invited Talk at the Second Paris Cosmology Colloquium Observatoire de Paris, Paris, June 2-4, 1994. Proceedings edited by H. de Vega and N. Sanchez (World Scientific, Singapore, 1995) gr-qc/9409053.
32. "CORRELATIONS, DECOHERENCE, DISSIPATION AND NOISE IN QUANTUM FIELD THEORY"
E. Calzetta and B. L. Hu,
Invited Talk at the International Workshop on Heat Kernel Techniques and Quantum Gravity, University of Winnipeg, Canada, August 1994.
Proceedings published as Discourses in the Mathematics and Its Applications No. 4, edited by S. A. Fulling (Texas A & M University Press, College Station, 1995) hep-th/9501040.
33. "ENVIRONMENT-INDUCED EFFECTS IN QUANTUM CHAOS: DECOHERENCE, DELOCALIZATION AND IRREVERSIBILITY"
K. Shiokawa and B. L. Hu
Invited Talk at the International Symposium on Quantum Classical Correspondence, Drexel University, Philadelphia, Sept. 1994, Proceedings eds D. H. Feng and B. L. Hu (International Press, Boston, 1997).
34. "SEMICLASSICAL GRAVITY AND MESOSCOPIC PHYSICS"
Invited Talk at the International Symposium on Quantum Classical Correspondence, Drexel University, Philadelphia, Sept. 1994, Proceedings eds D. H. Feng and B. L. Hu (International Publishers, Boston, 1997) gr-qc/9511077.
35. "HAWKING-UNRUH EFFECT AS RELATIVISTIC EXPONENTIAL SCALING OF QUANTUM NOISE"
Invited talk at the 4th International Workshop on Thermal Field Theory and Applications, Dalian, China, August 1995, Proceedings edited by Y. X. Gui and F. C. Khanna (World Scientific, Singapore, 1996) gr-qc/9606973
36. "CORRELATION DYNAMICS OF QUANTUM FIELDS AND BLACK HOLE INFORMATION PARADOX"
Invited talk at the International School of Astro-fundamental Physics, Sept. 1995. Proceedings edited by N. Sanchez and Zichichi, Physics, Sept. 1995. (Kluwer Publishers, Dordrecht, 1996) gr-qc/9511075
37. "GENERAL RELATIVITY AS GEOMETRO-HYDRODYNAMICS"
Invited talk at the Second Sakharov International Conference Lebedev Physical Institute, May, 1996. Proceedings to appear (World Scientific, Singapore, 1997)

gr-qc/9607070.

38. "NONEQUILIBRIUM PHASE TRANSITIONS IN THE EARLY UNIVERSE"
Invited talk at the International Workshop on Nonequilibrium Phase Transitions
July 1996, Santa Fe, New Mexico
39. "QUANTUM STATISTICAL FIELDS IN GRAVITATION AND COSMOLOGY"
Invited Talk at the International Conference on Gravitation and Cosmology
June 1997, Soo Chow University, Taiwan
40. "COHERENCE AND FLUCTUATIONS IN THE INTERACTION BETWEEN
A MOVING ATOM AND A QUANTUM FIELD"
B. L. Hu and Alpan Raval
Invited talk at the International Symposium on Macroscopic Quantum Coherence,
Northeastern University, Boston, July 1997 (World Scientific, Singapore, 1998)
quant-phys/9710061.
41. "FINITE-SIZE COSMOLOGY"
Invited Talk at the International Workshop on Topology and Cosmology,
Case Western University, Cleveland, Oct. 1997
42. "BLACK HOLE FLUCTUATIONS AND BACKREACTION"
B. L. Hu, Invited talk at the International Conference on quantum Gravity in the
Southern Cone, Bariloche, Argentina, January 1998.
43. "STOCHASTIC GRAVITY"
B. L. Hu, Invited talk at the Third Peyresq Meeting on Quantum Cosmology,
Peyresq, France, June 1998.
44. "NON-EQUILIBRIUM DYNAMICS OF A THERMAL PLASMA IN A
GRAVITATIONAL FIELD"
Invited Talk at the International Workshop on Non-equilibrium Quantum Fields in
Relativistic Heavy Ion Physics, Brookhaven National Laboratory, L. I., Oct. 1998.
45. "NONEQUILIBRIUM QUANTUM FIELDS IN BLACK HOLES AND THE
EARLY UNIVERSE"
Invited Talk at the International Workshop on Nonequilibrium Quantum Fields,
Institute for Theoretical Physics, University of California, Santa Barbara, Jan 1999.
46. "RENORMALIZATION GROUP THEORY IN CURVED SPACETIMES AND
COSMOLOGY: Scaling, Coarse-Graining and Backreaction"
Invited Talk at the International Conference on Renormalization Group Theory
—RG2000 Taxco, Mexico, Jan. 1999

47. "FLUCTUATIONS OF VACUUM ENERGY IN BLACK HOLE SPACETIMES"
Invited Talk at the Fourth Peyresq Meeting on Quantum Cosmology, Peyresq,
France, June 1999
48. "NOISE FROM QUANTUM FIELD THEORY" Invited talk at the Workshop on
Quantum Field theory of Nonequilibrium Processes at the Institute for Nuclear
Theory , University of Washington, Seattle. Nov. 1999
49. "FLUCTUATIONS OF VACUUM ENERGY AND VALIDITY OF
SEMICLASSICAL GRAVITY"
Invited Talk at the Fifth Peyresq Meeting on Quantum Cosmology
Peyresq, France, June 2000
50. **Is there emitted radiation in Unruh effect?**
B.L. Hu, Alpan Raval, Invited Talk at the Capri Workshop on Quantum Aspects
of Beam Physics, Oct. 2000 . Proceedings edited by Pisin Chen.(World-Scientific,
Singapore, 2001) quant-ph/0012134
51. **"Beyond Unruh Effect: Nonequilibrium Quantum Dynamics of Moving
Charges"** B.L. Hu, Philip R. Johnson, Invited Talk at the Capri Workshop on
Quantum aspects of Beam Physics, Oct. 2000. Proceedings edited by Pisin Chen.
(World-Scientific, Singapore, 2001) [quant-ph/0012132]
52. **"Worldline Influence Functional: Abraham-Lorentz-Dirac-Langevin
Equation from QED"** Philip R. Johnson, B.L. Hu , in Proceedings of the Capri
Workshop on Quantum Aspects of Beam Physics, Oct. 2000. Edited by Pisin
Chen (World-Scientific, Singapore, 2001) [quant-ph/0012135]
53. **Recent Advances in Stochastic Gravity: Theory and Issues**
B. L. Hu and E. Verdaguer , Invited Lectures at Erice School, May 2001, in
Advances in the Interplay between Quantum and Gravity Physics edited by P.
Bergmann and V. De Sabbata, (Kluwer, 2002) [gr-qc/0110092]
54. **"Vacuum Energy Fluctuations in Minkowski and Casimir Spaces"** Invited Talk at
the Sixth Peyresq Meeting: Stochastic Gravity and Quantum Cosmology, Peyresq,
France, June 2001
55. **"Decoherence in Two Level Systems and Brownian Motion"**
Invited Talk at the Workshop Mechanisms for Decoherence-Theory and Applications to
Nanotechnology and Quantum Information Science held at IC2, University of Texas,
Austin October 2001. Proceedings published in *Chaos, Solitons and Fractals*, (2003)
56. **"Teacup Cosmology –Particle Creation and Structure Formation in the Early
Universe from BEC Collapse "** Invited Talk at the Seventh Peyresq Meeting
Peyresq, France, June 2002

57. Quantum Noise and Fluctuations in Gravitation and Cosmology

B. L. Hu, Albert Roura, Sukanya Sinha, E. Verdaguer Invited Talk given by BLH at the *First International Symposium on Fluctuations and Noise* Sponsored by SPIE, 1-4 June 2003, Santa Fe, New Mexico. Paper number 5111-46. [gr-qc/0304057]

58. What can we learn from BEC about Quantum Gravity? Invited Talk at the Eighth Peyresq Meeting, Peyresq, France, June 2003

59. Moving Charges, Detectors and Mirrors in a Quantum Field with Backreaction

Chad Galley, B. L. Hu and Philip R. Johnson in Proceedings of the Third International Symposium on Quantum Field Theory under the influence of External Conditions, Oklahoma City, Sept. 2003, edited by Kimball Milton (Rinton Press, 2004) [quant-ph/0402002]

60. “Stochastic Theory of Relativistic Charges and Atoms in a Quantum Field”, IARD04 conference, Saas Fee, Switzerland, June 2004. Proceedings published in Foundations of Physics (2005)

61. “Black Hole Backreaction – difference between the Bekenstein Model and Stochastic Gravity Predictions” Invited Talk at the Ninth Peyresq Meeting, Peyresq, France, June 2004

62. “Black Hole Backreaction in the Moving Mirror Analog”, with Chad Galley, Invited Talk at the Ninth Peyresq Meeting, Peyresq, France, June 2004

63. “Stochastic Gravity: From Macro to Micro Structures of Spacetime” invited talk at the DICE04 meeting, Piombino, Italy, September 2004

64. “The Universe as an Ultimate Macroscopic Quantum Phenomenon” invited talk at the *Quantum Physics of Nature* (QUPON) Conference, Vienna, Austria, May 2005.

65. “Black hole fluctuations and dynamics from back-reaction of Hawking radiation: Current work and further studies based on stochastic gravity”

B. L. Hu, Albert Roura, Invited talk at the VII Asia-Pacific International Conference on Gravitation and Astrophysics – On the Occasion of the 90th anniversary of the publication of the Theory of General Relativity, National Central University, Taiwan. Nov. 2005 *Proceedings edited by J. M. Nester, C-M Chen and J-P Hsu (World Scientific Singapore, 2006)* p. 236

66. Uniformly Accelerated Detectors in (3+1) D spacetime: From Vacuum

Fluctuations to Radiation Flux. S. Y. Lin and B. L. Hu, Invited talk delivered by S Y Lin at the VII Asia-Pacific International Conference on Gravitation and Astrophysics – On the Occasion of the 90th Year of General Relativity, National Central University, Taiwan. Nov. 2005 *Proceedings edited by J. M. Nester, C-M Chen and J-P Hsu (World Scientific Singapore, 2006)* p.191

67. **“Stochastic Gross-Pitaevsky Equation from Coarse-Grained Effective Action”**,
in International Conference on **Nonlinear Science**, Hong Kong Baptist University
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