HUI LI

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EDUCATION

1990 - 1995	Ph.D. in Theoretical Astrophysics, Rice University Dissertation: "Particle Acceleration Near Astrophysical Compact Object and Several Problems in High Energy Astrophysics" Thesis Advisors: Charles D. Dermer (NRL) and Edison P. Liang (Rice)
1986 - 1990	B.S. in Physics, Beijing University

PROFESSIONAL EXPERIENCES

2002 - present	Adjunct Professor, Dept. of Physics and Astronomy, Rice University.
2000 - present	Staff Member, Los Alamos National Laboratory.
1997 - 2000	J. Robert Oppenheimer Fellow, Los Alamos National Laboratory.
1995 - 1997	Director's Postdoctoral Fellow, Los Alamos National Laboratory.
1990 - 1995	Graduate Fellowship and Research Assistant, Rice University.

HONORS and AWARDS

2005	Fellow, American Physical Society
1997 - 2000	J. Robert Oppenheimer Fellow, Los Alamos National Laboratory.
1995 - 1996	Director's Postdoctoral Fellow, Los Alamos National Laboratory.
1994 - 1995	Grants-in-Aid of Research Award from Sigma Xi Research Society.
1993 - 1994	*William and Elva Gordon* Fellowship, Rice University
1990 - 1991	Rice Graduate Fellowship.

SERVICES and SOCIETIES

- Executive Committee Member of APS/Topical Group in Plasma Astrophysics (2003-2005)
- Chair, APS/Topical Group in Plasma Astrophysics (2006-2007)
- Member of Amer. Astro. Soc.; Amer. Phys. Soc.

STUDENTS and POSTDOCS

- Mr. X. Sun (7/97-5/98, now at MSFC) on X-ray flash search in ROSAT database.
- Mr. Y. Kazimura (7/99-10/99, Toyama Univ.) on PIC simulations of plasma micro-instability.
- Mr. O. Stawicki (8/00-12/00, Univ. of Bochum) on Solar wind MHD turb. and CR transport.
- Dr. K. Noguchi (1/01-present, UT-Austin) on magnetic fields in accretion disks.
- Dr. K. Nishimura (9/01-present, Kyoto Univ.) on particle acceleration by magnetic fields.
- Mr. J. Koller (06/01-06/05, Rice Univ.) on protoplanet migration.
- Dr. I. Tregillis (09/02-09/04, Univ. Minnesota) on astrophysical MHD.
- Dr. S. Li (09/02-09/04, Univ. Minnesota) on numerical MHD.
- Dr. M. Nakamura (08/05-present, JPL) on MHD modeling of astrophysical jets.
- Dr. S. Diehl (06/06-present, Ohio Univ.) on AGN feedback in galaxies.
- Mr. H. Xu (06/06-present, UCSD) on mangetic fields in IGM.

RESEARCH

My main research interest is the physics of magnetized plasmas around compact astrophysical objects and how it can be constrained by astrophysical observations. Specific topics include:

1. *Fluid Dynamics of Accretion Flows:* Waves and instabilities of inviscid shear flows and their role in understanding the angular momentum transport in accretion disks; Linear theory and nonlinear hydro. simulations of Rossby vortices in accretion disks. Application to star formation and supermassive black hole formation.
2. *Origin and Role of Magnetic Fields in Active Galactic Nuclei:* Galactic dynamo via star-disk collisions; MHD equilibria and formation of large scale force-free helix/jets; Magnetic fields in galaxy clusters and IGM, implications for galaxy formation.
3. *Particle Acceleration & Radiative Processes:* Stochastic particle acceleration by MHD turbulence; modeling of the time-dependent multiwavelength radiation from black hole accretion disks and AGN jets by numerically solving coupled kinetic equations for MHD waves, particles and photons; Radiative acceleration of Galactic superluminal jets.
4. *Basic Plasma Physics of Astrophysical and Space Plasmas:* Linear kinetic theory of micro-instabilities of both $e-p$ and $e^{\pm}$ plasmas; Quasilinear theory of wave-particle resonant interactions; Nonlinear simulations of transit-time damping, firehose, electron beam, heat flux instabilities using Particle-in-cell and Hybrid codes.
5. *Gamma Ray Bursts:* Statistical, spatial and temporal analyses of burst data; Search for X-ray flashes from nearby galaxies; High velocity neutron star model for GRBs.
6. *Neutron Stars:* Structure of magnetosphere and relativistic pulsar winds.

PUBLICATIONS

1. Li, H. & Dermer, C.D. 1992, "Gamma-ray Bursts from High-Velocity Neutron Stars", **Nature**, 359, 514
2. Li, H. & Liang, E.P. 1992, "X-ray Flashes From M31 Based on Extended Halo Models of Gamma-ray Bursts", **Astrophysical Journal Letters**, 400, L59
3. Dermer, C.D. & Li, H. 1992, "Galactic Neutron Star Models for Gamma-ray Bursts", **Gamma-Ray Bursts**, eds. W.S. Paciesas & G.J. Fishman (New York: AIP), p. 115
4. Liang, E.P. & Li, H. 1993, "Possible Stellar Flare Contributions to the BATSE Gamma-ray Burst Database", **Astronomy and Astrophysics Letters**, 273, L53
5. Li, H., Dermer, C.D. & Liang, E.P. 1993, "Galactic Halo Model for Gamma-ray Bursts From High Velocity Neutron Stars", in **Compton Gamma-Ray Observatory**, ed. M. Friedlander, N. Gehrels, & D. Macomb (New York: AIP), p. 1035
6. Duncan, R.C., Li, H. & Thompson, C. 1993, "Halo Beaming Models for Gamma-ray Bursts" in **Compton Gamma-Ray Observatory**, ed. M. Friedlander, N. Gehrels, & D. Macomb (New York: AIP), p. 1074
7. Li, H. & Liang, E.P. 1993, "Models for the Spatial Distribution of Gamma-ray Bursts", in **Compton Gamma-Ray Observatory**, ed. M. Friedlander, N. Gehrels, & D. Macomb (New York: AIP), p. 1099

8. Kargatis, V.E., Li, H., et al. 1994, "Duration versus Brightness of Gamma-ray Bursts: Comparison Between SIGNE and BATSE", **Astrophysical Journal Letters**, 421, L83
9. Li, H., Duncan, R. C., & Thompson, C. 1994, "Beamed Gamma-ray Bursts from the Galactic Halo: Model Comparisons with BATSE", in **2nd Huntsville Gamma-Ray Burst Workshop**, ed. G. Fishman, K. Hurley, & J. Brainerd (New York: AIP), p. 600
10. Li, H., Smith, I. A., & Duncan, R. C. 1994, "Comments on Galactic Anisotropy of Gamma-Ray Bursts", in **2nd Huntsville Gamma-Ray Burst Workshop**, ed. G. Fishman, K. Hurley, & J. Brainerd (New York: AIP), p. 79
11. Li, H., Liang, E., Smith, I. A., & Kargatis, V. 1994, "Effects of Pulse Shape on the Details of the Fluence Edge for Short Bursts", in **2nd Huntsville Gamma-Ray Burst Workshop**, ed. G. Fishman, K. Hurley, & J. Brainerd (New York: AIP), p. 217
12. Liang, E.P. & Li, H. 1995, "On Relativistic Ejections from GRS 1915+105", **Astronomy and Astrophysics Letters**, 298, L45
13. Li, H. & Duncan, R.C. 1996, "Beamed Gamma-ray Bursts from the Galactic Halo: Model Comparisons with the 2nd BATSE catalog",in **High Velocity Neutron Stars and Gamma-ray Bursts**, ed. R. Rothschild, & R.E. Lingenfelter, (New York: AIP), p. 244
14. Li, H. & Duncan, R.C. 1996, "Constraints from 3B on Halo Beaming Model", in **3rd Huntsville Gamma-Ray Burst Workshop**, ed. C. Kouveliotou, M. Briggs, & J. Fishman, (New York: AIP), p. 472
15. Li, H. & Liang, E.P. 1996, "Expected Gamma-ray Burst Excess from M31 Based on Halo Models", in **3rd Huntsville Gamma-Ray Burst Workshop**, ed. C. Kouveliotou, M. Briggs, & J. Fishman, (New York: AIP), p. 467
16. Colgate, S.A. & Li, H. 1996, "Gamma-Ray Bursts from the Interaction of Degenerate Disks with Fast Neutron Stars", in **3rd Huntsville Gamma-Ray Burst Workshop**, ed. C. Kouveliotou, M. Briggs, & J. Fishman, (New York: AIP), p. 734
17. Dermer, C.D., Miller, J.A., & Li, H. 1996, "Stochastic Particle Acceleration near Accreting Black Holes", **Astrophysical Journal**, 456, 106
18. Li, H. & Liang, E.P. 1996, "Formation and Radiation Acceleration of Pair Plasmoids near Galactic Black Holes", **Astrophysical Journal**, 458, 514
19. Li, H., Kusunose, M., & Liang, E.P. 1996, "Gamma-rays from Galactic Black Hole Candidates with Stochastic Particle Acceleration", **Astrophysical Journal Letters**, 460, L29
20. Li, H., Fenimore, E.E., & Liang, E.P. 1996, "Detectability of Gamma-ray Burst Excess toward M31", **Astrophysical Journal Letters**, 461, L73
21. Li, H. & Fenimore, E.E. 1996, "Log-normal Distributions in Gamma-Ray Burst Time Histories", **Astrophysical Journal Letters**, 469, L115
22. Li, H., Kusunose, M., & Liang, E.P. 1996, "Non-thermal High Energy Emissions and Stochastic Particle Acceleration in Galactic Black Holes", **Astronomy and Astrophysics Supplements**, 120, C167
23. Gary, S.P. & Li, H. 1996, "Proton Firehose Instability in Solar Wind", in **3rd SOLTIP Symposium on Solar and Interplanetary Transient Phenomena**, Journal of Space Sciences.

24. Li, H. & Miller, J.A. 1997, "Electron Acceleration and the Production of Nonthermal Electron Distributions in Accretion Disk Coronae", **Astrophysical Journal Letters**, 478, 67

25. Duncan, R.C. & Li, H. 1997, "The Halo Beaming Model for Gamma Ray Bursts", **Astrophysical Journal**, 484, 720

26. Li, H., Miller, J.A. & Colgate, S.A. 1997, "Stochastic Particle Acceleration by Plasma Waves in AGN Jets", an invited review in **Relativistic Jets in AGNs**, ed. M. Ostrowski, M. Sikora, G. Madejski, & M. Begelman (Krakow, Poland), p. 162

27. Colgate, S.A. & Li, H. 1997, "The Galactic Dynamo, the Helical Force Free Field and the Emissions of AGN", in **Relativistic Jets in AGNs**, ed. M. Ostrowski, M. Sikora, G. Madejski, & M. Begelman (Krakow, Poland), p. 172

28. Kusunose, M., Li, H. & Miller, J.A. 1997, "Nonthermal Electron Production by Stochastic Particle Acceleration and Gamma-rays from Galactic Black Hole Candidates", in **International Astronomical Union. Symposium no. 188. The Hot Universe**, Kyoto, Japan

29. Li, H. 1998, "An Overview of the Physical Issues on Pulsar Winds", **RevMexAA**, 7, 98

30. Li, H., Sun, X. & Fenimore, E.E. 1998, "The Expected Rates of X-ray Flashes from GRBs in ROSAT and Preliminary Search Results", in **4th Huntsville Gamma-Ray Burst Workshop**, ed. C. Meegan, R. Preece, & T. Koshut, (New York: AIP), p. 420

31. Sun, X., Li, H., Fenimore, E.E. & Wang, Q.D. 1998, "X-ray Flashes in ROSAT PSPC Data", in **4th Huntsville Gamma-Ray Burst Workshop**, ed. C. Meegan, R. Preece, & T. Koshut, (New York: AIP), p. 456

32. Colgate, S.A. & Li, H. 1998, "The Galactic Model of GRBs", in **4th Huntsville Gamma-Ray Burst Workshop**, ed. C. Meegan, R. Preece, & T. Koshut, (New York: AIP), p. 820

33. Gary, S.P., Li, H., O'Rourke, S. & Winske, D. 1998, "Proton resonant firehose instability: Temperature anisotropy and fluctuating field constraints", **Journal of Geophysical Research**, 103, A7, 14567

34. Colgate, S.A. & Li, H. 1999, "Dynamo Dominated Accretion and Energy Flow: The Mechanism of Active Galactic Nuclei", **Astrophy. and Space Sci.**, 264, 357

35. Dermer, C.D., Li, H. & Chiang, J. 1998, "Correlated Spectral and Temporal Variability in the High Energy Emissions from Blazars", in **Proceedings of the Third Integral Workshop**, Taormina, Sicily

36. Li, H., Colgate, S.A., Kusunose, M. & Lovelace, R.V.E. 1999, "On the Particle Heating and Acceleration in Black Hole Accretion Systems", an invited review at **High Energy Processes in Accreting Black Holes**, **ASP Conf.**, 161, 349

37. Lovelace, R.V.E, Li, H., Colgate, S.A. & Nelson, A.F. 1999, "Rossby Wave Instability of Keplerian Accretion Disks", **Astrophysical Journal**, 513, 805

38. Michel, F.C. & Li, H. 1999, "Electrodynamics of Neutron Stars", **Physics Reports**, 318, 227

39. Gary, S.P. & Li, H. 2000, "Whistler Heat Flux Instability at High Beta", **Astrophysical Journal**, 529, 1131

40. Li, H., Finn, J.M., Lovelace, R.V.E. & Colgate, S.A. 2000, "Rossby Wave Instability of Thin Accretion Disks – II. Detailed Linear Theory", **Astrophysical Journal**, 533, 1023

41. Colgate, S.A. & Li, H. 2000, "The Magnetic Fields of the Universe and Their Origin", in **Highly Energetic Physical Processes and Mechanisms for Emission from Astrophysical Plasmas,** IAU Sym. 195, 255

42. Gary, S.P., Kazimura, Y., Li, H., & Sakai, J.I. 2000, "Simulations of Electron/Electron Instabilities: Electromagnetic Fluctuations", **Physics of Plasmas**, 7, 448

43. Kazimura, Y., Gary, S.P. & Li, H., & Sakai, J.I. 2000, "Electromagnetic Fluctuations Near the Electron Plasma Frequency From An Electron/Electron Instabilities", **Journal of Geophysical Research**, 105, 10537

44. Kazimura, Y., Tega, H., Li, H., & Sakai, J.I. 2000, "Wave excitations from high dense and hot plasmas", **Progress of Theoretical Phy. Supp.,** 138, 650

45. Haruki, T., Sakai, J.I., Bulanov, S., & Li, H. 2000, "Formation of Helical Current During Coalescence of Current Loops in Pair Plasmas", **Progress of Theoretical Phy. Supp.,** 138, 718

46. Kusunose, M., Takahara, F., & Li, H. 2000, "Electron Acceleration and Time Variability of High-Energy Emission from Blazars", **Astrophysical Journal**, 536, 299

47. Li, H. & Kusunose, M. 2000, "Temporal and Spectral Variabilities of High Energy Emission from Blazars Using Synchrotron Self-Compton Models", **Astrophysical Journal**, 536, 729

48. Ustyugova, G.V., Lovelace, R.V.E., Romanova, M.M., Li, H., & Colgate, S.A. 2000, "Poynting Jets from Accretion Disks: Magnetohydrodynamic Simulations", **Astrophysical Journal Letters**, 541, L21

49. Colgate, S.A., Li, H., & Pariev, V. 2001, "The Origin of the Magnetic Fields of the Universe: The Plasma Astrophysics of the Free Energy of the Universe", invited talk at Div. Plasma Phys. meeting, **Physics of Plasmas**, 8, 2425

50. Li, H., Colgate, S.A., Wendroff, B., & Liska, R. 2001, "Rossby Wave Instability of Thin Accretion Disks – III. Nonlinear Simulations", **Astrophysical Journal**, 551, 874

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52. Stawicki, O., Gary, S.P., & Li, H. 2001, "Solar Wind Magnetic Fluctuations Spectra: Dispersion versus Damping", **Journal of Geophysical Research**, 106, 8273

53. Colgate, S.A., & Li, H. 2001, "The Origin of All Cosmic Rays: A Space-Filling Mechanism", in **The Role of Neutrinos, Strings, Gravity, and Variable Cosmological Constant in Elementary Particle Physics**, eds. B.N. Kursunoglu, S.L. Mintz, A. Perlmutter, p149

54. Krönberg, P.P., Dufton, Q., Li, H., & Colgate, S.A. 2001, "Magnetic Energy of the Intergalactic Medium from Galactic Black Holes", **Astrophysical Journal**, 560, 178

55. Li, H., Lovelace, R.V.E., Finn, J.M., & Colgate, S.A. 2001, "Magnetic Helix Formation Driven by Keplerian Disk Rotation in an External Plasma Pressure — The Initial Expansion Stage", **Astrophysical Journal**, 561, 915

56. Lovelace, R.V.E., Li, H., Koldoba, A.V., Ustyugova, G.V., & Romanova, M.M. 2002, "Poynting Jets from Accretion Disks", **Astrophysical Journal**, 572, 445

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59. Nishimura, K., Gary, S.P, Li, H., & Colgate, S.A. 2003, "Magnetic Reconnection in a Force-Free Plasma: Relationship between Micro- and Macroinstabilities", **Physics of Plasmas**, 10, 347

60. Liang, E.P.T., Nishimura, K., Li, H., & Gary, S.P. 2003, "Particle Energization in an Expanding Magnetized Relativistic Plasma", **Phys. Rev. Lett**, 90, 085001

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62. Koller, J., Li, H., & Lin, D.N.C. 2003, "Vortices in the Co-orbital Region of an Embedded Protoplanet", **Astrophysical Journal Letters**, 596, 91

63. Colgate, S.A., Cen, R., Li, H., Currier, N., & Warren, M. 2003, "Cosmological Mestel Disks and the Rossby Vortex Instability: The Origin of Supermassive Black Holes", **Astrophysical Journal Letters**, 598, 7

64. Kronberg, P.P, Colgate, S.A., Li, H., & Dufton, Q.W. 2004, "Giant Radio Galaxies and Cosmic-Ray Acceleration", **Astrophysical Journal**, 604, 77

65. Finn, J.M., Lapenta, G., & Li, H. 2004, "Similarity solutions for magnetic bubble expansion", **Physics of Plasmas**, 11, 2082

66. Colgate, S.A., & Li, H. 2004, "Acceleration mechanisms 2: force-free reconnection", **Comptes Rendus Physique**, v.5, p431

67. Li, S., & Li, H. 2004, "A Novel Approach for Maintaining Divergence-Free for Adaptive Mesh Refinement", **J. Computational Phys.**, 199, 1

68. Li, H. et al. 2005, "Potential Vorticity Evolution of a Protoplanetary Disk with an Embedded Protoplanet", **Astrophysical Journal**, 624, 1003

69. Wang, Z., Si, J., & Li, H. 2006, "Observation of an Enhanced Magnetic Helicity Injection Mode by a Rotating Plasma Annulus", **J. Fusion Energy**, DOI: 10.1007/s108894-006-9057-y

70. Li, H. et al. 2006, "Modeling the Large-Scale Structures of Astrophysical Jets in the Magnetically Dominated Limit", **Astrophysical Journal**, 643, 92

71. Nakamura, M., Li, H., & Li, S. 2006, "Structure of Magnetic Tower Jets in Stratified Atmospheres", **Astrophysical Journal**, 652, 1059

72. Nakamura, M., Li, H., & Li, S. 2007, "Stability Properties of Magnetic Tower Jets", **Astrophysical Journal**, 656, 721

73. Bowers, K., & Li, H. 2007, "Spectral Energy Transfer and Dissipation of Magnetic Energy from Fluid to Kinetic Scales", **Phys. Rev. Lett**, 98, 035002

74. Li, S., Li, H., & Cen, R. 2007, "CosmoMHD: A Cosmological Magnetohydrodynamics Code", **Astrophysical J. Suppl.**, in press

75. Rockefeller, G., Fryer, C., & Li, H. 2007, "Collapsars in Three Dimensions", **Astrophysical Journal**, submitted