

CURRICULUM VITAE

William B. Hubbard

Present position:

Professor Emeritus, Department of Planetary Sciences and Lunar and Planetary Laboratory, University of Arizona

Education:

1962 - B.A., Physics, Rice University (*magna cum laude*)

1967 - Ph.D., Astronomy, University of California, Berkeley

Dissertation Title: "Electron Conduction in Degenerate Stellar Matter"

Dissertation Director: L.G. Henyey

Academic and Professional Appointments:

1966, Fellow, Lick Observatory

1967-1968, Postdoctoral Research Fellow, Kellogg Radiation Laboratory, California Institute of Technology

1968-1972, Assistant Professor of Astronomy, University of Texas at Austin

1970-1977, Consultant, Jet Propulsion Laboratory, Pasadena, California

1972-1982, Consultant, NASA Headquarters, Washington, DC

1972-1986, Consultant, Lawrence Livermore National Laboratory, Livermore, California

1972-1975, Associate Professor, Department of Planetary Sciences and Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona

1973, National Academy of Sciences Exchange Scientist to the USSR (O. Yu. Schmidt Institute of Geophysics, Moscow)

1975-2017, Professor, Department of Planetary Sciences and Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona

1977, Acting Director, Lunar and Planetary Laboratory, and Acting Head, Department of Planetary Sciences, University of Arizona

1978-1981, Director, Lunar and Planetary Laboratory, and Head, Department of Planetary Sciences, University of Arizona

2017- , Professor Emeritus, Department of Planetary Sciences and Lunar and Planetary Laboratory, University of Arizona, Tucson, Arizona

Memberships:

American Association for the Advancement of Science

American Astronomical Society (Division for Planetary Sciences)

American Geophysical Union

International Astronomical Union

Awards and Honors:

1989, Fellow, Japan Society for the Promotion of Science

1991, Fellow, American Geophysical Union

2003, Fellow, American Association for the Advancement of Science

2005, Gerard P. Kuiper Prize in Planetary Sciences, Division for Planetary Sciences, American Astronomical Society

2010, main-belt asteroid 11216 Billhubbard (1999 JG1)

2012, NASA Group Achievement Award for *Juno* proposal

- 2012, NASA Group Achievement Award for *Juno* development, launch, and early operations
- 2013, Blitzer Award for Excellence in the Teaching of Physics and Related Sciences, University of Arizona
- 2017, AIAA Space Systems Medal to *Juno* project, for exceptional achievement in the development and implementation of the *Juno* mission
- 2019, Fellow, American Astronomical Society

Professional Service:

- 1971-1972, Science Advisory Group on Outer Solar System Exploration, NASA
- 1972-1973, Outer Planets Science Working Group, NASA
- 1973, 1974, Jupiter-Uranus Science Advisory Group, NASA
- 1973-1975, Interchange participant, Ames Research Center
- 1977-1980, Member, *Icarus* Editorial Board
- 1978, Shuttle-Salyut Payload Study Group, NASA
- 1980-2003, Associate Editor, *Icarus*
- 1984-1985, Nomination committee, Kuiper and Urey awards of the Division for Planetary Sciences, American Astronomical Society
- 1986-1988, Member, Division for Planetary Sciences Committee
- 1989-1990, Member, Planetary Panel, Astronomy and Astrophysics Survey Committee, National Research Council
- 1991-1996, Member, Outer Planets Science Working Group, NASA
- 1994-1996, Chairman, Outer Planets Science Working Group, NASA
- 1996-1998, Chairman, Astrophysical Analogs Campaign Strategy Working Group, NASA
- 1994-1998, Member, Solar System Exploration Subcommittee, NASA
- 1998-2001, Member, Electorate Nominating Committee, Astronomy, AAAS (Chair, 2000)
- 2000, Group Chief, Planetary Astronomy Review Panel, NASA
- 2001, *ad hoc* member, Core Writing Committee, NASA Planetary Astronomy Program
- 2003-2006, member, Committee on Planetary and Lunar Exploration (COMPLEX), NAS-NRC
- 2004-2006, member, Steering Committee, Outer Planets Advisory Group, NASA
- 2005-2010, Receiving Editor, *New Astronomy* (Elsevier)
- 2003-2006, Member, IAU Working Group on Extrasolar Planets
- 2006-2015, Member, IAU Commission 53 on Extrasolar Planets
- 2015-, Member, IAU Commission C.F2 on Exoplanets and the Solar System
- 2007, Member, Cassini Extended Mission Senior Review Board
- 2008-2009, Prize Subcommittee, Division for Planetary Sciences, American Astronomical Society
- 2009, Atmospheres Panel Chair, NASA Cassini Data Analysis Program
- 2009-2010, Member, Giant Planets Panel, Decadal Survey of Astronomy and Astrophysics, NAS-NRC
- 2020, Member, Paolo Farinella Prize Committee, Europlanet Society

2005-2024..., Co-Investigator, NASA *Juno* Jupiter orbiter mission

Major Fields of Research:

Planetary interiors, high pressure physics, structure of rotating planets, stellar structure, occultation theory and observation, turbulence, extrasolar giant planets and brown dwarfs.

Publications:

RESEARCH PAPERS IN REFEREED JOURNALS

- [1] Photoelectric Spectrophotometry of Gaseous Nebulae. I. The Orion Nebula, C.R. O'Dell and W.B. Hubbard, *Astrophys. J.*, **142**, 591, 1965.
- [2] Photoelectric Spectrophotometry of Gaseous Nebulae. III. Scattered Light in Three Bright HII Regions, C.R. O'Dell, W.B. Hubbard, and M. Peimbert, *Astrophys. J.*, **143**, 743, 1966.
- [3] Studies in Stellar Evolution. V. Transport Coefficients of Degenerate Stellar Matter, W. B. Hubbard, *Astrophys. J.*, **146**, 858, 1966.
- [4] Thermal Structure of Jupiter, W. B. Hubbard, *Astrophys. J.*, **152**, 745, 1968.
- [5] Thermal Models of Jupiter and Saturn, W. B. Hubbard, *Astrophys. J.*, **155**, 333, 1969.
- [6] Thermal Conduction by Electrons in Stellar Matter, W.B. Hubbard and M. Lampe, *Astrophys. J. Supplement*, **18**, 297, 1969.
- [7] Hot White Dwarfs, W.B. Hubbard and R.L. Wagner, *Astrophys. J.*, **159**, 93, 1970.
- [8] Structure of Jupiter: Chemical Composition, Contraction, and Rotation, W. B. Hubbard, *Astrophys. J.*, **162**, 687, 1970.
- [9] Statistical Mechanics of Light Elements at High Pressures. I. Theory and Results for Metallic Hydrogen with Simple Screening, W.B. Hubbard and W.L. Slattery, *Astrophys. J.*, **168**, 131, 1971.
- [10] The Occultation of Beta Scorpii C by Io on 1971 May 14, W. B. Hubbard and 10 other coauthors, *Nature*, **234**, 405, 1971.
- [11] The Occultation of Beta Scorpii by Jupiter and Io. I. Jupiter, W.B. Hubbard, R.E. Nather, D.S. Evans, F.G. Tull, D.C. Wells, G.W. Van Citters, B. Warner, and P. Vanden Bout, *Astron. J.*, **77**, 41, 1972.
- [12] The Occultation of Beta Scorpii by Jupiter and Io. III. Astrometry, W. B. Hubbard and T.C. Van Flandern, *Astron. J.*, **77**, 65, 1972.

- [13] Statistical Mechanics of Light Elements at High Pressure. II. Hydrogen and Helium Alloys, *Astrophys. J.*, **176**, 525, 1972.
- [14] Thermodynamics of Hydrogen-Helium Mixtures at High Pressure and Finite Temperature, W. B. Hubbard, *Phys. of the Earth and Planetary Interiors*, **6**, 65, 1972.
- [15] Observations of Rapid Blue Variables. XI. DQ Herculis, B. Warner, W. Peters, R. Nather, and W.B. Hubbard, *Mon. Not. Roy. Astron. Soc.*, **159**, 321, 1972.
- [16] Solidification of a Carbon-Oxygen Plasma, W. B. Hubbard and G. Loumos, *Astrophys. J.*, **180**, 199, 1973.
- [17] Discrepancies in Measurements of the Jupiter Atmospheric Scale Height, W. B. Hubbard and D. S. Evans, *Nature Phys. Sci.*, **240**, 162, 1972.
- [18] Statistical Mechanics of Light Elements at High Pressure. III. Molecular Hydrogen, W. L. Slattery and W. B. Hubbard, *Astrophys. J.*, **181**, 1031, 1973.
- [19] Observational Constraint on the Structure of Hydrogen Planets, W. B. Hubbard, *Astrophys. J. Lett.*, **182**, 132, 1973.
- [20] Gravitational Field of a Rotating Planet of Unit Polytropic Index, *Astronomicheskii Zhurnal*, **51**, 1052, 1974.
- [21] Significance of Gravitational Moments for Interior Structure of Jupiter and Saturn, W.B. Hubbard, V.N. Zharkov, and V.P. Trubitsyn, *Icarus*, **21**, 147, 1974.
- [22] Inversion of Gravity Data for Giant Planets, W. B. Hubbard, *Icarus*, **21**, 157, 1974.
- [23] Deuterium Enrichment of Metallic Hydrogen, W. B. Hubbard, *Astrophys. J.*, **190**, 223, 1974.
- [24] Tides in the Giant Planets, W. B. Hubbard, *Icarus*, **23**, 42, 1974.
- [25] Structure of the Jovian Envelope from Pioneer 10 Gravity Data, W. B. Hubbard, J. D. Anderson, and W. L. Slattery, *Astrophys. J. Lett.*, **193**, 1149, 1974.
- [26] Interior Structure of Uranus: Critical Measurements for an MJU Mission, *Icarus*, **24**, 285, 1975.
- [27] High Zonal Harmonics of Rapidly Rotating Planets, W. B. Hubbard, W. L. Slattery, and C.L. DeVito, *Astrophys. J.*, **199**, 504, 1975.
- [28] Effect of the Jovian Oblateness on Pioneer 10/11 Radio Occultation, W. B. Hubbard, D. M. Hunten, and A. Kliore, *Geophys. Res. Lett.*, **2**, 265, 1975.

- [29] Effects of Turbulence on Radio-Occultation Scale Heights, W. B. Hubbard and J. R. Jokipii, *Astrophys. J. Lett.*, **199**, L193, 1975.
- [30] Comparison of Geometrical Effects in Radio and Stellar Occultations, W. B. Hubbard, *Icarus*, **26**, 175, 1975.
- [31] Ray Propagation in Oblate Atmospheres, W. B. Hubbard, *Icarus*, **27**, 387, 1976.
- [32] Statistical Mechanics of Light Elements at High Pressure. IV. A Model Free Energy for the Metallic Phase, H. E. DeWitt and W. B. Hubbard, *Astrophys. J.*, **205**, 295, 1976.
- [33] Thermodynamics of a Solar Mixture of Molecular Hydrogen and Helium at High Pressure, W. L. Slattery and W. B. Hubbard, *Icarus*, **29**, 187, 1976.
- [34] Temperature of the Atmosphere of Jupiter from Pioneer 10/11 Radio Occultations, A. Kliore, P. Woiceshyn, and W. B. Hubbard, *Geophys. Res.Lett.*, **3**, 113, 1976.
- [35] DeSitter's Theory Flattens Jupiter, W. B. Hubbard, *Icarus*, **30**, 305, 1977.
- [36] The Jovian Surface Condition and Cooling Rate, W. B. Hubbard, *Icarus*, **30**, 305, 1977.
- [37] Stellar Occultations by Turbulent Planetary Atmospheres: A Heuristic Scattering Model, W. B. Hubbard and J. R. Jokipii, *Icarus*, **30**, 531, 1977.
- [38] Stellar Occultations by Turbulent Planetary Atmospheres: The Beta Sco Events, J. R. Jokipii and W. B. Hubbard, *Icarus*, **30**, 537, 1977.
- [39] Effects of Particle Drift on Cosmic- Ray Transport. I. General Properties, Application to Solar Modulation, J. R. Jokipii, E. H. Levy, and W. B. Hubbard, *Astrophys. J.*, **213**, 861, 1977.
- [40] The Occultation of Epsilon Geminorum by Mars: Analysis of McDonald Data, W. B. Hubbard and 9 coauthors, *Astrophys. J.*, **214**, 934, 1977.
- [41] Turbulent Scattering in an Exponential Atmosphere: A Wave-Optical Model, W. B. Hubbard and J. R. Jokipii, *Astrophys. J.*, **214**, 924, 1977.
- [42] Possible Flyby Measurements of Galilean Satellite Interior Structure, W. B. Hubbard and J. D. Anderson, *Icarus*, **33**, 336, 1978.
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- [45] Stellar Occultations by Turbulent Planetary Atmospheres: A Wave-Optical Theory Including a Finite Scale Height, W. B. Hubbard, J. R. Jokipii, and B. A. Wilking, *Icarus*, **34**, 374, 1978.
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- [48] The Epsilon Geminorum Occultation: Evidence for Waves or Turbulence, W. B. Hubbard, *Astrophys. J.*, **299**, 821, 1979.
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- [54] Interior Structure of Saturn Inferred from Pioneer 11 Gravity Data, W. B. Hubbard, J. J. MacFarlane, J. D. Anderson, G. W. Null, and E. D. Biller, *J. Geophys. Res.*, **85**, 5909, 1980.
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- [66] Statistical Mechanics of Light Elements at High Pressure. VIII. Thomas-Fermi-Dirac Theory for Binary Mixtures of H with He, C, and O, W. B. Hubbard and J. J. MacFarlane, *Astrophys. J.*, **297**, 133, 1985.
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- [70] Evolution and Infrared Spectra of Brown Dwarfs, J. I. Lunine, W. B. Hubbard and M. S. Marley, *Astrophys. J.*, **310**, 238, 1986.
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[72] The Size, Shape, Density, and Albedo of Ceres From its Occultation of BD +8°471, by 42 authors (Millis, et al.) including W. B. Hubbard, *Icarus*, **72**, 507, 1987.

[73] Oblateness, Radius, and Mean Stratospheric Temperature of Neptune from the 20 August 1985 Occultation, W. B. Hubbard, P. D. Nicholson, E. Lellouch, B. Sicardy, A. Brahic, F. Vilas, P. Bouchet, R. A. McLaren, R. L. Millis, L. H. Wasserman, J. H. Elias, K. Matthews, J. D. McGill, and C. Perrier, *Icarus*, **72**, 635, 1987.

[74] Structure of Scintillations in Neptune's Occultation Shadow, W. B. Hubbard, E. Lellouch, B. Sicardy, A. Brahic, F. Vilas, P. Bouchet, R. A. McLaren, and C. Perrier, *Astrophys. J.*, **325**, 490, 1988.

[75] Theory of Anisotropic Refractive Scintillation --Application to Stellar Occultations by Neptune, R. Narayan and W. B. Hubbard, *Astrophys. J.*, **325**, 503, 1988.

[76] Thermodynamics of Dense Molecular Hydrogen-Helium Mixtures at High Pressure, M. S. Marley and W. B. Hubbard, *Icarus*, **73**, 536, 1988.

[77] No Effects of Diffraction on Pluto - Charon Mutual Events, D. J. Tholen and W. B. Hubbard, *Astronomy and Astrophysics*, **204**, L5, 1988.

[78] Optimized Jupiter, Saturn, and Uranus Interior Models, W. B. Hubbard and M. S. Marley, *Icarus*, **78**, 102, 1989.

[79] The Effect of Grain Formation on the Cooling of Brown Dwarfs, J. I. Lunine, W. B. Hubbard, A. S. Burrows, and Y. P. Wang, *Astrophys. J.*, **338**, 314, 1989.

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[82] Nonisothermal Pluto Atmosphere Models, W. B. Hubbard, R. V. Yelle, and J. I. Lunine, *Icarus*, **84**, 1-11, 1990.

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[88] Interior Structure of Neptune: Comparison with Uranus, W. B. Hubbard, W. J. Nellis, A. C. Mitchell, N. C. Holmes, S. S. Limaye, and P. C. McCandless, *Science*, **253**, 648, 1991.

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